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The use of telemedicine services for medical abortion (Review)

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[Intervention Review]

The use of telemedicine services for medical abortion

Amanda Cleeve[1,2], Antonella Lavelanet[3], Kristina Gemzell-Danielsson[1,2], Margit Endler[1,4]

[1]Department of Women's and Children's Health, Karolinska Institutet, Stockholm, Sweden. [2]Karolinska University Hospital, Stockholm, Sweden. [3]UNDP/UNFPA/UNICEF/WHO/World Bank Special Programme of Research, Development and Research Training in Human Reproduction (HRP), Department of Sexual and Reproductive Health and Research, World Health Organization, Geneva, Switzerland. [4]Department of Public Health, University of Cape Town, Cape Town, South Africa

Contact: Amanda Cleeve, amanda.cleeve@ki.se.

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ABSTRACT

Rationale

Telemedicine models for medical abortion are service delivery models where care is provided by a health worker using telecommunications to support the abortion process. Existing evidence suggests that telemedicine for medical abortion is safe, effective, and acceptable to women compared to when care is provided in-clinic. However, the available data are often constrained by several factors. We sought to strengthen the evidence base by comparing telemedicine models for medical abortion with medical abortion provided in-clinic.

Objectives

To assess the safety, success rate, and acceptability of telemedicine models for medical abortion, according to which phase or phases (pre-abortion, abortion, and/or post-abortion) telecommunications were used as the primary means of service delivery, compared to in-clinic care for medical abortion in the corresponding phase/phases.

Search methods

We searched CENTRAL (Ovid EBM Reviews), MEDLINE ALL (Ovid), Embase.com, CINAHL (EBSCOhost), LILACS, Global Health (Ovid), Scopus, Google Scholar, and grey literature sources from the inception of the database to 13 August 2024. We screened the references of included studies and contacted authors to identify additional data or enquire about ongoing studies.

Eligibility criteria

We included randomised controlled trials (RCTs) and non-randomised studies (NRS) of telemedicine models compared with in-clinic care (standard care) for medical abortion. We only included studies that used an interactive type of telecommunication and studies where telemedicine services were provided by a health worker.

Outcomes

Critical: successful abortion (a terminated pregnancy without the need for surgical intervention to complete the abortion within 42 days of the abortion). Important: continuing pregnancy, blood transfusion, hospitalisation, emergency visits, satisfaction, adherence.

Risk of bias

We used the RoB 2 and ROBINS-I tools to assess the risk of bias in the included RCTs and NRS, respectively.

Synthesis methods

Two review authors (AC and ME) independently screened and extracted data in Covidence. We grouped interventions according to which abortion phase or phases (pre-abortion, abortion, post-abortion) telecommunications were used to deliver care. We graded the certainty of the evidence using the GRADE approach.

Included studies

We included 22 studies: six RCTs and 16 NRS, comprising a total of 131,278 individuals undergoing medical abortion up to 12 weeks' gestation. Studies were conducted across five high-income and four middle-income countries. Due to the heterogeneity among included NRS, we performed meta-analyses only for comparisons where we had RCTs.

Synthesis of results

Main intervention: Pre- to post-abortion care telemedicine models for medical abortion versus in-clinic care

In these telemedicine models, various forms of synchronous and asynchronous telecommunications were used to deliver care from the pre- to post-abortion phase, up to 12 weeks' gestation. Any in-clinic testing was done to complement, rather than to replace, service delivery in the pre-abortion phase. Five out of nine studies did not perform routine ultrasounds as part of the eligibility screening.

Pre- to post-abortion telemedicine models probably result in little to no difference in successful abortion (RR 0.99, 95% CI 0.97 to 1.01; 2 RCTs, 837 participants; moderate-certainty evidence). This finding was supported by NRS results (Aiken 2021; 99% versus 98%; adjusted P value = 0.268; 7 NRS, 83,061 participants; moderate-certainty evidence). Further, pre- to post-abortion telemedicine models probably result in little to no difference in rates of continued pregnancy (Aiken 2021: 0.5% versus 1%; adjusted P value = 0.268; 5 NRS, 74,269 participants; moderate-certainty evidence) and may result in little to no difference in blood transfusions (Aiken 2021: 0.02% versus 0.03%, adjusted P value = 0.557; 5 NRS, 83,651 participants; low-certainty evidence). The effect of the intervention on hospitalisation is uncertain (RR 1.45, 95% CI 0.24 to 8.61; 2 RCTs, 846 participants; very low-certainty evidence). This intervention may result in little to no difference in emergency visits (RR 1.15, 95% CI 0.36 to 3.75; 2 RCTs, 847 participants; low-certainty evidence) and satisfaction (RR 1.01, 95% CI 1.00 to 1.02; 2 RCTs, 832 participants; low-certainty evidence), and probably results in little to no difference in adherence to the medical abortion regimen (RR 0.99, 95% CI 0.96 to 1.02; 1 RCT, 732 participants; moderate-certainty evidence). No deaths were reported in this review.

Sub-interventions: Pre-abortion/abortion telemedicine models for medical abortion versus in-clinic; Post-abortion telemedicine models versus in-clinic

Four NRS compared pre-abortion/abortion telemedicine models with in-clinic care; all outcomes had very low-certainty evidence. Four RCTs and five NRS compared post-abortion telemedicine models with in-clinic follow-up. Post-abortion telemedicine models likely result in little to no difference in successful abortion (RR 1.0, 95% CI 0.99 to 1.01; 4 RCTs, 5069 participants; moderate-certainty evidence). They may result in little to no difference in continuing pregnancy (RR 0.81, 95% CI 0.48 to 1.36; 4 NRS, 5069 participants; low-certainty evidence) and likely result in higher rates of adherence to follow-up procedures (RR 1.15, 95% CI 1.13 to 1.18; 4 RCTs, 5235 participants; moderate-certainty evidence). The effects of post-abortion telemedicine models on blood transfusion, hospitalisation, emergency visits, and satisfaction are uncertain.

Authors' conclusions

Pre- to post-abortion telemedicine models probably result in little to no difference in successful abortion, continuing pregnancy, and adherence to the medical abortion regimen, with moderate-certainty evidence. We found low-certainty evidence that this intervention may result in little to no difference in rates of blood transfusions, emergency visits, and satisfaction, but we are uncertain about the effect on hospitalisation. Post-abortion telemedicine models likely result in higher rates of adherence to follow-up procedures, with moderate-certainty evidence. We downgraded studies mainly due to serious risk of bias or imprecision, with some outcomes being rare events. Altogether, the findings indicate that telemedicine models for medical abortion in early pregnancy may result in similar outcomes in terms of safety, effectiveness, and acceptability when compared to in-clinic provision.

Most studies were conducted in high-resource settings and data were limited to gestational ages above nine weeks. Future studies should investigate telemedicine models for medical abortion in lower-resourced settings and in gestational ages above nine weeks, compare different kinds of telecommunications, and assess models that omit testing (ultrasounds, physical exams, or blood tests).

Funding

None

Registration

DOI: 10.1002/14651858.CD013764

PLAIN LANGUAGE SUMMARY

Is the use of telemedicine services for medical abortion better than in-clinic care?

What is medical abortion care?

A medical abortion is an abortion where a person ends a pregnancy using a combination of two types of medication, mifepristone and misoprostol, or by using misoprostol alone. Medical abortion care comprises three different phases: pre-abortion, abortion, and post-abortion. These phases include different care components. The pre-abortion phase includes pre-abortion information, counselling, if desired, and eligibility assessment. The abortion phase includes instructions for, dispensing of, and administration of medications. The post-abortion phase includes the assessment of whether the abortion was successful and may also involve linkages to other reproductive health services. Some care components, such as information provision, counselling, and contraceptive counselling if desired, cross-cut all three phases.

What is telemedicine for medical abortion?

Telemedicine is a service delivery model for abortion where care is provided by a health worker using telecommunications, such as online chat, text messages, phone, or videoconference, to deliver care. This review focuses on telemedicine models for the provision of medical abortion care. Telemedicine can be used to support a woman either for part of or for the entire abortion process, from the pre-abortion to post-abortion phase.

What did we want to find out?

Previous research suggests that telemedicine models for medical abortion may be safe, effective, and acceptable to abortion seekers. However, existing data are constrained for reasons relating to self-reporting of outcomes, lack of comparison groups, and missing data, and therefore conclusions must be drawn with caution. In this review we aimed to build a more robust evidence base by investigating models using telecommunications to deliver care relating to one or more phases of an abortion. Our main interests were models of care in which telecommunications were used as the main means of service delivery from the pre-abortion phase to the post-abortion phase, compared with in-clinic care for the corresponding phases. We were also interested in models of care in which telecommunications were used to deliver care in a single phase or for a combination of two phases of an abortion.

What did we do?

We looked for studies comparing telemedicine for medical abortion with in-clinic care.

What did we find?

In total, we found 22 studies, including a total of 131,278 individuals undergoing medical abortion in the first trimester. These studies were conducted across 10 middle- and high-income countries and provided evidence on three interventions: pre- to post-abortion telemedicine models for medical abortion (nine studies); pre-abortion/abortion telemedicine models (four studies); and post-abortion telemedicine models (nine studies). The types of telecommunications used varied across the included studies and contained both synchronous (real-time) and asynchronous (not occurring in real-time) communication.

Main results

We found that pre- to post-abortion telemedicine models for medical abortion are probably similar in terms of their effect on the outcomes of successful abortion, unintended pregnancy, and adherence to the medical abortion regimen, when compared to in-clinic care. This was consistent with our findings relating to the comparisons of pre-abortion/abortion telemedicine models with in-clinic care, and post-abortion telemedicine models with in-clinic care. With regard to post-abortion telemedicine models, we saw that these models likely result in higher rates of adherence to follow-up procedures when compared to in-clinic care. Altogether, our findings indicate that the use of telemedicine for medical abortion in early pregnancy may result in similar outcomes in terms of safety, effectiveness, and acceptability when compared to in-clinic provision.

What are the limitations of the evidence?

Sufficiently large randomised studies and non-randomised studies with appropriate analyses were relatively few, especially for our main intervention of interest. Most studies were conducted in high-resource settings and the majority of included participants were at up to nine weeks' gestation. Most studies included some in-clinic care to confirm the gestational age or the abortion outcome. For our main intervention of interest, however, five out of nine studies did not perform routine ultrasounds, laboratory tests, or physical exams to confirm gestational length or pregnancy location prior to the abortion.

How up-to-date is this review?

The evidence is up-to-date to 13 August 2024.

SUMMARY OF FINDINGS

Summary of findings 1. Summary of findings table - Pre- to post-abortion telemedicine models compared to in-clinic care for people (any age) who underwent a medical abortion

Pre- to post-abortion telemedicine models compared to in-clinic care for people (any age) who underwent a medical abortion

Patient or population: people (any age) who underwent a medical abortion
Setting: global
Intervention: pre- to post-abortion telemedicine models
Comparison: in-clinic care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with in-clinic care	Risk with pre- to post-abortion telemedicine models				
Successful abortion assessed with: terminated pregnancy without the need for surgical intervention follow-up: 6 weeks	983 per 1000	**973 per 1000** (953 to 993)	**RR 0.99** (0.97 to 1.01)	837 (2 RCTs)	⊕⊕⊕⊖ Moderate[a]	Pre- to post-abortion telemedicine models likely result in little to no difference in complete abortion.
Successful abortion assessed with: terminated pregnancy without the need for surgical intervention follow-up: 6 weeks	One before and after study with adjusted analysis for this outcome (n = 52,142); Aiken 2021, 99% (I) vs 98% (C) (adjusted P value = 1.0). One case control study (n = 381), two retrospective cohort studies with unadjusted analysis for this outcome (n = 218; n = 19,555). One retrospective cohort study with adjusted analysis for this outcome (n = 10,251); Cely-Andrade 2024, 95% (I) vs 93% (C); AOR for in-clinic model vs telemedicine 1.18 (0.87 to 1.59). One prospective cohort study with adjusted analysis for this outcome (n = 537); Ralph 2024, 95.6% (I) vs 93.6% (C); adjusted risk difference 1.1 (−3.6 to 5.9).			83061 (6 non-randomised studies)	⊕⊕⊕⊖ Moderate[b]	Pre- to post-abortion telemedicine models likely result in little to no difference in successful abortion.
Continued pregnancy assessed with: continuing viable pregnancy after intake of abortion medications follow-up: 6 weeks	One before and after study (n = 52,142) with adjusted analysis for this outcome; Aiken 2021, 0.5% (I) vs 1% (C) (adjusted P value = 0.268). One case control study (n = 354) and two retrospective cohort studies (n = 218; n = 19,555) with unadjusted analysis for this outcome.			74269 (4 non-randomised studies)	⊕⊕⊕⊖ Moderate[b,c]	Pre- to post-abortion telemedicine models likely result in little to no difference in continued pregnancy.

Blood transfusion assessed with: blood transfusion for reasons related to the abortion follow-up: 6 weeks	One before and after study (n = 52,142) with adjusted analysis for this outcome; Aiken 2021, 0.02% (I) vs 0.03% (C) (adjusted P value = 0.557). Three retrospective cohort studies (n = 218; n = 19,555; n = 11,199) and one prospective cohort study with unadjusted analysis for this outcome (n = 537).			83651 (5 non-randomised studies)	⊕⊕⊖⊖ Low[b,d,e]	Pre- to post-abortion telemedicine models may result in little to no difference in blood transfusion.
Hospitalisation assessed with: hospitalisation for reasons related to the abortion follow-up: 6 weeks	5 per 1000	**7 per 1000** (1 to 41)	**RR 1.45** (0.24 to 8.61)	846 (2 RCTs)	⊕⊖⊖⊖ Very low[a,f,g]	The evidence is very uncertain about the effect of pre- to post-abortion telemedicine models on hospitalisation.
Emergency visit assessed with: emergency visit to a healthcare facility for reasons related to the abortion follow-up: 6 weeks	12 per 1000	**14 per 1000** (4 to 45)	**RR 1.15** (0.36 to 3.75)	847 (2 RCTs)	⊕⊕⊖⊖ Low[a,e,g]	Pre- to post-abortion telemedicine models may result in little to no difference in emergency visits.
Adherence assessed with: adherence to allocated intervention follow-up: 6 weeks	960 per 1000	**951 per 1000** (922 to 980)	**RR 0.99** (0.96 to 1.02)	732 (1 RCT)	⊕⊕⊕⊖ Moderate[h]	Pre- to post-abortion telemedicine models likely result in little to no difference in adherence.
Satisfaction assessed with: reporting being somewhat satisfied, satisfied or very satisfied with the abortion care service follow-up: 6 weeks	979 per 1000	**989 per 1000** (979 to 999)	**RR 1.01** (1.00 to 1.02)	832 (2 RCTs)	⊕⊕⊖⊖ Low[g,i]	Pre- to post-abortion telemedicine models may result in little to no difference in satisfaction.

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).

CI: confidence interval; **RR:** risk ratio

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

See interactive version of this table: https://gdt.gradepro.org/presentations/#/isof/isof_question_revman_web_435985662740627152.

