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Postpartum remote blood pressure monitoring and risk of hypertensive-related readmission: systematic review and meta-analysis of randomized controlled trials

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Abstract

Objectives: To assess the efficacy of remote blood pressure monitoring to prevent readmission due to complications of hypertensive disorders of pregnancy.

Methods: The search was conducted using MEDLINE, EMBASE, Web-of-Sciences, Scopus, ClinicalTrial.gov, OVID and Cochrane-Library as electronic databases from the inception of each database to November 2023. Selection criteria included randomized controlled trials of postpartum individuals randomized to remote blood pressure monitoring or telehealth strategies vs. routine-care. The primary outcome was postpartum readmission, defined as postpartum hospital admission after discharge. Secondary maternal outcomes included stroke, eclampsia, ICU-admission, maternal death, emergency department visit, ascertainment of a blood pressure measurement within 7–10 days after delivery, attendance of the 4–6-week postpartum visit. The summary measures were reported as relative risk (RR) or as mean difference (MD) with 95 % confidence intervals (CI).

Results: Four RCTs including 714 individuals randomized to either telematic reporting of blood pressure measurements (n=356, 49.8 %) or standard postpartum care (n=358, 50.1 %). There were no significant differences in the rate of hospital readmission due to hypertensive related causes (5.3 % vs. 11.8 %). However, emergency department visit rate differed significantly among the two groups (9.0 % vs. 4.4 %). With regards to postpartum follow up, blood pressure assessment at 10 days postpartum and 4–6-week postpartum visit attendance rate were similar. No included RCT provided data on maternal secondary outcome like pulmonary edema, stroke, maternal death, and ICU admission.

Conclusions: Remote blood pressure monitoring is not superior to standard care to prevent hypertensive related readmission and increases emergency department visits.

Keywords: telehealth; postpartum hypertension; hypertensive disorders of pregnancy; preeclampsia; telemedicine; digital health policies

Introduction

In the US, every hour of every day, about 45 individuals with hypertensive disorder of pregnancy (HDP) deliver. HDP is defined as blood pressure >140/90 mmHg on two occasions at least 4 h apart after 20 weeks of gestation, in a woman with a previously normal blood pressure [1]. HDP is associated with persistent postpartum hypertension, coagulopathy, renal failure, HELLP syndrome retinal injury pulmonary edema, acute respiratory distress syndrome, myocardial infarction, stroke and death [2, 3]. These disorders are the leading cause of postpartum readmissions, with postpartum stroke emerging as the primary cause of mortality within 10 days of delivery [2, 4, 5]. Given the potential benefits of early intervention and monitoring, the American College of Obstetricians and Gynecologists (ACOG) recommends postpartum patients with HDP to undergo blood pressure evaluation within 7–10 days after delivery, traditionally with an in-person office setting [1]. The International Society for the

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Study of Hypertension in Pregnancy (ISSHP) recommends regular general practitioner follow-up to monitor BP in addiction to periodic measurement of fasting lipids and blood sugar and adopt healthy lifestyle with maintenance of ideal weight and regular aerobic exercise [6]. NICE guidelines from UK suggest to offer all women who have had pre-eclampsia a medical review with their general practitioner (GP) or specialist 6–8 weeks after the birth and for individuals who remain on antihypertensive treatment a medical review with their GP or specialist 2 weeks after transfer to community care [7, 8].

However, adherence to these recommendations has been less than ideal, with up to 70 % of individuals not keeping their follow-up appointments [9]. Although remote monitoring programs can place a considerable strain on hospital resources due to the substantial financial investment required for their implementation and maintenance, these programs offer an alternative for maintaining patient contact and providing continuity of care without requiring office visits with the potential to enhance patient satisfaction without compromising the patient-physician relationship, but there is uncertainty about the effectiveness of current practices in reducing short-term outcomes such as postpartum complications and readmissions [10–13].

By enabling patients to measure their blood pressure in familiar surroundings, remote monitoring circumvents the environmental stressors inherent in traditional healthcare settings. This approach may yield more accurate and reliable blood pressure data, reducing the potential for misdiagnosis or unnecessary intervention based on artificially elevated readings induced by white coat syndrome [14, 15].

As HDP can lead to persistent postpartum complications and are associated with long-term cardiovascular risks, the timely management and monitoring of blood pressure in this population could be of paramount importance. Higher blood pressure during this young adult period of life is associated with a 2-fold higher risk of subsequent vascular diseases including myocardial infarction and stroke [16].

Thus, the aim of this study was to assess the efficacy of remote blood pressure monitoring and telehealth strategies to prevent readmission due to complications of hypertensive disorders of pregnancy.

Materials and methods

Search strategy

We followed the Cochrane Handbook for Systematic Reviews of Interventions [17] as well as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [18, 19] reporting guidelines for meta-analyses. We developed a protocol for this systematic review, which was registered with the International Prospective Register of Systematic Reviews (PROSPERO, registration number CRD42024499564). Our protocol specified methods for collecting, extracting and analyzing data a priori. Institutional review board approval was not required as only limited, publicly-accessible data without personally-identifiable information was utilized and no direct patient involvement was needed for the completion of this study [20]. The research was conducted using MEDLINE, EMBASE, Web of Sciences, Scopus, ClinicalTrial.gov, OVID and Cochrane Library as electronic databases from the inception of each database to November 2023. The search strategy was initially developed for use in MEDLINE and was then translated for searching the remaining databases. A completed search strategy is available as Supplementary Appendix A. We also reviewed the title and abstract for all references included in articles retrieved during the search and for all prior meta-analyses on this topic. We systematically searched for a combination of the following terms: "telehealth", "postpartum hypertension" "remote blood pressure monitoring" "home blood pressure monitoring" "postpartum readmission". Review of articles also included the abstracts of all references retrieved from the search. No restrictions for language or geographic location were applied.

Study selection

Selection criteria included only RCTs of pregnant women randomized to either digital surveillance of blood pressure (i.e. text-based approaches, remote blood monitoring, telehealth approach) or standard postpartum care. Eligible studies evaluated at least one of the primary and/or secondary outcomes of interest. Quasi-randomized trials (i.e., trials in which allocation was done based on a pseudo-random sequence, e.g., odd/even hospital number or date of birth, alternation) were excluded. Retrieved references were downloaded into EndNote citation software (version 20.6; Clarivate, Berkeley, CA).

Risk of bias assessment

The risk of