[a] Downgraded one level for high risk of bias due to missing outcome data in one of the included studies.
[b] Downgraded one level for risk of bias due to confounding (moderate risk in two included studies with > 50,000 study participants, serious risk in three studies, and critical in one study).
[c] Results from RCTs not shown because the certainty of evidence was very low (RR 1.88, 95% CI 0.47 to 7.47; 2 RCTs, 837 women) - see Table 2.
[d] Results from RCTs not shown because the certainty of evidence was very low (RR 1.9, 95% CI 0.17 to 20.91; 2 RCTs, 851 women) - see Table 2.
[e] Downgraded one level because of rare event.
[f] Downgraded two levels for imprecision; wide confidence interval and rare event.
[g] Results from NRS not shown because the certainty of evidence was very low - see Table 3.
[h] Downgraded one level because of imprecision (only one RCT).
[i] Downgraded two levels for risk of bias (high risk of bias due to missing data in one study and some concerns regarding the lack of blinding in the two included studies).

Summary of findings 2. Summary of findings table - Pre-abortion/abortion telemedicine models compared to in-clinic care for people (any age) who underwent a medical abortion

Pre-abortion/abortion telemedicine models compared to in-clinic care for people (any age) who underwent a medical abortion

Patient or population: people (any age) who underwent a medical abortion
Setting: global
Intervention: pre-abortion/abortion telemedicine models
Comparison: in-clinic care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with in-clinic care	Risk with pre-abortion/abortion telemedicine models				
Successful abortion assessed with: terminated pregnancy without the need for surgical intervention follow-up: 6 weeks	One prospective cohort study (n = 449) and one retrospective cohort study (n = 4456) with adjusted analyses for this outcome; Grossman 2011, 99% vs 97%, AOR 2.34 (95% CI 0.84 to 6.55); Kohn 98% (I) vs 94% (C), odds of surgical intervention with telemedicine: AOR 0.28 (95% CI 0.17 to 0.46).			4905 (2 non-randomised studies)	⊕⊕⊖⊖ Low[a]	Pre-abortion/abortion telemedicine models may result in a slight increase in successful abortion.
Continuing pregnancy assessed with: continuing viable pregnancy after intake of abortion medications follow-up: 6 weeks	One prospective cohort study with unadjusted analysis for this outcome (n = 449) and one retrospective cohort study with adjusted analyses for this outcome (n = 4456); Kohn 2019, 0.5% (I) vs 2% (C), AOR 0.23 (95% CI 0.14 to 0.39).			4905 (2 non-randomised studies)	⊕⊖⊖⊖ Very low[a,b]	The evidence is very uncertain about the effect of pre-abortion/abortion telemedicine models on continuing pregnancy.
Blood transfusion assessed with: blood transfusion for reasons related to the abortion	One prospective cohort study (n = 449) and one retrospective cohort study (n = 19,170) with unadjusted analyses for this outcome.			19619 (2 non-randomised studies)	⊕⊖⊖⊖ Very low[b,c]	The evidence is very uncertain about the effect of pre-abortion/abortion

follow-up: 6 weeks					telemedicine models on blood transfusion.
Hospitalisation assessed with: hospitalisation for reasons related to the abortion follow-up: 6 weeks	One prospective cohort study (n = 449) and one retrospective cohort study (n = 19,170) with unadjusted analysis for this outcome.		19619 (2 non-randomised studies)	⊕⊖⊖⊖ Very low[b,c]	The evidence is very uncertain about the effect of pre-abortion/abortion telemedicine models on hospitalisation.
Emergency visit assessed with: emergency visit to a healthcare facility for reasons relating to the abortion follow-up: 6 weeks	Two retrospective cohort studies (n = 19,170; n = 5952) with unadjusted analysis for this outcome.		25122 (2 non-randomised studies)	⊕⊖⊖⊖ Very low[b,d]	The evidence is very uncertain about the effect of pre-abortion/abortion telemedicine models on emergency visits.
Adherence assessed with: adherence to the allocated intervention follow-up: 6 weeks			(0 studies)	-	The sample size is too small/events are too few to grade the certainty of the evidence.
Satisfaction assessed with: reporting being somewhat satisfied, satisfied, or very satisfied with the abortion care service follow-up: 6 weeks	One retrospective cohort study with unadjusted analysis for this outcome (n = 386), and one prospective cohort study with adjusted analysis related to this outcome (n = 449); Grossman 2011, 95% (I) vs 94% (C): very satisfied: AOR 2.10 (95% CI 0.75 to 5.92).		835 (2 non-randomised studies)	⊕⊕⊖⊖ Low[e]	Pre-abortion/abortion telemedicine models may result in little to no difference in satisfaction.

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).

CI: confidence interval

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

See interactive version of this table: https://gdt.gradepro.org/presentations/#/isof/isof_question_revman_web_442643197294641286.

[a] Downgraded two levels for high risk of bias due to missing outcome data and high risk of bias in the measurement of outcomes in one included study.
[b] Downgraded one level because of rare event.
[c] Downgraded two levels for high risk of bias due to confounding and high risk of bias due to missing outcome data in one study.
[d] Downgraded two levels for high risk of bias due to confounding in one study and high risk of bias due to missing outcome data in two included studies.

[e] Downgraded two levels for high risk of bias due to confounding and missing outcome data in one of the included studies.

Summary of findings 3. Summary of findings table - Post-abortion telemedicine models compared to in-clinic care for people (any age) who underwent a medical abortion

Post-abortion telemedicine models compared to in-clinic care for people (any age) who underwent a medical abortion

Patient or population: people (any age) who underwent a medical abortion
Setting: global
Intervention: post-abortion telemedicine models
Comparison: in-clinic care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with in-clinic care	Risk with post-abortion telemedicine models				
Successful abortion assessed with: terminated pregnancy without the need for surgical intervention follow-up: 6 weeks	925 per 1000	**925 per 1000** (916 to 934)	**RR 1.00** (0.99 to 1.01)	5069 (4 RCTs)	⊕⊕⊕⊖ Moderate[a,b]	Post-abortion telemedicine models likely result in little to no difference in successful abortion.
Continuing pregnancy assessed with: continuing viable pregnancy after intake of abortion medications follow-up: 6 weeks	12 per 1000	**10 per 1000** (6 to 17)	**RR 0.81** (0.48 to 1.36)	5069 (4 RCTs)	⊕⊕⊖⊖ Low[a,b,c]	Post-abortion telemedicine models may result in little to no difference in continuing pregnancy.
Blood transfusion assessed with: blood transfusion for reasons related to the abortion follow-up: 6 weeks	2 per 1000	**1 per 1000** (0 to 17)	**RR 0.33** (0.01 to 8.07)	933 (1 RCT)	⊕⊖⊖⊖ Very low[d,e]	The evidence is very uncertain about the effect of post-abortion telemedicine models on blood transfusion.
Hospitalisation assessed with: hospitalisation for reasons related to the abortion follow-up: 6 weeks	0 per 1000	**0 per 1000** (0 to 0)	**RR 4.95** (0.24 to 102.76)	933 (1 RCT)	⊕⊖⊖⊖ Very low[b,d,e]	The evidence is very uncertain about the effect of post-abortion telemedicine models on hospitalisation.
Emergency visit	One retrospective cohort study (n = 167) and one prospective cohort			285	⊕⊖⊖⊖ Very low[f]	The evidence is very uncertain about the effect of post-abortion

assessed with: emergency visit to a healthcare facility for reasons related to the abortion follow-up: 6 weeks	study (n = 118) with unadjusted analysis.			(2 non-randomised studies)		telemedicine models on emergency visits.
Adherence assessed with: adherence to allocated intervention follow-up: 6 weeks	803 per 1000	**924 per 1000** (908 to 948)	**RR 1.15** (1.13 to 1.18)	5235 (4 RCTs)	⊕⊕⊕⊖ Moderate[b,d]	Post-abortion telemedicine models likely result in slightly higher adherence to follow-up.
Satisfaction assessed with: reporting being somewhat satisfied, satisfied, or very satisfied with the abortion care service follow-up: 6 weeks	756 per 1000	**635 per 1000** (582 to 696)	**RR 0.84** (0.77 to 0.92)	933 (1 RCT)	⊕⊖⊖⊖ Very low[b,g,h]	The evidence is very uncertain about the effect of post-abortion telemedicine models on satisfaction.

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).

CI: confidence interval; **RR:** risk ratio

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

See interactive version of this table: https://gdt.gradepro.org/presentations/#/isof/isof_question_revman_web_435855407054875478.

[a] Downgraded one level because of high risk of bias due to missing outcome data in two of the included RCTs.
[b] Results from NRS not shown because the certainty of evidence was very low - see Table 6.
[c] Downgraded one level for imprecision - rare event.
[d] Downgraded one level for high risk of bias due to deviations from intended intervention and missing outcome data.
[e] Downgraded two levels for imprecision; wide confidence interval and/or rare event in one single study.
[f] Downgraded one level for risk of bias due to confounding, one level for imprecision, and one level for inconsistency.
[g] Downgraded two levels due to risk of bias due to missing outcome data, deviations from intended intervention, and unblinded study that may have impacted the outcome.
[h] Downgraded one level due to imprecision (1 RCT).

BACKGROUND

Description of the condition

Globally, abortion care is being demedicalised – moving from the hands of health workers to the hands of abortion seekers, thanks to the development of medical abortion and technological and scientific advancements [1, 2]. Today, many women self-manage part of the medical abortion process, such as self-assessing the abortion outcome, with sustained safety, effectiveness, and acceptability [3], and routine follow-up in-clinic visits are no longer recommended [4]. Research has shown that self-managed medical abortion is sometimes preferred, including in settings where abortion is legal and available, citing reasons such as privacy, comfort, and cost [5]. Online options to access medical abortion have been described as more confidential and a means to avoid abortion-related stigma [6]. Telemedicine is a well-established digital health intervention in many fields of medicine with demonstrated benefits of reducing unnecessary in-clinic visits and improving access to timely care [7]. By improving access to timely care, telemedicine has the potential to decrease abortion-related morbidity and mortality [8]. The past decades have seen various telemedicine models for medical abortion developed to circumvent legal, geographical, infrastructural, or stigma-related barriers to accessing medical abortion [9, 10]. As such, the evidence base for different telemedicine models has grown exponentially. This development was accelerated by the COVID-19 pandemic, which often obstructed or prevented access to in-clinic care [11, 12]. In many ways, the pandemic underscored the importance of alternative pathways to accessing medical abortion; in some contexts, it led to a restructuring of service delivery to mitigate barriers to care imposed by lockdowns [13, 14, 15].

Description of the intervention and how it might work

Telemedicine is "the delivery of healthcare services, where distance is a critical factor, by all healthcare professionals, using information and communications technologies for the exchange of valid information for diagnosis, treatment or prevention of disease and injuries in the interests of advancing the health of individuals and their communities" [7].

Telemedicine services may be provided synchronously (i.e. in real-time) through a video-link, over the telephone or an online chat, or asynchronously, which is when a query is sent using email, audio calls, text messages, or a store-and-forward method, and the answer is provided later. According to this definition, unidirectional messaging services in the shape of online informational sites or automated messaging without an interactive component, do not qualify as telemedicine services. Nor do services provided by non-health workers [7]. The World Health Organization (WHO) defines health workers as "all people engaged in actions whose primary intent is to advance health". This term is usually used to refer to people engaged in paid activities such as nurses, midwives, and physicians [4].

In the context of medical abortion care, telemedicine services may be used to deliver care during the different phases of an abortion, from the pre-abortion, abortion, and post-abortion phases. The pre-abortion phase includes pre-abortion information, counselling if desired, and eligibility assessment. The abortion phase includes information about the management of the abortion process, instructions for, dispensing of, and administration of medications. The post-abortion phase includes the assessment of whether the abortion was successful and may also involve linkages to other reproductive health services. Some care components such as information provision, counselling, and contraceptive counselling, if desired, cross-cut all three phases. Telemedicine services may be offered as part of the range of services provided by a healthcare facility, performed alongside in-clinic care, or as a supplement to existing services to improve access to medical abortion [9, 10, 16, 17, 18].

Existing telemedicine models for medical abortion vary greatly with respect to the scope and types of services they offer, during which phase or phases of the abortion telemedicine is used, and the different types of telecommunications that are utilised, including whether communication is synchronous or asynchronous.

We categorised the telemedicine models described in the included studies according to which phase or phases of the abortion that telecommunications were used to deliver care. We also noted for which components of care telecommunications were used, and the kinds of telecommunications that were used. In addition, we noted whether the telemedicine model included any in-clinic testing or examinations, such as ultrasounds or blood testing. Our control was standard care, defined as in-clinic care for the corresponding phase or phases. Telemedicine models in which telecommunications were the main means of service delivery in all three phases of the abortion (i.e. the entire abortion process) were our main intervention of interest. Our sub-interventions were telemedicine models where telecommunications were used to deliver care relating to a single phase or for a combination of two phases. We aimed to generate evidence on telemedicine models for medical abortion care, on clinical outcomes and acceptability.

It is important to note that the evidence base for self-assessment of the outcome of an early medical abortion, using tools such as low-sensitive pregnancy tests and/or symptom checklists, is relatively solid, relying on low- to very low-certainty evidence [3, 4]. We included studies comparing telemedicine follow-up to in-clinic follow-up, to provide further evidence on the use of telemedicine for medical abortion in the post-abortion phase.

Why it is important to do this review

Barriers to accessing safe abortion present a serious health risk for women globally [19, 20, 21, 22]. Between 2010 and 2014, 25.1 million (45.1%) of all abortions that occurred each year were unsafe, meaning they were provided by unskilled practitioners and/or by using outdated or harmful methods [1]. Whereas mortality from unsafe abortion is estimated to cause 23,000 deaths each year [23], mortality after safe abortion is negligible and serious adverse events are rare [24, 25]. The evolution of medical abortion and technological advancements have enabled the development of different service delivery models for medical abortion using telecommunications, which may expand access to safe abortion care. The quality of care in these service delivery models varies greatly according to whether the service operates according to established medical guidelines, provides an interactive consultation, and is staffed by trained healthcare professionals [9]. Greater responsibility is placed on the abortion seeker when information is provided using telecommunications. Therefore, telemedicine models for medical abortion could hypothetically affect both the experience of the abortion, including acceptability, and adherence to medication

regimens or follow-up procedures, which in turn could affect the safety and effectiveness of the medical abortion. Several studies suggest that the clinical outcomes and acceptability of telemedicine for medical abortion are comparable to those for in-clinic care [10, 26, 27, 28]. However, studies on telemedicine often include only self-reported outcome data, and data quality suffers from a high loss to follow-up and the absence of a comparison group. Previous systematic reviews on telemedicine for medical abortion have included studies with a wide variety of telemedicine models for medical abortion, with and without a comparison group, and therefore conclusions regarding its safety and effectiveness should be made with some caution [8]. The WHO currently recommends telemedicine models for medical abortion in the first trimester; however, this recommendation is based on very low-certainty evidence for outcomes relating to safety, effectiveness, and acceptability [4].

Women around the world are increasingly self-managing their abortions and seeking abortion and related information online. Thus, it is important to understand when and how telemedicine can be used safely and effectively during the abortion process. Information about the success rate, safety, and acceptability of telemedicine models for medical abortion may also further inform national guidelines and international recommendations. With this review we aimed to build a stronger evidence base for the use of telemedicine models for medical abortion. As such, we assessed the success rate, safety, and acceptability of telemedicine models for medical abortion according to the phase or phases in which telecommunications were used to deliver care. In contrast to another recent systematic review [8], this review only includes studies with a comparison group.

OBJECTIVES

To assess the safety, success rate, and acceptability of telemedicine models for medical abortion, according to which phase or phases (pre-abortion, abortion, and/or post-abortion) telecommunications were used as a primary means of service delivery, compared to in-clinic care for medical abortion in the corresponding phase/phases.

METHODS

Criteria for considering studies for this review

Types of studies

This systematic review is based on a published protocol [29]. We included randomised controlled trials (RCTs) and non-randomised studies (NRS) with a comparison group. The evidence for the effects of telemedicine for medical abortion is more likely to be found within NRS compared to RCTs. This is because telemedicine services often operate outside of formal health systems and/or in private health systems, where RCTs are not as common. We also did not expect there to be adequate RCT evidence (number of studies or size of studies) to assess risks of harms or effectiveness of the interventions. We therefore considered the inclusion of evidence from NRS as relevant for this review.

Inclusion criteria

We included RCTs and NRS that studied telemedicine models for medical abortion (as defined above) compared to in-clinic care. All types of RCTs were eligible, including cluster-RCTs. Eligible NRS were observational comparative studies, i.e. studies with concurrent comparison groups (e.g. retrospective or prospective cohort studies) or historical comparison groups (e.g. before and after studies). Quasi-randomised trials, defined as studies in which participants are allocated different study groups using methods of allocation that are not truly random, were also eligible. Case studies, case series, descriptive studies without a comparison group, and qualitative studies were not included. Further, we included both full-text studies and unpublished data in our review. We included conference abstracts if they provided sufficient details on methodology and our outcomes of interest, aligned with standardised abortion outcomes [30]. There were no limitations with regard to inclusion based on setting, language, or time period.

Types of participants

Participants included persons of any age who had performed a medical abortion, without restrictions on the type of evidence-based abortifacient used in combination with misoprostol, and received care through telemedicine to support one or more phases of the abortion. It also included participants of any age receiving in-clinic medical abortion care as part of a comparison group.

Types of interventions

For the purposes of this review, we defined telemedicine models for medical abortion as the delivery of abortion care services, without regard to distance, by a health worker who uses information and communication technologies for the exchange of valid information during any of the abortion phases, pre-abortion, abortion, and post-abortion, in the interests of advancing the health or rights of individuals. This definition is in line with the WHO's most recent abortion guideline [4] and the WHO consolidated telemedicine implementation guideline from 2022 [7].

Main intervention

Our main intervention of interest was telemedicine models for medical abortion, in which the main means of service delivery was by telecommunications, throughout the entire abortion process (i.e. across the three abortion phases). For the purpose of this review, we call these 'Pre- to post-abortion telemedicine models'.

We compared our main intervention with standard care, i.e. in-clinic care for medical abortion. Standard care sometimes included elements of self-care to determine abortion success, but the main means of service delivery was in-clinic care.

For all telemedicine models in this review, we noted any in-clinic testing or physical exams done during the phase or phases of the abortion in which telemedicine was used to deliver care. Telemedicine models that included in-clinic testing or physical exams were included in the intervention category pre- to post-abortion telemedicine models if most care during all care phases was delivered using telecommunications. In these telemedicine models, the in-clinic testing or physical exams were done to complement telemedicine care as opposed to replace telemedicine care.

Sub-interventions

Our sub-interventions were telemedicine models in which telecommunications were used to deliver care during either the pre-abortion, abortion, or post-abortion phase, or for a combination of two phases. In these telemedicine models, study

participants received in-clinic care for one or two phases of the abortion; these in-clinic care visits replaced telemedicine care.

Outcome measures

In accordance with the GRADE assessment format, we assessed outcomes with respect to success rate, safety, and acceptability.

Critical outcomes

Our critical outcome was successful abortion, defined as a terminated pregnancy without the need for surgical intervention to complete the abortion within 42 days of intake of misoprostol. Any additional doses of misoprostol not included in the initial medication regimen, which were dispensed to complete the abortion, were noted but not deemed as treatment failure.

Important outcomes

Our important outcomes were:

- Continuing viable pregnancy after intake of abortion medications.
- Blood transfusion for reasons related to the abortion.
- Hospitalisation for reasons related to the abortion.
- Emergency visits to a healthcare facility for reasons related to the abortion, such as haemorrhage, severe pain, or signs of acute infection.
- Adherence to allocated intervention, defined as including (where applicable) answering phone calls, attending in-person appointments, or complying with the adequate dose-regimen (correct dose and timing intake of recommended abortion medication) or with follow-up procedures.
- Satisfaction, defined as reporting being somewhat satisfied, satisfied, or very satisfied with the abortion care service, delivered using telemedicine or in-clinic.
- Mortality from a cause related to the abortion.

The timeframe for the measurement of outcomes was 42 days (six weeks) for all important outcomes.

Search methods for identification of studies

The Cochrane Fertility Regulation Information Specialist conducted a search for all published, unpublished, and ongoing studies, without restrictions on language or publication status. The search strategies for each database were modelled on the search strategy designed for MEDLINE ALL (Ovid), and are available in Supplementary material 1.

Electronic searches

We searched the following databases:

- Cochrane Central Register of Controlled Trials (Ovid EBM Reviews): inception to July 2024 (date last searched 13 August 2024);
- MEDLINE ALL (Ovid)*: 1946 to 12 August 2024 (date last searched 13 August 2024);
- Embase.com: inception to 12 August 2024 (date last searched 13 August 2024);
- CINAHL (EBSCOHost): inception to 12 August 2024 (date last searched 13 August 2024);
- LILACS (lilacs.bvsalud.org/en): inception to 12 August 2024 (date last searched 13 August 2024);
- Global Health (Ovid): inception to 12 August 2024 (date last searched 13 August 2024);
- Scopus: inception to 12 August 2024 (date last searched 13 August 2024);
- Google Scholar: inception to 12 August 2024 (date last searched 13 August 2024).

We searched the following grey literature sites:

- Guttmacher Institute (www.guttmacher.org/united-states/abortion): inception to 12 August 2024 (date last searched 13 August 2024);
- International Planned Parenthood Federation (www.ippf.org): inception to 12 August 2024 (date last searched 13 August 2024);
- Ibis Reproductive Health (ibisreproductivehealth.org/): inception to 12 August 2024 (date last searched 13 August 2024);
- Women on Waves (www.womenonwaves.org/): inception to 12 August 2024 (date last searched 13 August 2024);
- Marie Stopes International (www.mariestopes.org/): inception to 12 August 2024 (date last searched 13 August 2024);
- Population Council (www.popcouncil.org/): inception to 12 August 2024 (date last searched 13 August 2024);
- Population Services International (www.psi.org/): inception to 12 August 2024 (date last searched 13 August 2024);
- Ipas (www.ipas.org/): inception to 12 August 2024: (date last searched 13 August 2024).

*The Ovid format Cochrane Highly Sensitive Search Strategy for identifying randomised trials in MEDLINE filter was used in the Ovid MEDLINE ALL search [31].

Searching other resources

We checked the bibliographies of included studies, ClinicalTrials.gov, and any relevant systematic reviews identified for further references to relevant studies.

Data collection and analysis

Selection of studies

Two review authors (AC and ME) screened abstracts/titles and full-text reports/publications independently and determined whether they met the eligibility criteria. If required, a third review author (AL) was consulted. We performed the study selection based on the steps suggested in the *Cochrane Handbook for Systematic Reviews of Interventions,* section 4.6.3 [32]. We documented the inclusion process in accordance with PRISMA guidance [33] (Figure 1) and documented the characteristics of included and excluded studies. See Supplementary material 2; Supplementary material 3; Supplementary material 4; Supplementary material 5.

Figure 1. Prisma flow diagram; created in Covidence

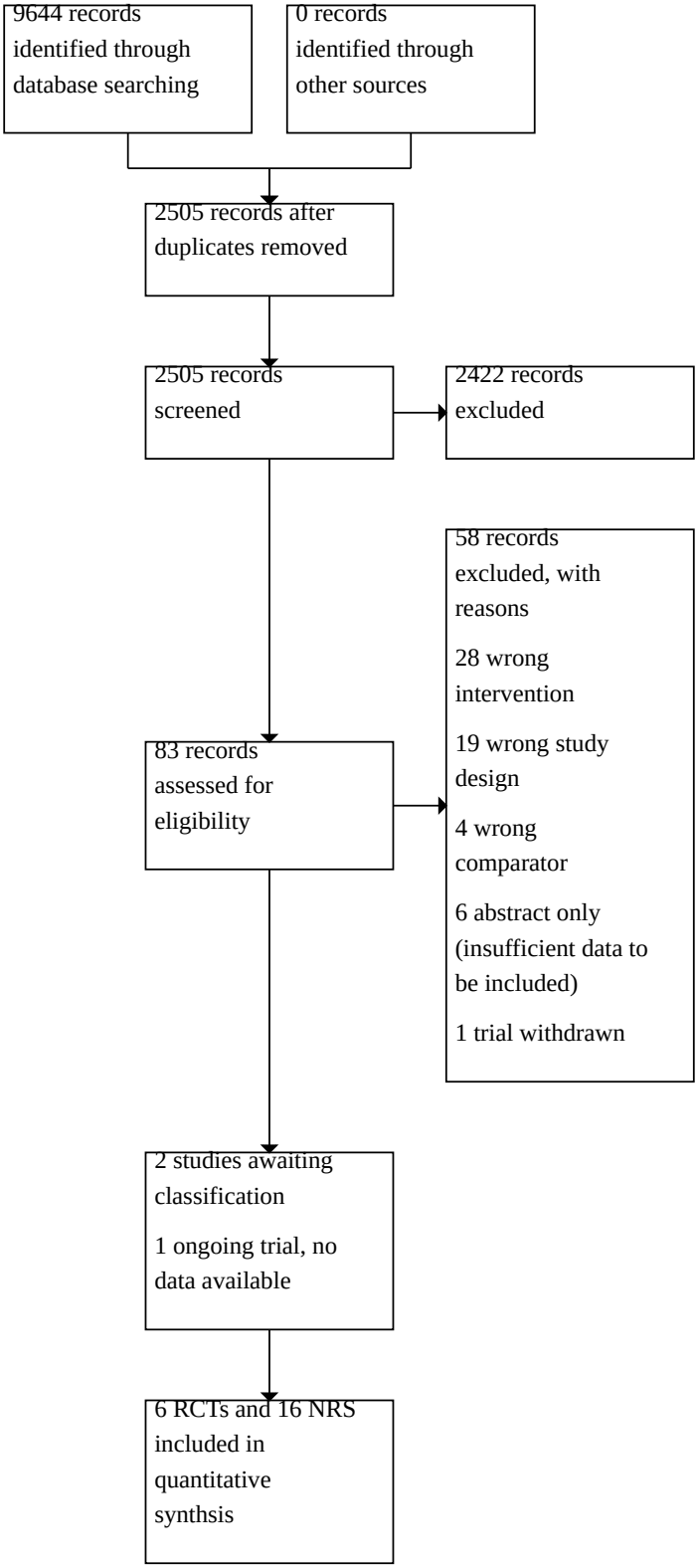


Figure 1. (Continued)

We identified and documented multiple reports from the same study by reviewing published articles with similar authorship, study setting, and, if relevant, trial identification number. If results were contradictory, we selected a primary study based on a documented justification for inclusion in the analysis.

Data extraction and management

The two primary review authors (AC and ME) independently extracted information relating to study characteristics and our critical and important outcomes from each selected study in Covidence [34]. The data entry form was pilot-tested to improve its accuracy.

Risk of bias assessment in included studies

AC and ME independently assessed the risk of bias of included studies using the criteria outlined in the *Cochrane Handbook* [32]. We used the revised Cochrane risk of bias assessment tool for RCTs trials (RoB 2) [35] and the Risk Of Bias In Non-randomised Studies - of Interventions (ROBINS-I) assessment tool for NRS version 19 September 2016 [36], both available at https://www.riskofbias.info/. To assess the risk of bias in cluster-RCTs, we planned to use the RoB 2 tool for cluster-RCTs, in accordance with the *Cochrane Handbook* chapter 13.3.2 [37]. We did not anticipate any cross-over RCTs since abortion is not generally a repeat treatment.

We assessed the risk of bias for each comparison and the outcomes successful abortion, continuing pregnancy, blood transfusion, hospitalisation, emergency visits, adherence, satisfaction, and mortality, occurring within 42 days of intake of abortion medications. The effect of interest was the effect of assignment to the intervention for all outcomes. For RCTs, we judged each potential risk of bias as low, high, some concerns, or no information and provided a quote from the study together with a justification for our judgement in the risk of bias table. For NRS, we judged each potential source of bias as low, moderate, serious, critical or no information. Finally, we made an overall risk of bias judgement for the included RCTs and NRS.

We used Robvis (available at https://www.riskofbias.info/welcome/robvis-visualization-tool) to create the RoB 2 and ROBINS-I summary plots and traffic lights [38].

Measures of treatment effect

We reported effect measures in the form of relative risk, i.e. risk ratio (RR). We used RRs with 95% confidence intervals (CI) as our measure of treatment effect. We did not consider time-to-event measures relevant for this review topic, as the occurrence, or severity of, the health outcomes of concern do not vary according to time-to-event. We also knew, based on our familiarity with the literature, that reporting time-to-event would be very unlikely.

Unit of analysis issues

We used the unit of analysis 'per person included' and for RCTs 'per person randomised.'

We did not find any cross-over design trials or studies with a clustered trial design, which would otherwise have been considered for inclusion. Had we identified eligible cluster-RCTs, then we would have followed Cochrane guidance on analysing RCT variants [37]. Briefly, had we included any cluster-RCTs, we would have abstracted the statistical information needed to account for the implications of clustering on variance estimation, such as intra-cluster correlations (ICC) and whether the study adjusted results for the correlations in the data. Had we found cluster-RCTs that did not account for clustering, we would have adjusted the effective sample size using study-derived or reasonably estimated ICCs.

Had any multi-arm trials contributed multiple comparisons to any of our meta-analyses, we would have combined treatment groups or split the 'shared' group as appropriate to avoid double counting.

Dealing with missing data

We documented the level of attrition in the included studies and considered whether each data summary/synthesis was likely to be biased because of the missing results in the studies. We also contacted study authors and asked for additional information if we suspected missing data or under-reported outcome data, and/or enquired about sensitivity analyses performed for missing data. In addition, we contacted study authors to enquire about possible interim results from ongoing studies identified in ClinicalTrials.gov on the topic of telemedicine models for medical abortion. Imputation of missing data was not deemed appropriate due to the lack of consistency in reporting of participant background information in the included studies.

Reporting bias assessment

We contacted study authors, asking them to provide missing outcome data in cases where under-reporting was suspected. We ended up with fewer than 10 RCTs or NRS for each outcome and per comparison, therefore we were unable to carry out investigations into the potential influence of small-study effects on our results.

Synthesis methods

We assessed intervention effects separately for RCTs and for NRS. We included all eligible RCTs and NRS in our analyses regardless of risk of bias. For RCTs, we analysed data in RevMan [39]. We analysed critical and important outcome data by intention-to-treat, excluding participants lost to follow-up, and conducted meta-analyses for comparisons where data were considered homogenous enough in terms of trial design, participants, and interventions. We conducted meta-analyses of pooled RCTs using a fixed-effect model. We illustrated the results from the meta-analysis using a forest plot displaying risk ratios and 95% CIs for individual studies and for the pooled effect estimates.

The included NRS varied in their study designs, outcome measurement, statistical analyses (e.g. adjustment for confounding), and enrolled populations. Therefore, we did not conduct meta-analyses for the body of evidence from NRS. Instead, we presented summary data for each study and outcome. We presented the risk difference with 95% CIs per outcome, between intervention and control. Further, we presented summary data per comparison, providing adjusted data points when available, for individual studies and outcomes, in summary of findings tables (see below).

For pooled results from RCTs, we tested for statistical heterogeneity using the I^2 statistic, which "describes the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error or chance" [32]. We also considered the P value from the Chi^2 test to assess whether this heterogeneity was significant ($P < 0.1$).

Investigation of heterogeneity and subgroup analysis

If there were sufficient data, we planned to conduct analyses among the following subgroups:

- Gestational age > 10 weeks versus ≤ 10 weeks.
- Context: abortion care provided as part of a formal health system or outside a formal health system.
- Degree of clinical examination required: physical exam required versus no physical exam required (as described by authors).
- Income level of study setting according to the World Bank classification: low- and low-middle-income versus high-middle to high-income setting.

Equity-related assessment

We did not investigate health inequity in this review.

Sensitivity analysis

The included data did not allow for any sensitivity analysis. If there had been sufficient data, we planned to perform the following sensitivity analysis: 1) limit analysis to low risk of bias studies only, and 2) conduct analyses using alternative statistical approaches to assess whether the findings would change on the basis of the model used.

Certainty of the evidence assessment

We presented the results in summary of findings tables, in which we included our critical and important outcomes. We prioritised comparisons that would be relevant for key stakeholders, including service users and service providers. These were comparisons of the use of telemedicine to support either the entire medical abortion process, or parts of this process, with in-clinic care.

The summary of findings tables included the estimates of the critical and important outcomes and the certainty of the evidence for each outcome according to GRADE, assessed using the GRADEpro software for RCTs [40] and manually for NRS. Two review authors (AC, ME) independently assessed the certainty of the evidence as high, moderate, low, and very low using the five GRADE considerations (risk of bias, consistency of effect, imprecision, indirectness, and publication bias [41]). When conducting the GRADE assessments, we incorporated the overall RoB 2 and ROBINS-I judgements for each outcome. A researcher at Cochrane performed the risk of bias assessment for one of the included RCTs authored by one of the review authors (ME). We used the methods and recommendations described in the *Cochrane Handbook* and Cochrane EPOC worksheets [32, 42].

We assessed the certainty of the evidence in NRS using the relevant GRADE guidelines, starting from high-certainty evidence [43]. We resolved disagreements on certainty ratings by discussion and provided justification for decisions to downgrade or upgrade the ratings using footnotes in the tables. We justified the GRADE assessments for RCTs and NRS using plain language statements as recommended by the GRADE working group [44].

With respect to our critical outcome, successful abortion, we decided on a sample large enough to detect a 4% difference in the rate of successful abortion with 80% power and considering a 10% loss to follow-up. The chosen range was based on equivalence ranges used in previous studies with the same critical outcome as in this review. According to this power calculation included studies would need a total of 450 participants in each study arm. We downgraded studies with smaller sample sizes for imprecision. We similarly downgraded data from studies on other outcomes for imprecision if they were collectively underpowered to assess that outcome.

We followed the current GRADE guidance when considering RCTs and NRS together [45]. If the certainty of evidence differed in a body of RCTs and a body of NRS, we presented results only with the highest-certainty evidence, regardless of whether data came from RCTs or NRS. If no RCT data were available, we presented only the results from NRS and vice versa. If certainty ratings for one outcome were the same from the body of RCTs and NRS, we considered NRS data to be complementary, and we presented results from both bodies of evidence, with the exception that results from NRS providing very low-certainty evidence were not shown in summary of findings tables, if results from RCTs were available [45]. We did not pool data across bodies of evidence from RCTs and NRS.

We presented the comparisons starting with our main intervention of interest (the use of telemedicine to support the entire abortion process, from the pre- to post-abortion phase). Because telemedicine can be used to support a medical abortion in one or more phases and because this intervention can be implemented in many different ways, we chose to include summary of findings tables also relating to our sub-interventions (the use of telemedicine to support either the pre-abortion, abortion, or post-abortion phase, or for a combination of two phases).

Consumer involvement

There was no consumer involvement in this review.

RESULTS

Description of studies

Results of the search

The search resulted in 9644 hits in electronic databases. We did not identify any potentially relevant studies from other sources. A total of 7127 studies were identified automatically as duplicates and another 12 were identified manually as duplicates and removed. We screened 2505 abstracts/titles. After excluding 2422 studies based on abstracts/titles, we retrieved and assessed a total of 83

records for eligibility. We excluded 58 records and of the remaining 25 records we included 22 studies. Three studies may have met our inclusion criteria. For one study with an abstract only, we were unable to obtain information from authors to determine eligibility (Riva-Palacio 2022 [46]), and for one study with full text we were unable to obtain information from the authors to determine if they had collected information on our outcomes of interest (Srinivasulu 2024 [47]). See 'Characteristics of studies awaiting classification' in Supplementary material 4. One study was ongoing at the time of data extraction (Gemzell Danielsson [48, 49]). See 'Characteristics of ongoing studies' in Supplementary material 5.

See the PRISMA flow diagram for details of the study section process (Figure 1).

We contacted and received additional data from the authors of four studies (Cameron 2012 [50]; Ralph 2024 [51]; Seymour 2018 [52]; Seymour 2022 [53]).

Included studies

This review included a total of 22 studies: six RCTs and 16 NRS, including a total of 131,278 women undergoing medical abortion. See 'Characteristics of included studies' in Supplementary material 2.

Setting

Seventeen studies were conducted in high-income countries: Australia (two), Canada (two), Switzerland (one), the United Kingdom (four), and the United States (eight). Five studies were conducted in five upper-middle-income countries: Colombia (one), South Africa (two), Moldova and Uzbekistan (one), and Vietnam (one).

Participants

Studies in this review included study participants with varying lengths of gestation. One study included participants with pregnancies up to seven weeks' gestation (Dunn 2015 [54]), 14 studies up to nine weeks' gestation (Bracken 2014 [55]; Cameron 2012; Chen 2016 [56]; Constant 2014 [57]; Endler 2022 [58, 59]; Grossman 2011 [60]; Grossman 2017 [61]; Kohn 2019 [62]; Ngoc 2014 [63]; Platais 2015 [64]; Seymour 2018; Seymour 2022; Thompson 2021 [65]; Vanetti 2021 [66]); four studies up to 10 weeks' gestation (Aiken 2021 [67]; Ralph 2024; Reynolds-Wright 2023 [68]; Wiebe 2020 [69]); one study up to 11 weeks' gestation (Kerestes 2021 [70]); and another up to 12 weeks (Cely-Andrade 2024 [71]). In Chong 2023 [72], most participants had a gestational age of nine weeks or lower, but it is unclear what the gestational age limit for participant inclusion was. It is important to note that while all included studies specified the gestational age up to which study participants were eligible to participate, not all provided the mean and range of the gestational age of included participants.

Interventions

Two RCTs, Endler 2022; Reynolds-Wright 2023, and seven NRS, Aiken 2021; Cely-Andrade 2024; Kerestes 2021; Ralph 2024; Seymour 2022; Thompson 2021; Wiebe 2020, provided evidence on our main intervention of interest, pre- to post-abortion telemedicine models for medical abortion compared with in-clinic care. Four NRS provided evidence for the sub-intervention pre-abortion/abortion telemedicine models compared with in-clinic care (Grossman 2011; Grossman 2017; Kohn 2019; Seymour 2018). Four RCTs (Bracken 2014; Constant 2014; Ngoc 2014; Platais 2015) and five NRS (Cameron 2012; Chen 2016; Chong 2023; Dunn 2015; Vanetti 2021) provided evidence for the sub-intervention post-abortion telemedicine models.

Comparisons

The included studies provided evidence for the following comparisons:

Comparison 1: Pre- to post-abortion telemedicine models versus in-clinic care for medical abortion

- RCTs: Endler 2022; Reynolds-Wright 2023
- NRS: Aiken 2021; Cely-Andrade 2024; Kerestes 2021; Ralph 2024; Seymour 2022; Thompson 2021; Wiebe 2020

Comparison 2: Pre-abortion/abortion telemedicine models versus in-clinic care for medical abortion

- NRS: Grossman 2011; Grossman 2017; Kohn 2019; Seymour 2018

Comparison 3: Post-abortion telemedicine models versus in-clinic care for medical abortion

- RCTs: Bracken 2014; Constant 2014; Ngoc 2014; Platais 2015
- NRS: Cameron 2012; Chong 2023; Chen 2016; Dunn 2015; Vanetti 2021

Outcomes

The included studies in this review provided evidence relating to one or more of our critical and important outcomes. All RCTs and 12 out of 16 NRS reported on our critical outcome, successful abortion, but the outcome was measured in different ways (using ultrasound, pregnancy tests, blood hCG testing, questionnaires, or symptom checklists), at different time points (one week, two weeks, three weeks, or six weeks after medical abortion). All studies reported on at least one important outcome.

Ten studies reported on the outcome emergency visits, but without specifying the reasons for, or urgency of the visit, or within which timeframe the visit occurred in relation to the medical abortion. Two studies reported emergency visits only for which the patient received treatment (Grossman 2017; Kohn 2019).

Five studies reported on the outcome adherence and used varying definitions for this outcome. In Endler 2022, adherence was measured as adherence to the medical abortion regimen. In Chen 2016, Chong 2023, and Dunn 2015, adherence was measured in the completion of scheduled follow-up appointments and procedures by intervention/comparison group, and in Bracken 2014, adherence was measured as completion of follow-up appointments regardless of the mode of contact (by telemedicine or in-person).

Due to heterogeneity with regard to outcome measurements and interventions, it was only possible to conduct meta-analysis for our main intervention of interest, pre- to post-abortion telemedicine models for medical abortion, and for the sub-intervention post-abortion telemedicine models, for which we had data from RCTs. Data did not allow for any subgroup analysis, which would have required data from a larger pool of studies conducted in a broader variety of settings and gestational ages. Only two studies included participants above 10 gestational weeks, no studies were performed outside the formal healthcare system, and all

telemedicine models included the possibility of in-clinic testing or follow-up care if deemed necessary by a health worker.

Excluded studies

We excluded 58 studies from the review. Most excluded studies focusing on telemedicine models for medical abortion were omitted because they lacked a comparison group, did not meet our definition of telemedicine, or did not collect information on our outcomes of interest. Gerdts 2015 [73] first appeared to meet our inclusion criteria, but this study was later excluded because the intervention did not meet our definition of telemedicine and because the intervention and control group were both followed up in-clinic. Another study that first appeared to meet our inclusion criteria was an abstract (University of California 2020a [74]). After contact with the authors, we excluded this study (as well as the related publication from 2024 [75]) as it did not include an in-clinic comparison group. See 'Characteristics of excluded studies' in Supplementary material 3.

Risk of bias in included studies

The risk of bias in the included studies is presented separately for RCTs and NRS with our judgements and their justifications. For risk of bias in the RCTs, see Supplementary material 6, with risk of bias traffic lights and summary plots shown in Figure 2 and Figure 3. Our risk of bias assessment, with responses to ROBINS-I signalling questions for NRS, is provided in Table 1, with risk of bias traffic lights and summary plots shown in Figure 4 and Figure 5. Below we summarise the risk of bias in the included studies per comparison and outcome. Our risk of bias assessments with responses to RoB 2 signalling questions for RCTs are stored in a repository maintained by Cochrane Fertility Regulation and will be made available on reasonable request.

Figure 2. Risk of bias in RCTs - summary plot; created in Robvis (visualisation tool) at riskofbias.info

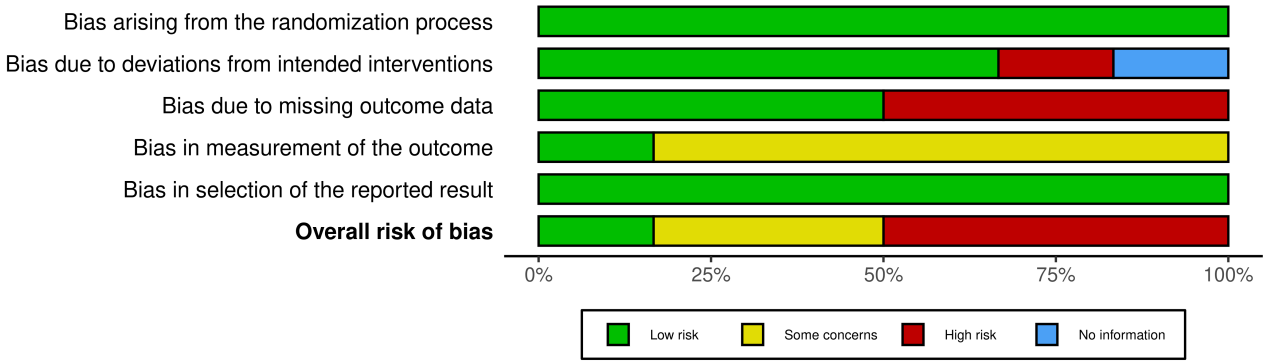


Figure 3. Risk of bias in RCTs - traffic lights; created in Robvis (visualisation tool) at riskofbias.info

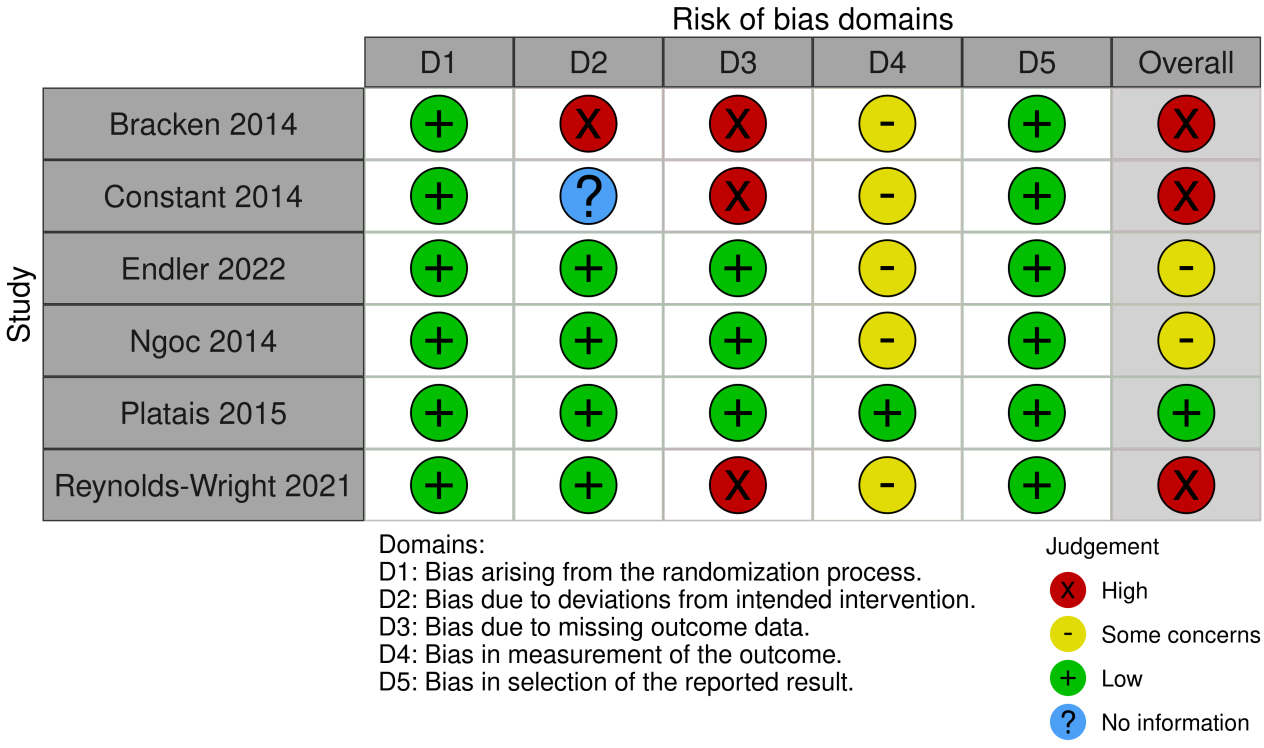


Figure 4. Risk of bias in NRS - traffic lights; created in Robvis (visualisation tool) at riskofbias.info

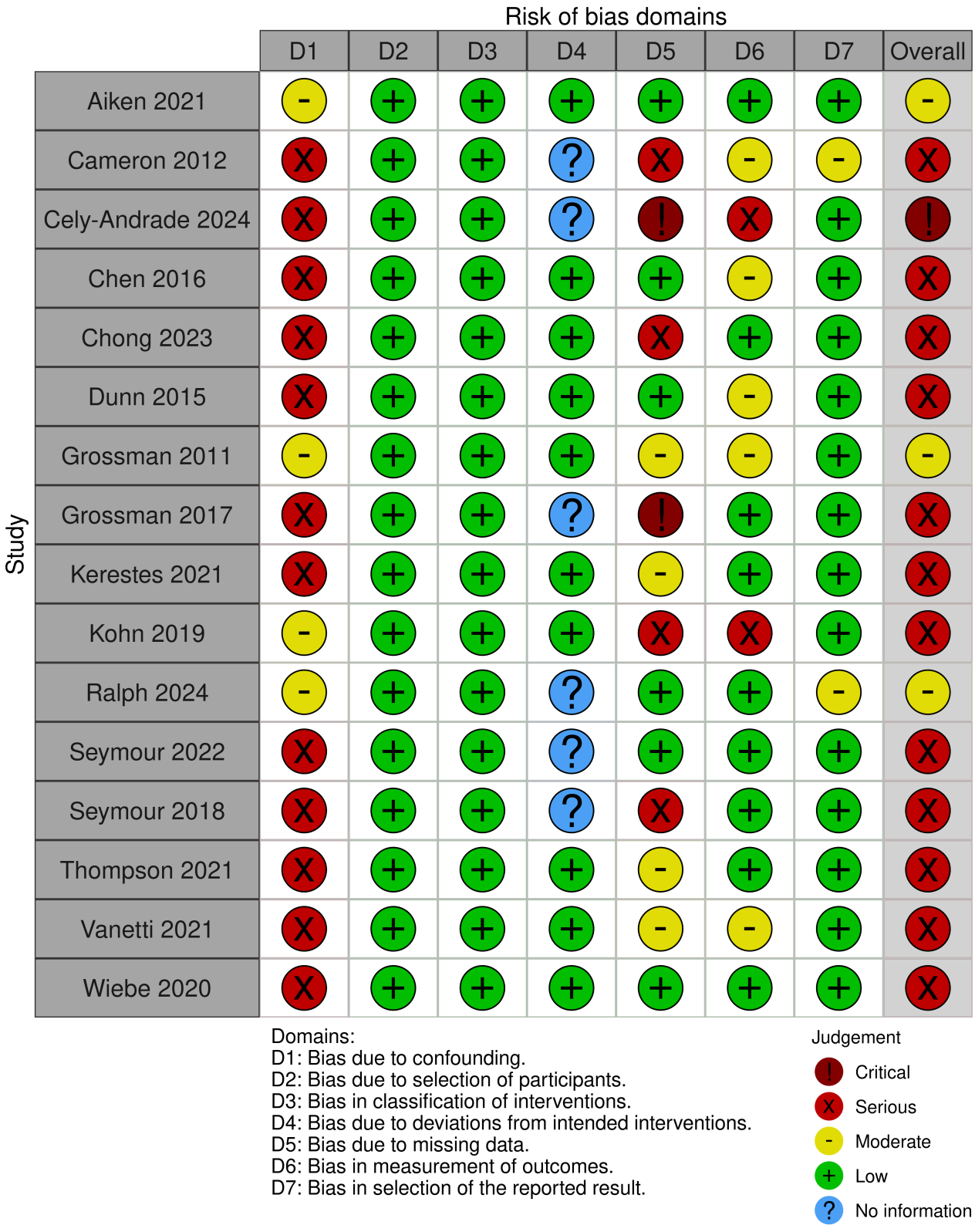
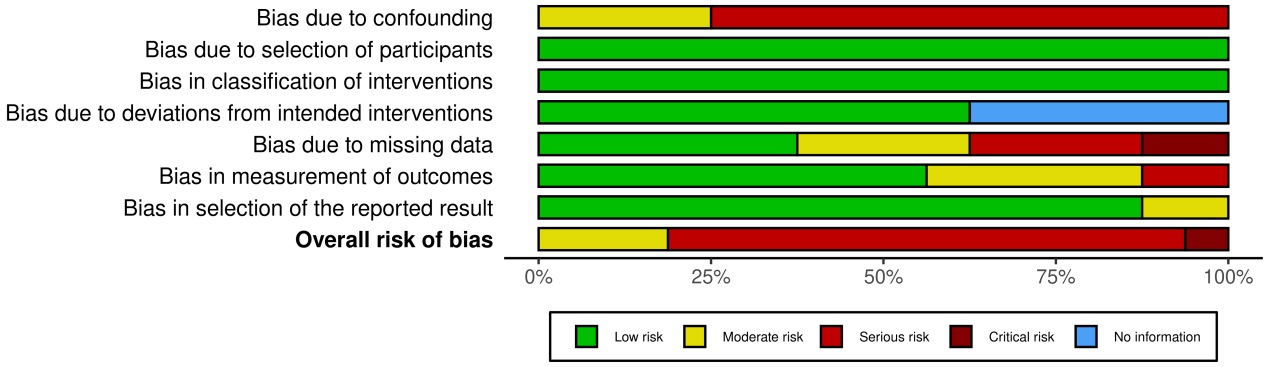


Figure 4. (Continued)

Figure 5. Risk of bias in NRS - summary plot; created in Robvis (visualisation tool) at riskofbias.info



Comparison 1. Pre- to post-abortion telemedicine models versus in-clinic care for medical abortion

Two RCTs (Endler 2022; Reynolds-Wright 2023) and seven NRS (Aiken 2021; Cely-Andrade 2024; Kerestes 2021; Ralph 2024; Seymour 2022; Thompson 2021; Wiebe 2020) provided information on outcomes in this comparison. Among the RCTs, one had a high overall risk of bias (Reynolds-Wright 2023) and one had some concerns (Endler 2022). Among the NRS, two had an overall moderate risk of bias (Aiken 2021; Ralph 2024), four had an overall serious risk of bias (Kerestes 2021; Thompson 2021; Seymour 2022; Wiebe 2020), and one had an overall critical risk of bias (Cely-Andrade 2024).

Successful abortion

The RCTs Endler 2022 and Reynolds-Wright 2023 reported on the outcome successful abortion. Both studies had a low risk of bias arising from randomisation, deviations from intended intervention, measurement of outcomes, and selection of the reporting of outcomes. It is important to mention that we considered blinding in relation to our outcomes and judged the risk of bias for this domain as low for all clinical outcomes (successful abortion, continuing pregnancy, blood transfusion, hospitalisation, emergency visits) and for adherence, since the outcome was assessed with objective measures and standardised criteria. Endler 2022 had a low risk of bias due to missing data. Reynolds-Wright 2023 aimed to include 1222 participants but stopped recruitment early, including a total of 125 participants. We therefore deemed this study to have a high risk of bias due to missing outcome data.

Six NRS provided results for the outcome successful abortion (Aiken 2021; Cely-Andrade 2024; Kerestes 2021; Ralph 2024; Seymour 2022; Wiebe 2020), of which three included adjusted analyses for this outcome (Aiken 2021; Cely-Andrade 2024; Ralph 2024). We deemed the risk of bias due to confounding as moderate in the three studies with adjusted analysis for this outcome, and serious for the remaining three studies. Risk of bias due to selection of participants, and risk of bias due to classification of interventions, was low in all included NRS. No information was provided about deviations from intended interventions in Cely-Andrade 2024, Ralph 2024, and Seymour 2022, while we judged the risk of bias in this domain as low for Aiken 2021, Kerestes 2021, and Wiebe 2020. While Aiken 2021, Ralph 2024, Seymour 2022, and Wiebe 2020 had a low risk of bias due to missing outcome data, Cely-Andrade 2024 had a critical risk of bias in this domain. The study Kerestes 2021 had a moderate risk of bias due to missing outcome data, the proportion of missing data being below 20% and balanced between study groups. Cely-Andrade 2024 had a serious risk of bias due to measurement of outcomes as the methods of measurement were not comparable between study groups. The remaining studies had a low risk of bias in this domain. All studies had a low risk of bias due to selective reporting for the outcome successful abortion.

Continuing pregnancy

The RCTs Endler 2022 and Reynolds-Wright 2023 provided results for the outcome continuing pregnancy. The risk of bias assessment for this outcome did not differ from that of the outcome successful abortion. The NRS Aiken 2021, Kerestes 2021, Seymour 2022, and Wiebe 2020 provided results for this outcome. We judged the risk of bias due to confounding as moderate in Aiken 2021, and serious in Kerestes 2021, Seymour 2022, and Wiebe 2020. The risk of bias due to selection of participants and due to classification of interventions was low in all NRS. We judged the risk of bias due to deviations from intended intervention as low in Aiken 2021, Kerestes 2021, and Wiebe 2020, while information about deviations from intended interventions was lacking in Seymour 2022. Results from Aiken 2021, Seymour 2022, and Wiebe 2020 were at low risk of bias due to missing outcome data, and results from Kerestes 2021 were at moderate risk of bias in this domain. Results from the four NRS were at low risk of bias due to measurement of outcomes and selective reporting of results.

Blood transfusion

The RCTs Endler 2022 and Reynolds-Wright 2023 provided results for the outcome blood transfusion. The risk of bias assessment for this outcome did not differ from that of the outcome successful abortion. Results from NRS for this outcome came from five

studies (Aiken 2021; Cely-Andrade 2024; Kerestes 2021; Ralph 2024; Seymour 2022). The risk of bias due to confounding was moderate in Aiken 2021 and serious in Cely-Andrade 2024, Kerestes 2021, and Seymour 2022. The risk of bias due to selection of participants and due to classification of interventions was low in all five NRS. Information about deviations from intended interventions was lacking in Cely-Andrade 2024, Ralph 2024, and Seymour 2022, while the risk of bias in this domain was low for Aiken 2021. The results from Aiken 2021 and Seymour 2022 were at low risk of bias due to missing outcome data. The results from Kerestes 2021 were at moderate risk of bias due to missing data, and the results from Cely-Andrade 2024 were at critical risk of bias in this domain. Results from the three studies were at low risk of bias due to the measurement of outcomes, and the results from one study had a serious risk of bias in this domain (Cely-Andrade 2024). The results from Ralph 2024 were at moderate risk of bias due to selection of the reported results for this outcome. The authors did, however, provide additional results on request. Results from the remaining studies were at low risk of bias in this domain.

Hospitalisation

RCTs by Endler 2022 and Reynolds-Wright 2023 provided results for the outcome hospitalisation. The risk of bias assessment for this outcome did not differ from that of the outcome successful abortion. Results from NRS for this outcome came from three studies: Cely-Andrade 2024, Ralph 2024, and Seymour 2022. Results from all three NRS were at serious risk of bias due to confounding. The risk of bias due to selection of participants and due to classification of interventions was low in all NRS that provided information on this outcome. Information about deviations from intended interventions was lacking in the three studies. Results from Ralph 2024 and Seymour 2022 were at low risk of bias due to missing outcome data, while the results from Cely-Andrade 2024 were at critical risk of bias in this domain. Further, results from one study had a serious risk of bias due to measurement of outcomes (Cely-Andrade 2024), while results from two NRS were at low risk of bias in this domain. Results from one NRS were at moderate risk of bias due to selection of the reported results for this outcome; however, the study authors provided additional results upon request from the review authors (Ralph 2024). Results from the remaining studies were at low risk of bias in this domain.

Emergency visits

The RCTs Endler 2022 and Reynolds-Wright 2023 provided results for the outcome emergency visits. The risk of bias assessment for this outcome did not differ from that for the outcome successful abortion. The results from three NRS provided information on this outcome: Cely-Andrade 2024; Kerestes 2021; Wiebe 2020. All three studies had a serious risk of bias due to confounding for this outcome. The risk of bias due to selection of participants and the risk of bias due to classification of interventions was low in the three NRS. Information about deviations from intended interventions was lacking in Cely-Andrade 2024, while results from Kerestes 2021 and Wiebe 2020 had a low risk of bias in this domain. The results from Wiebe 2020 were at low risk of bias due to missing outcome data, the results from Kerestes 2021 had a moderate risk of bias, and the results from Cely-Andrade 2024 were at critical risk of bias in this domain. The results from Kerestes 2021 and Wiebe 2020 were at low risk of bias due to measurement of outcomes, and the results from Cely-Andrade 2024 had a serious risk of bias in this domain. The results from the three studies were at low risk of bias due to measurement of outcomes and selective reporting of results.

Satisfaction

The RCTs Endler 2022 and Reynolds-Wright 2023 provided results for the outcome satisfaction. The risk of bias assessment for this outcome differed slightly from that of the outcome successful abortion. The results from both RCTs had some concerns about risk of bias due to measurement of outcomes, because of the absence of blinding. The results from one NRS provided information on this outcome, Thompson 2021. The results from this study had a serious risk of bias due to confounding, low risk of bias due to selection of participants, classification of interventions and selection of the reported results, and a moderate risk of bias due to missing data.

Adherence

The RCT Endler 2022 provided results for the outcome adherence. The risk of bias assessment for this outcome did not differ from that of the outcome successful abortion. No NRS provided results for this outcome.

Comparison 2: Pre-abortion/abortion telemedicine models versus in-clinic care for medical abortion

Four NRS provided information on outcomes in this comparison. Across the risk of bias domains, one had an overall moderate risk of bias (Grossman 2011), two had an overall serious risk of bias (Kohn 2019; Seymour 2018), and one had an overall critical risk of bias (Grossman 2017).

Successful abortion

Two NRS provided information on the outcome successful abortion (Grossman 2011; Kohn 2019). The results from both studies had a moderate risk of bias due to confounding. Further, the risk of bias due to selection of participants, classification of interventions, and deviation from intended intervention was low in the two studies and for this outcome. The results from Grossman 2011 had a moderate risk of bias due to missing outcome data, while the results from Kohn 2019 were at serious risk of bias in this domain. Similarly, the results from Grossman 2011 had a moderate risk of bias due to measurement of outcomes, and Kohn 2019 had a serious risk of bias in this domain. Both studies had a low risk of bias due to selection of reported results for this outcome.

Continuing pregnancy

Two NRS provided information on the outcome continuing pregnancy (Grossman 2011; Kohn 2019). The risk of bias assessment for this outcome did not differ from that for the outcome successful abortion.

Blood transfusion

Two NRS provided information on the outcome blood transfusion, Grossman 2011; Grossman 2017. Neither study provided adjusted analyses for this outcome and the risk of bias due to confounding was therefore serious for both studies. The risk of bias due to selection of participants and due to classification of interventions was low in both studies and for this outcome. Information about deviations from intended interventions was lacking in Grossman 2017. The results from Grossman 2011 had a moderate risk of bias due to missing outcome data, while the results from Grossman 2017 had a critical risk of bias in this domain. The results from Grossman

2011 had a moderate risk of bias due to measurement of outcomes, and the results from Grossman 2017 had a low risk of bias in this domain. Both studies had a low risk of bias due to selection of reported results for this outcome.

Hospitalisation

Two NRS provided information on the outcome hospitalisation (Grossman 2011; Grossman 2017). The risk of bias assessment for this outcome did not differ from that of the outcome blood transfusion.

Emergency visits

Two NRS provided information on the outcome emergency visits (Grossman 2017; Kohn 2019). Neither study provided adjusted analyses for this outcome and risk of bias due to confounding was therefore serious for both studies. The risk of bias due to selection of participants and classification of interventions was low in the two studies and for this outcome. Information about deviations from intended interventions was lacking in Grossman 2017. The results from Grossman 2017 had a critical risk of bias due to missing outcome data and Kohn 2019 had a serious risk of bias in this domain. The results from Grossman 2011 had a moderate risk of bias due to measurement of outcomes, and the results from Kohn 2019 had a critical risk of bias in this domain. Both studies had a low risk of bias due to selection of reported results for this outcome.

Satisfaction

Two NRS provided information on the outcome satisfaction (Grossman 2011; Seymour 2018). The results from Grossman 2011 were based on adjusted analysis, and we judged the risk of bias due to confounding for this outcome as moderate. The results from Seymour 2018 had a serious risk of bias due to confounding. The risk of bias due to selection of participants and due to classification of interventions was low in both studies and for this outcome. Information about deviations from intended interventions was lacking in Seymour 2018. The results from Grossman 2011 had a moderate risk of bias due to measurement of outcomes, and the results from Seymour 2018 had a low risk of bias in this domain. Both studies had a low risk of bias due to selection of reported results for this outcome.

Adherence

No studies were identified.

Comparison 3: Post-abortion telemedicine models versus in-clinic care for medical abortion

Four RCTs and six NRS provided information on outcomes in this comparison. Two RCTs had an overall high risk of bias (Bracken 2014; Constant 2014), one had some concerns (Ngoc 2014), and one had an overall low risk of bias (Platais 2015). All NRS had an overall serious risk of bias (Cameron 2012; Chen 2016; Chong 2023; Dunn 2015; Vanetti 2021).

Successful abortion

Four RCTs provided information on the outcomes successful abortion. The results from two RCTs had a low risk of bias across all risk of bias domains for this outcome (Ngoc 2014; Platais 2015). The results from Bracken 2014 and Constant 2014 had a low risk of bias from the randomisation process and selection of reported results. The results from Bracken 2014 had a high risk of bias due to deviations from intended outcomes, and for Constant 2014 this outcome was of some concerns. Further, the results from these two RCTs had a high risk of bias due to missing outcome data and the results from Constant 2014 had some concerns relating to the risk of bias in the measurement of outcomes.

Four NRS provided information on this outcome (Cameron 2012; Chen 2016; Dunn 2015; Vanetti 2021). The results from NRS had a serious risk of bias due to confounding. The risk of bias due to selection of participants and due to classification of interventions was low in all four NRS and for this outcome. Information about deviations from intended interventions was lacking in Cameron 2012. Results from Cameron 2012 and Vanetti 2021 had a serious and moderate risk of bias due to missing outcome data, respectively. Further, the results from all four studies had a moderate risk of bias in measurement of outcomes. The results from Cameron 2012 also had a moderate risk of bias due to selection of reported results. The authors of this study did, however, provide additional results upon request from the review authors.

Continuing pregnancy

Four RCTs provided information on the outcome continuing pregnancy (Bracken 2014; Constant 2014; Ngoc 2014; Platais 2015). The risk of bias assessment for this outcome did not differ from that of the outcome successful abortion. Three NRS provided information on this outcome (Cameron 2012; Chen 2016; Dunn 2015). The results from these NRS had a serious risk of bias due to confounding. The risk of bias due to selection of participants and due to classification of interventions was low in all three NRS and for this outcome. Information about deviations from intended interventions was lacking in Cameron 2012. Results from Cameron 2012 had a serious risk of bias due to missing outcome data, while results from Chen 2016 and Dunn 2015 had a low risk of bias in this domain. Further, the results from all three studies had a moderate risk of bias in measurement of outcomes. The results from Cameron 2012 had a moderate risk of bias due to selection of reported results. The authors of this study did, however, provide additional results after request from the review authors.

Blood transfusion

One RCT provided information on the outcome blood transfusion (Bracken 2014). The results from this study had a low risk of bias for the randomisation process, selection of reported results, and in the measurement of outcomes. The results from the same RCT had a high risk of bias due to deviations from intended outcomes, and a high risk of bias due to missing outcome data.

Hospitalisation

One RCT (Bracken 2014) and one NRS (Dunn 2015) provided information on the outcome hospitalisation. For the RCT, the risk of bias assessment for this outcome did not differ from that of the outcome blood transfusion. The results from the NRS had a serious risk of bias due to confounding, but a low risk of bias in all other risk of bias domains for this outcome.

Emergency visits

Two NRS provided information on emergency visits (Chen 2016; Dunn 2015). The results from these NRS had a serious risk of bias due to confounding and a low risk of bias in the remaining risk of bias domains for this outcome.

Satisfaction

One RCT (Bracken 2014) and one NRS (Vanetti 2021) provided information on satisfaction. Results from the RCT had a low risk of bias from the randomisation process and selection of reported results, and some concerns with regard to the measurement of outcomes due to the absence of blinding. The results from the same RCT had a high risk of bias due to deviations from intended outcomes, and a high risk of bias due to missing outcome data. The results from Vanetti 2021 had a serious risk of bias due to confounding, a moderate risk of bias due to missing data and measurement of outcomes, and a low risk of bias for the remaining risk of bias domains.

Adherence

Three RCTs (Bracken 2014; Ngoc 2014; Platais 2015) and three NRS (Chen 2016; Chong 2023; Dunn 2015) provided information on adherence. The results from the RCTs had a low risk of bias from the randomisation process, selection of reported results, and in measurement of outcomes. The results from Bracken 2014 had a high risk of bias due to deviations from intended outcomes and due to missing outcome data, while the results from Ngoc 2014 and Platais 2015 were at low risk of bias in these domains. The results from Chen 2016 and Chong 2023 had a serious risk of bias due to confounding for this outcome, and for Dunn 2015, the risk of bias due to confounding was moderate. The results from Chong 2023 had a serious risk of bias due to missing data and the results from Chen 2016 and Dunn 2015 had a moderate risk of bias due to measurement of outcomes. The results from all three NRS had a low risk of bias due to the selection of reported results.

Synthesis of results

Comparison 1: Pre- to post-abortion telemedicine models versus in-clinic models for medical abortion

Two RCTs (Endler 2022; Reynolds-Wright 2023) and seven NRS (Aiken 2021; Cely-Andrade 2024; Kerestes 2021; Ralph 2024; Seymour 2022; Thompson 2021; Wiebe 2020) provided evidence on our main intervention of interest, pre- to post-abortion telemedicine models for medical abortion compared with in-clinic care. In these telemedicine models, telecommunications were used to deliver most care from the pre- to post-abortion phase. See Summary of findings 1 and the analyses in Supplementary material 7. Studies were conducted in Australia (Seymour 2022; Thompson 2021), Canada (Wiebe 2020), Colombia (Cely-Andrade 2024), South Africa (Endler 2022), the United Kingdom (Aiken 2021; Reynolds-Wright 2023), and the United States (Kerestes 2021; Ralph 2024) and included a total of 97,701 women undergoing medical abortion. Among these studies, two included participants up to nine weeks' gestation (Endler 2022; Thompson 2021), four up to 10 weeks' gestation (Aiken 2021; Ralph 2024; Reynolds-Wright 2023; Wiebe 2020), one up to 11 weeks' gestation (Kerestes 2021), and one up to 12 weeks' gestation (Cely-Andrade 2024).

Ultrasound to determine gestational age was not done routinely in six studies (Aiken 2021; Cely-Andrade 2024; Endler 2022; Kerestes 2021; Ralph 2024; Wiebe 2020). In Ralph 2024, the eligibility screening in the telemedicine group was history-based only. In one study, bimanual palpations were done routinely to corroborate the date of the last menstrual period (Endler 2022) and in two studies, serum human chorionic gonadotropin (hCG) blood tests were done routinely as part of the eligibility assessment (Seymour 2022; Thompson 2021). Different types of telecommunications, such as phone, video-call text messages, and online questionnaires, were used in the included studies in this comparison, using both synchronous and asynchronous communication. In two studies, it was unclear what kind of telecommunication was used (Cely-Andrade 2024; Ralph 2024). Studies also differed in their approaches to how medications were dispensed, and how and when outcomes were assessed. Participants in the comparison group received in-clinic care for the pre-abortion and abortion phase in all included studies. However, abortion success was assessed remotely using telemedicine combined with a pregnancy test in nine studies. In Seymour 2022 and Wiebe 2020, abortion success was assessed during an in-clinic visit. In Cely-Andrade 2024, the abortion outcome was determined using a urine test or blood test, or ultrasound. In Ralph 2024, ultrasound, pregnancy test, review of symptoms, blood hCG testing, and physical examination are mentioned, but it is unclear which of these were used to determine the abortion outcome. Results from NRS were mainly driven by a large before-and-after study with adjusted analysis, Aiken 2021. All studies included an option of in-clinic care if deemed necessary by a health worker, such as in cases where the woman was uncertain about the dates of her last menstrual period, having used long-acting reversible contraception at the time of conception, or for women showing signs of ectopic pregnancy.

We found that there is probably little to no difference in rates of successful abortion (RR 0.99, 95% CI 0.97 to 1.01; 2 RCTs, 837 women; moderate-certainty evidence; Aiken 2021: 99% versus 98%, adjusted P value 1.0; 4 NRS, 52,142 participants; moderate-certainty evidence).

There is also probably little or no difference in rates of continuing pregnancy (Aiken 2021: 0.5% versus 1%, adjusted P value = 0.268; 4 NRS, 5142 participants; moderate-certainty evidence) between pre- to post-abortion telemedicine models and in-clinic care.

Pre- to post-abortion telemedicine models may result in little to no difference in rates of blood transfusion (Aiken 2021: 0.02% versus 0.03%, adjusted P value = 0.557; 5 NRS, 83,651 participants; low-certainty evidence), but we are uncertain about the effect of the intervention on hospitalisation (RR 1.45, 95% CI 0.24 to 8.61; 2 RCTs, 846 participants, very low-certainty evidence).

Further, pre- to post-abortion telemedicine models may result in little to no difference in emergency visits (RR 1.15, 95% CI 0.36 to 3.75; 2 RCTs, 847 participants) and satisfaction (RR 1.01, 95% CI 1.00 to 1.02; 2 RCTs, 832 participants) and likely result in similar rates of adherence to the medical abortion regimen (RR 0.99, 95% CI 0.96 to 1.02; 1 RCT, 732 participants; moderate-certainty evidence).

For the outcomes continuing pregnancy and blood transfusion, RCT results are presented separately because the certainty of evidence from included RCTs was lower than for the results from the included NRS for these outcomes. See Table 2 for the the outcomes hospitalisation, satisfaction, and emergency visits. NRS results are presented separately in Table 3 because data were available from RCTs. See Table 4 for details of NRS data.

In the four studies that reported on mortality, zero deaths were reported (Aiken 2021; Ralph 2024; Reynolds-Wright 2023; Seymour 2022).

Additional doses of misoprostol were reported in the studies Cely-Andrade 2024, Kerestes 2021, and Wiebe 2020.

See details in the 'Characteristics of included studies' in Supplementary material 2.

Comparison 2: Pre-abortion/abortion telemedicine models versus in-clinic care for medical abortion

Four NRS provided evidence for the sub-intervention pre-abortion/abortion telemedicine models compared with in-clinic care (Grossman 2011; Grossman 2017; Kohn 2019; Seymour 2018). See Summary of findings 2.

In telemedicine models in this sub-intervention category, participants attended an in-clinic consultation with a clinician who was not an abortion provider, who performed an ultrasound and blood testing. Obtained information was then reviewed by an abortion provider remotely, who consulted with the study participant over a video call and then dispensed medications to eligible study participants. All participants were then followed up in-clinic with an ultrasound to determine treatment success. In the comparison group, care provision during all phases of the abortion was by in-clinic care.

We found low-certainty evidence that pre-abortion/abortion telemedicine models may result in a slight increase in successful abortion (Grossman 2011: 99% versus 97%, adjusted odds ratio (AOR) 2.34, 95% CI 0.84 to 6.55; Kohn 2019: 98% versus 94%, AOR for surgical intervention 0.28, 95% CI 0.17 to 0.46; 2 NRS, 6550 participants). The effects of the intervention on continuing pregnancy (2 NRS, 4905 participants, very low-certainty evidence), blood transfusion (2 NRS, 19,619 participants, very low-certainty evidence), hospitalisation (2 NRS, 19,619 participants, very low-certainty evidence), and emergency visits (2 NRS, 25,122 participants, very low-certainty evidence) were uncertain. Finally, pre-abortion/abortion telemedicine models may result in little to no difference in rates of satisfaction when compared with in-clinic care (Grossman 2011: 95% versus 94%: AOR (very satisfied) 2.10, 95% CI 0.75 to 5.92; 2 NRS, 1636 participants; low-certainty evidence). See Table 5 for details of NRS data.

In the three studies that reported on mortality, zero deaths were reported (Grossman 2011; Grossman 2017; Kohn 2019). Additional doses of misoprostol were not reported by studies included in this comparison.

Comparison 3: Post-abortion telemedicine models versus in-clinic care for medical abortion

Four RCTs (Bracken 2014; Constant 2014; Ngoc 2014; Platais 2015) and five NRS (Cameron 2012; Chen 2016; Chong 2023; Dunn 2015; Vanetti 2021) provided evidence for the sub-intervention post-abortion telemedicine models. See Summary of findings 3; Supplementary material 7.

In post-abortion telemedicine models, different types of telecommunications were used, including phone, online questionnaire, and automated text messages. In Chong 2023, it was unclear what kinds of telecommunications were used. Telemedicine care replaced an in-clinic visit to determine abortion success, often combined with a pregnancy test and/or a symptom checklist. In Constant 2014, participants in the telemedicine group also had an in-clinic visit to complete a questionnaire, while in the comparison group, abortion success was determined in-clinic.

We found moderate-certainty evidence that post-abortion telemedicine models compared to in-clinic follow-up likely result in little to no difference in rates of successful abortion (RR 1.00, 95% CI 0.99 to 1.01; 4 RCTs, 5069 participants; moderate-certainty evidence). Further, post-abortion telemedicine models may result in little to no difference in continuing pregnancy (RR 0.81, 95% CI 0.48 to 1.36; 4 RCTs, 5069 participants; low-certainty evidence). We are uncertain about the effects of the intervention on blood transfusion (RR 0.33, 95% CI 0.01 to 8.07; 1 RCT, 933 participants) and hospitalisation (RR 4.95, 95% CI 0.24 to 102.76). The RCTs included in this comparison did not provide results for the outcome of emergency visits. Based on results from NRS, we are uncertain about the effect of the intervention on emergency visits (2 NRS, 285 participants; very low-certainty evidence) and on satisfaction (RR 0.84, 95% CI 0.77 to 0.92; 1 RCT, 933 participants). We found moderate-certainty evidence that post-abortion telemedicine models likely result in higher rates of adherence to follow-up procedures (RR 1.15, 95% CI 1.13 to 1.18; 4 RCTs, 5235 participants).

With regards to NRS, the certainty of the evidence for all included outcomes for this comparison was very low. NRS results for all outcomes where RCT results were available (successful abortion, continuing pregnancy, hospitalisation, satisfaction, adherence) are presented separately in Table 6. See Table 7 for details on NRS data.

No studies in this comparison reported on the outcome mortality. Additional doses of misoprostol were reported in the study Vanetti 2021. See Supplementary material 2.

Equity assessment

We did not investigate health inequity in this review. This may, however, be of relevance for forthcoming updates.

DISCUSSION

Summary of main results

We identified 22 studies, six RCTs and 16 NRS with a comparison group, comparing telemedicine models for medical abortion with in-clinic care. We were able to conduct a meta-analysis for our critical and important outcomes for the comparisons pre- to post-abortion telemedicine models versus in-clinic care, and post-abortion telemedicine versus in-clinic care, for medical abortion. The review findings are mainly applicable to the use of telemedicine for medical abortion from the pre- to post-abortion phase, in pregnancies up to nine weeks' gestation, with some support for pregnancies between 10 and 12 weeks' gestation.

We found that pre- to post-abortion telemedicine models for medical abortion probably result in little to no difference in successful abortion, continued pregnancy, and adherence to the medical abortion regimen, when compared to in-clinic care for medical abortion. Further, pre- to post-abortion telemedicine models may result in little to no difference in blood transfusion, emergency visits, and satisfaction compared to in-clinic care. We are uncertain about the effect of the intervention on hospitalisation, which was a rare event in the included studies and more generally in the literature on medical abortion. No deaths were reported among the studies included in this review.

The evidence regarding the effects of pre-abortion/abortion telemedicine models suggests that there is little to no difference in successful abortion and satisfaction when compared to in-clinic care. However, we are uncertain about the effects on continued pregnancy, blood transfusion, hospitalisation, and emergency visits. For the sub-intervention post-abortion telemedicine models, the evidence was more robust, based on both RCTs and NRS. Post-abortion telemedicine models probably result in little to no difference in successful abortion and in continued pregnancy, but likely result in higher rates of adherence to follow-up procedures compared to in-clinic follow-up. The effects of post-abortion telemedicine models on blood transfusion, hospitalisation, emergency visits, and satisfaction were uncertain.

Together, the findings relating to our main intervention and sub-interventions suggest that the use of telemedicine models for medical abortion in early pregnancy may result in similar safety, effectiveness, and acceptability rates when compared with in-clinic care. The review findings thereby indicate that telemedicine may be used to support one or several phases of an abortion, with similar outcomes as when care is provided in-clinic.

Limitations of the evidence included in the review

This review included data from RCTs and NRS. Although RCTs were few, especially in regard to our main intervention of interest, they were generally of good quality. Three RCTs had some concerns due to non-blinding of the intervention, and two had high risk of bias due to issues relating to missing data. Among the NRS, we judged three to have an overall moderate risk of bias. We judged the remaining NRS to have serious or critical overall risk of bias, primarily due to not having addressed the issue of confounding.

We assessed the certainty of evidence for each comparison and outcome using the GRADE process. For our main intervention of interest, pre- to post-abortion telemedicine models for medical abortion, the highest certainty of evidence for our critical outcome, successful abortion, was moderate for both RCTs and NRS. The outcome of continuing pregnancy had a moderate certainty of evidence based on the findings from four NRS. The results related to the remaining important outcomes had either a low or very low certainty of evidence.

For the comparison pre-abortion/abortion telemedicine model versus in-clinic, the certainty of evidence was very low for all outcomes and based on four NRS. For the comparison post-abortion telemedicine versus in-clinic, the highest certainty of evidence was moderate for our critical outcome, successful abortion, low for continuing pregnancy, and very low for the remaining outcomes.

The data in this review are generally reflective of the abortion-seeking population aged 16 and above in early pregnancy. Most studies in this review were conducted in well-resourced countries and the generalisability of the findings may therefore be limited to such settings. The review does, however, include one high-quality RCT conducted in a low-resourced population, suggesting that the findings relating to pre- to post-abortion telemedicine models for medical abortion may be applicable to similar settings.

This review includes five NRS conducted in three high-income countries and one middle-income country, which excluded routine in-clinic testing to determine pregnancy length and location, suggesting that these kinds of telemedicine models may have similar impacts on safety and effectiveness outcomes as in-clinic care with testing. However, our results cannot conclude this with any certainty. Further, the studies in this review included telemedicine models using different types of telecommunications. This means that the review findings are not applicable to any specific type of telecommunications; rather, the applicability relates to the phase or phases of the abortion process in which telecommunications are used to deliver care.

The sample size for most outcomes was adequate to address the objectives of this review and insufficient only with respect to the outcomes of very low incidence such as hospitalisation and mortality. The heterogeneity among the included NRS was too large to allow for meta-analysis. The data also did not allow for our planned sub-analyses.

Studies on telemedicine models for medical abortion without an in-clinic comparison group were not included in this review. Nonetheless, this type of data, including programmatic data, may be valuable to understand how telemedicine models for medical abortion can be contextually adapted and successfully integrated within public and private health systems.

The review findings suggest that satisfaction with care is similar with telemedicine models for medical abortion compared to in-clinic care, in line with previous research. However, the findings do not shed light on the acceptability or preference associated with different types of telecommunications or asynchronous versus synchronous communication. Age, parity, cultural differences, and contextual factors may play a role in the acceptability of one type over another.

Limitations of the review processes

We believe that we have identified all relevant RCTs and NRS with a comparison group in our search. The search was last updated in August 2024 and there may be relevant studies published after this date and before the publication of this review, which could be included in an update. The review only includes English language papers, and we may therefore have missed relevant papers in other languages that could have impacted our results.

There is currently no standardised or generally accepted classification or grouping of the different types of telemedicine models for medical abortion. We made a pragmatic decision to group interventions according to the abortion phase in which telemedicine was used to deliver care and to note the care components delivered via telemedicine. This was done to enable us to draw meaningful conclusions with respect to clinical practice and implementation. This approach is not necessarily reflective of how study authors would group their studies.

ME and KGD authored one included study. The risk of bias for this study was therefore assessed by an independent reviewer at Cochrane.

Agreements and disagreements with other studies or reviews

The findings of this review are consistent with the conclusions of previous work on the topic [8], including more recent non-comparative studies [75] (Anger 2024 [76]), that the use of

telemedicine for medical abortion in early pregnancy is generally safe, effective, and acceptable.

AUTHORS' CONCLUSIONS

Implications for practice

The findings from this review indicate that the use of telemedicine for medical abortion to support the entire abortion process (from pre- to post-abortion) probably results in similar rates of successful abortion, continued pregnancy, and adherence to the medication regimen, when compared with in-clinic provision. Further, this intervention may result in similar rates of blood transfusions, emergency visits, and satisfaction, when compared with in-clinic care; however, the effect on the outcome hospitalisation remains uncertain. We found that post-abortion telemedicine models likely result in higher rates of adherence to follow-up procedures when compared to in-clinic follow-up.

Studies included in this review and within the same comparison group used different ways to assess eligibility and measure outcomes, different time points at which outcomes were measured, different means of dispensing medications, and different types of telecommunication, both synchronous and asynchronous. The implications of the findings from this review are therefore not limited to a certain telemedicine model for medical abortion – they highlight the various ways in which this intervention can be understood and applied in practice.

Implications for research

Future studies on telemedicine models for medical abortion should focus on settings where health system infrastructure, resources, and general population health may require different solutions and technical innovations to enable safe, effective, and acceptable telemedicine models for medical abortion. More research is needed, in all types of settings, on telemedicine models that omit routine physical exams, ultrasound, or blood testing, that include more study participants with gestational ages above nine weeks, and that compare different types of telecommunications, synchronous and asynchronous. Such research, especially if based on randomised controlled trials or adequately powered comparative non-randomised studies with adjusted analyses, would strengthen the evidence base for telemedicine models for medical abortion and widen the applicability of our findings.

SUPPLEMENTARY MATERIALS

Supplementary materials are available with the online version of this article: 10.1002/14651858.CD013764.

Supplementary material 1 Search strategies

Supplementary material 2 Characteristics of included studies

Supplementary material 3 Characteristics of excluded studies

Supplementary material 4 Characteristics of studies awaiting classification

Supplementary material 5 Characteristics of ongoing studies

Supplementary material 6 Risk of bias

Supplementary material 7 Analyses

Supplementary material 8 Data package

ADDITIONAL INFORMATION

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Editorial and peer-reviewer contributions

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The following people conducted the editorial process for this article:

- Sign-off Editor (final editorial decision): Soo Downe, University of Central Lancashire; Cindy Farquhar, University of Auckland.
- Managing Editor (selected peer-reviewers, provided editorial guidance to authors, edited the article): Anne-Marie Stephani, Cochrane Central Editorial Service.
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Contributions of authors

ME drafted the study protocol with support from AC, AL, and KGD. AC and ME screened studies for inclusion, extracted data, and assessed the risk of bias in included studies. AC and ME performed the analyses and AC created tables for inclusion and drafted the manuscript with support from ME. AL, ME, and KGD contributed to the interpretation of results and the writing of the manuscript.

Declarations of interest

AC: none known.

AL: none known.

KGD: has authored one of the included studies in this review (Endler 2022).

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Registration and protocol

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Differences between protocol and review

We made the following changes to the definition of outcomes after the protocol was published but before the data were analysed. Changes were made to limit the number of outcomes, to align with standard core abortion care outcomes, and to create meaningful areas of comparison between studies:

- We limited our critical outcome to one successful abortion, and modified its definition to pregnancies terminated without the need for surgical intervention. The initial inclusion of additional misoprostol treatment as a possible criterion for incomplete abortion would have required us to remove most studies from the analysis of this outcome. Where data were available, the use of additional misoprostol is reported in the results section and under the 'Characteristics of included studies' (Supplementary material 2).
- We moved hospitalisation, blood transfusion, and satisfaction from critical to important outcomes.
- We removed the time limit of two days from intake of misoprostol as a criterion for an 'emergency visit' since the timing of the visit was not reported in any study, which would have excluded these data from the review.
- We applied the timeframe for measurement of outcomes of 42 days for all important outcomes (in the protocol we had not specified this timeframe for all outcomes).
- We changed the wording of the outcome adherence to read "or" instead of "and" between listed definitions of adherence measures.
- We excluded met expectations and preference as outcomes because we assessed them to be superfluous since the predefined outcome satisfaction was consistently reported by our included studies.
- We excluded the outcomes severe pain and heavy bleeding because we assessed that these outcomes were difficult to report in a standardised way across studies.

We made the following change to the definition of interventions after the protocol was published but before data analysis, to conform to the clinical models that the studies described. Our main intervention, “comprehensive telemedicine abortion”, was renamed “pre-abortion to post-abortion telemedicine models” to clarify that our definition of this intervention was based on the fact that telemedicine was used as the main means of service delivery throughout all phases of the abortion care process. We regrouped the sub-interventions 1) Eligibility assessment, including assessment of gestational age, 2) Counselling and/or instruction for the abortion, and 3) Instruction for and active facilitation of the medication into sub-interventions based on during which phase of the abortion (pre-abortion, abortion, or post-abortion) telecommunications were used to deliver care.

We made the following change to the analysis plan after the protocol was published, but before data analysis: we used the RoB 2 tool to assess risk of bias in the RCTs as is now recommended by Cochrane.

Finally, we added information detailing our approach to incorporating results from NRS, in accordance with evolving methods for incorporating NRS evidence into Cochrane reviews.

History

Protocol first published: Issue 11, 2020

Data, code and other materials

As part of the published Cochrane review, the following data package is made available for download for users of the Cochrane Library: see Supplementary material 8. Appropriate permissions have been obtained for such use. Analyses and data management were conducted within Cochrane’s authoring tool, RevMan, using the inbuilt computation methods.

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ADDITIONAL TABLES

Table 1. Risk of bias table for ROBINS-I with judgements

Author year	Confounding	Bias due to selection into the study	Bias classification of interventions	Deviation from intended intervention	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of reported results	Overall judgement
Aiken 2021	Moderate	Low	Low	Low	Low	Low	Low	Moderate
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 and 1.5 = PY; judgement = moderate for successful abortion, continuing pregnancy and blood transfusion	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	4.1 = N, reasons for any deviation adequately explained; judgement = low	5.1 = Y; judgement = low	6.1 = PN, 6.2 = PY, 6.3 = PY (before and after study), 6.4 = N; judgement = low	7.1 to 7.3 = N; judgement = low	
Cameron 2012	Serious	Low	Low	No information	Serious	Moderate	Moderate	Serious
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	NI to signalling questions; judgement = NI	5.1 = N, 5.4 = PY, 5.5 = N, judgement = serious	6.1 = PN, 6.2 = Y, 6.3 = Y and 6.4 = NI; judgement = moderate	For some outcomes, only data for the telemedicine arm presented in publication; however, additional data available upon request by authors; judgement = moderate	
Cely Andrade 2024	Serious	Low	Low	No information	Critical	Serious	Low	Critical

Table 1. Risk of bias table for ROBINS-I with judgements *(Continued)*

ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	No information about deviations; judgement = NI	5.1 = N, 5.4 = N, 5.5 = N High rates of missing data (> 50%), unbalanced between groups; judgement = critical	6.1 = PN, 6.2 = PY, 6.3 = N and 6.4 = PY; judgement = serious	7.1 to 7.3 = N; judgement =low	
Chen 2016	Serious	Low	Low	Low	Low	Moderate	Low	Serious
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	4.1 = N, reasons for any deviation adequately explained; judgement = low	5.1 = Y; judgement = low	6.1 = PN but may have affected the outcome adherence, 6.2 = Y, 6.3 = Y, 6.4 = PN, judgement = moderate	7.1 to 7.3 = N; judgement = low	
Chong 2023	Serious	Low	Low	Low	Serious	Low	Low	Serious
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious Comment: propensity scoring done, small study comparing two different time periods	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome and therefore judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	4.1 = N, reasons for any deviation adequately explained; judgement = low	5.1 = N, 5.4 = PY, 5.5 = N relatively high rates (22 vs 17%) of missing data although balanced between groups; 5.5 = PN; judgement = serious	6.1 = N, 6.2 = NI, 6.3 = Y, 6.4 = PN, judgement = low	7.1 to 7.3 = N; judgement = low	
Dunn 2015	Serious	Low	Low	Low	Moderate	Moderate	Low	Serious
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 and 1.5 = PN for the outcomes successful abortion and continuing pregnancy, PY for the outcome adherence,	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome and therefore judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	4.1 = N, reasons for any deviation adequately explained; judgement = low	5.1 = Y, 5.4 = N, 5.5 = N; judgement = moderate	6.1 = PN but may have affected the outcome adherence, 6.2 = Y, 6.3 = Y, and 6.4 = PN, judgement = moderate	7.1 to 7.3 = N; judgement = low	

Table 1. Risk of bias table for ROBINS-I with judgements *(Continued)*

	judgement = serious							
Grossman 2011	Moderate	Low	Low	Low	Moderate	Moderate	Low	Moderate
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 and 1.5 = PY for the outcome successful abortion and satisfaction, N for other secondary outcomes; judgement = moderate	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	4.1 = N, reasons for any deviation adequately explained; judgement = low	5.1 = PN, 5.4 = Y, 5.5 = N; judgement = moderate	6.1 = PN but may have affected the outcome satisfaction = PY, 6.2 = Y, 6.3 = Y and 6.4 = PN, judgement = moderate	7.1 to 7.3 = N; judgement = low	
Grossman 2017	Serious	Low	Low	No information	Critical	Moderate	Low	Critical
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	No information about deviations; judgement = NI	5.1 = N, 5.4 = PN, 5.5 = N, no access to information about some outcomes and some participants; judgement = serious	6.1 = PN, 6.2 = PY, 6.3 = NI and 6.4 = PN; judgement = moderate	7.1 to 7.3 = N; judgement = low	
Kerestes 2021	Serious	Low	Low	Low	Moderate	Low	Low	Serious
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	4.1 = N; judgement = low	5.1 = PY, missing data below 20% and balanced between groups; judgement = moderate	6.1 = PN, 6.2 = Y, 6.3 = Y, 6.4 = PN; judgement = low	7.1 to 7.3 = N; judgement = low	
Kohn 2019	Moderate	Low	Low	Low	Serious	Serious	Low	

Table 1. Risk of bias table for ROBINS-I with judgements *(Continued)*

ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 and 1.5 = PY for the outcome successful abortion and N for secondary outcomes; judgement = moderate	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	4.1 = N; judgement = low	5.1 = N, 5.4 = N, high and unbalanced rates of missing data, 5.5 = PN; judgement = serious	6.1 = PN, 6.2 = Y, 6.3 = PN, 6.4 = PY Comment: option of vacuum aspiration not available in all clinics, which may have an impact on measurement of outcomes; judgement = serious	7.1 to 7.3 = N; judgement = low	
Ralph 2024	Moderate	Low	Low	No information	Low	Low	Moderate	Moderate
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 and 1.5 = PY for the outcome successful abortion, N for secondary outcomes; judgement = moderate	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	No information about deviations; judgement = NI	5.1 = Y; < 10% and balanced between groups; judgement = low	6.1 = PN, 6.2 = PY, 6.3 = PY and 6.4 = PN; judgement = low Comment: how complete abortion was determined (ultrasound, pregnancy test, review of symptoms, blood-hCG-testing, physical examination) not reported	7.1 = N, 7.2 = PN to 7.3 = PN; judgement = moderate Comment: Secondary outcomes not reported per study group and some secondary outcomes listed in the study protocol not reported on (mortality, adherence and satisfaction). However, additional data were provided by the authors.	

Table 1. Risk of bias table for ROBINS-I with judgements *(Continued)*

Seymour 2018	Serious	Low	Low	No information	Serious	Low	Low
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	No information about deviations; judgement = NI	5.1 = N; 5.4 = N, 5.5 = N; judgement = serious	6.1 = N, 6.2 = NI, 6.3 = Y, 6.4 = PN; judgement = low	7.1 to 7.3 = N; judgement = low
Seymour 2022	Serious	Low	Low	No information	Low	Low	Low
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	No information about deviations; judgement = NI	5.1 = Y; judgement = low	6.1 = PN, 6.2 = PY, 6.3 = Y, 6.4 = PN; judgement = low	7.1 to 7.3 = PN; judgement = low Comment: additional data were provided by the authors
Thompson 2021	Serious	Low	Low	Low	Moderate	Low	Low
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	4.1 = N; judgement = low	5.1 = Y; judgement = low 5.1 = Y; but only 14% and 1.4% who obtained abortion care via telemedicine and in-clinic, respectively, during the study period, were included in the study; judgement = moderate	6.1 = N, 6.2 = NI, 6.3 = Y, 6.4 = PN, judgement = low	7.1 to 7.3 = N; judgement = low
Vanetti 2021	Serious	Low	Low	Low	Moderate	Moderate	Low

Table 1. Risk of bias table for ROBINS-I with judgements *(Continued)*

ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	4.1 = N; judgement = low	5.1 = Y, 5.4 = PN; low rates of missing data for primary outcome but higher and unbalanced rates for satisfaction, 5.5 = N; judgement = moderate	6.1 = PN but may have affected the outcome satisfaction; 6.2 = Y, 6.3 = PY (before and after study), 6.4 = PN; judgement = moderate	7.1 to 7.3 = N; judgement = low
Wiebe 2020	Serious	Low	Low	Low	Low	Low	Low
ROBINS-I tool/rationale for judgement	1.1 = Y, 1.4 = N; judgement = serious	2.1 = N, 2.4 = Y Comment: selection of participants does not appear to be related to both intervention and outcome; judgement = low	3.1 and 3.2 = Y, 3.3 = N; judgement = low	4.1 = N; judgement = low	5.1 = Y, low rates of missing data that is balanced between groups; judgement = low	6.1 = PN, 6.2 = Y, 6.3 = PY, 6.4 = PN, therefore judgement = low	7.1 to 7.3 = N; judgement = low

ROBINS-I template version 19 September 2016
Y: yes; N: no; PY: probably yes; PN: probably no; NI: no information

Table 2. RCT results not shown in SOF 1: Pre- to post-abortion telemedicine models vs in-clinic care for medical abortion

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	In-clinic care	Telemedicine models				
Continued pregnancy	7 per 1000	13 per 1000	RR 1.88 (0.47 to 7.47)	837 (2 RCTs)	Very low[a]	The evidence is very uncertain about the effect of pre- to post-abortion telemedicine models on continued pregnancy.
Blood transfusion	2 per 1000	4 per 1000	RR 1.9 (0.17 to 20.91)	851 (2 RCTs)	Very low[a]	The evidence is very uncertain about the effect of pre- to post-abortion telemedicine models on blood transfusion.

[a]Downgraded one level for risk of bias due to missing outcome data in one included RCT, and two levels for imprecision; wide confidence interval and rare event.
CI: confidence interval; RCT: randomised controlled trial; RR: risk ratio; SOF: summary of findings table

Table 3. NRS results not shown in SOF 1: Pre- to post-abortion telemedicine models versus in-clinic care for medical abortion

Outcome	Study characteristics	Adjusted analyses (where available)	Total participants n (studies)	GRADE	What does this mean?
Hospitalisation	Two retrospective cohort studies (n = 19,555; n = 10,899) and one prospective cohort study (n = 537) with unadjusted analysis for this outcome	-	30,991 (3 NRS)	Very low[a,b]	The evidence is very uncertain about the effect of pre- to post-abortion telemedicine models on hospitalisation.
Emergency visits	One case control study (n = 358), two retrospective cohort studies (n = 218; n = 10,899) with unadjusted analysis for this outcome	-	11,475 (3 NRS)	Very low[a,b]	The evidence is very uncertain about the effect of pre- to post-abortion telemedicine models on emergency visits.
Satisfaction	One prospective cohort study with unadjusted analysis for this outcome (n = 385)	-	385 (1 NRS)	Very low[b,c]	The evidence is very uncertain about the effect of pre- to post-abortion telemedicine models on satisfaction.

[a]Downgraded one level for rare event.
[b]Downgraded two levels for serious risk of bias due to confounding (included studies lack adjusted analysis).
[c]Downgraded one level for imprecision (one small study with insufficient power).
NRS: non-randomised study; SOF: summary of findings table

Table 4. NRS data table; pre- to post-abortion telemedicine models (I) vs in-clinic care (C) for medical abortion

Outcome	Telemedicine events/total n (%)	In-person events/total n (%)	Adjusted comparison

Table 4. NRS data table; pre- to post-abortion telemedicine models (I) vs in-clinic care (C) for medical abortion *(Continued)*

Successful abortion			
Aiken 2021	29,618/29,984 (99)	21,769/22,158 (98)	Adjusted P value = 1.0
Cely-Andrade 2024	1184/1247 (94.9)	8384/9004 (93.3)	Adjusted OR 1.18 (0.87 to 1.59); P value = 0227
Kerestes 2021	120/124 (97)	88/94 (94)	
Ralph 2024	303/317 (95.6)	206/220 (93.6)	Adjusted risk difference 1.1 (−3.6 to 5.9)
Seymour 2022	2159/2222 (97)	16,540/17,333 (95)	
Wiebe 2020	164/170 (96)	179/188 (95)	
Continued pregnancy			
Aiken 2021	158/29,984 (0.5)	164/22,158 (1)	Adjusted P value = 0.268
Kerestes 2021	0/124 (0)	3/94 (3)	
Seymour 2022	12/2222 (0.5)	98/17,333 (0.5)	
Wiebe 2020	0/170 (0)	1/184 (0.5)	
Blood transfusion			
Aiken 2021	7/29,984 (0.02)	8/22,158 (0.03)	Adjusted P value = 0.557
Cely-Andrade 2024	2/1443 (0.1)	2/9756 (0.02)	
Kerestes 2021	2/124 (1.6)	0/94 (0)	
Ralph 2024	1/317 (0.3)	1/220 (0.4)	
Seymour 2022	3/2222 (0.1)	9/17,333 (0.05)	
Hospitalisation			
Cely-Andrade 2024	7/1143 (0.5)	4/9756 (0.04)	
Ralph 2024	2/317 (0.6)	2/220 (0.9)	
Seymour 2022	0/2222	1/17,333 (0.01)	
Emergency visits			
Cely-Andrade 2024	48/1443 (3.3)	39/9756 (0.4)	
Kerestes 2021	5/124 (4)	2/94 (2)	

Table 4. NRS data table; pre- to post-abortion telemedicine models (I) vs in-clinic care (C) for medical abortion *(Continued)*

Wiebe 2020	6/170 (3.5)	3/188 (1.5)
Satisfaction		
Thompson 2021	171/173 (99)	204/212 (96)
Adherence	No studies identified	

NRS: non-randomised study; OR: odds ratio

Table 5. NRS data table; pre-abortion/abortion telemedicine models (I) vs in-clinic care (C) for medical abortion

Outcome	Telemedicine events/total n (%)	In-person events/total n (%)	Adjusted comparison
Successful abortion			
Grossman 2011	220/223 (99)	219/226 (97.0)	AOR 2.34 (95% CI 0.84 to 6.55)
Kohn 2019	437/445 (98)	3758/4011 (94)	Odds of surgical evacuation: AOR 0.28 (95% CI 0.17 to 0.46)
Continuing pregnancy			
Grossman 2011	2/223 (1)	2/226 (1)	
Kohn 2019	2/445 (0.5)	71/4011 (2)	AOR 0.23 (95% CI 0.14 to 0.39)
Blood transfusion			
Grossman 2011	1/223 (0.5)	0/226 (0)	
Grossman 2017	6/8765 (0.1)	7/10,405 (0.1)	
Hospitalisation			
Grossman 2011	0/223 (0)	0/226 (0)	
Grossman 2017	6/8765 (0.1)	13/10,405 (0.1)	
Emergency visits			
Grossman 2017[a]	13/8765 (0.1)	22/10,405 (0.2)	
Kohn 2019a[*]	0/738	9/5214 (0.2)	
Satisfaction			
Grossman 2011	211/223 (95)	212/226 (94)	Odds of being very satisfied: AOR 2.10 (95% CI 0.75 to 5.92)
Seymour 2018	172/187 (92)	190/199 (95)	
Adherence	No studies identified		

[a]Visits to emergency department with treatment; *denominator includes lost to follow-up.
AOR: adjusted odds ratio; CI: confidence interval

Table 6. NRS results not shown in SOF 3: Post-abortion telemedicine models vs in-clinic care for medical abortion

Outcome	Study characteristics	Adjusted analyses (where available)	Total participants n (studies)	GRADE	What does this mean?
Successful abortion	Two (n = 167; n = 514) retrospective cohort studies, one prospective cohort study (n = 118), and one before and after study (n = 201), all with unadjusted analysis for this outcome	-	1000 (4 NRS)	Very low[a]	The evidence is very uncertain about the effect of post-abortion telemedicine models on successful abortion.
Continuing pregnancy	Two retrospective cohort studies (n = 514; n = 167) and one before and after study (n = 201), all with unadjusted analyses for this outcome	-	882 (3 NRS)	Very low[a,b]	The evidence is very uncertain about the effect of post-abortion telemedicine models on continuing pregnancy.
Blood transfusion	No studies identified				
Hospitalisation	One prospective cohort study (n = 118) with unadjusted analysis for this outcome	-	118 (1 NRS)	Very low[a,b]	The evidence is very uncertain about the effect of post-abortion telemedicine models on hospitalisation.
Satisfaction	One before and after study (n = 201) with unadjusted analysis	-	154 (1 NRS)	Very low[c]	The evidence is very uncertain about the effect of post-abortion telemedicine models on satisfaction.
Adherence	One before and after study (n = 408), one retrospective cohort study with unadjusted analysis (n = 176) and one prospective cohort study with adjusted analyses (n = 129)	Dunn 2015, 72% (I) vs 77% (C), P = 0.57; AOR* 1.09, 95% CI 0.39 to 3.01 (*odds of non-adherence with in-clinic vs telemedicine)	713 (3 NRS)	Very low[c]	The evidence is very uncertain about the effect of post-abortion telemedicine models on adherence.

[a]Downgraded two levels for risk of bias due to confounding and one level for imprecision (only one study with an adequate sample size).
[b]Downgraded one level for rare event.
[c]Downgraded two levels for serious risk of bias due to confounding and one level for imprecision (small sample sizes with insufficient power).
AOR: adjusted odds ratio; C: control; CI: confidence interval; I: intervention; NRS: non-randomised study; SOF: summary of findings table

Table 7. NRS data table; Post-abortion telemedicine models (I) vs in-clinic care (C) for medical abortion

Outcome/studies	Telemedicine (I) events/total n (%)	In-clinic (C) events/total n (%)	Adjusted analyses

Table 7. NRS data table; Post-abortion telemedicine models (I) vs in-clinic care (C) for medical abortion *(Continued)*

Successful abortion			
Cameron 2012	393/404 (97)	108/110 (98)	
Chen 2016	62/67 (92.5)	94/100 (94)	
Dunn 2015	79/81 (97.5)	34/37 (92)	
Vanetti 2021	137/145 (94.5)	54/56 (96)	
Continuing pregnancy			
Cameron 2012	5/404 (1)	1/110 (1)	
Chen 2016	0/67 (0)	1/100 (1)	
Vanetti 2021	2/145 (1)	0/56	
Blood transfusion	No studies identified		
Hospitalisation			
Dunn 2015	1/81 (1)	0/37 (0)	
Emergency visits			
Chen 2016	4/67 (6)	2/100 (2)	
Dunn 2015	2/81 (2.5)	3/37 (8)	
Satisfaction			
Vanetti 2021	110/116 (95)	21/38 (55)	
Adherence*			
Chen 2016	60/71 (84.5)	99/105 (94)	
Chong 2023	95/136 (79)	199/272 (73)	
Dunn 2015	62/86 (72)	33/43 (77)	Odds of non-adherence: AOR 1.09 (0.39 to 3.01)

*Denominator includes lost to follow-up.
AOR: adjusted odds ratio; C: control; I: intervention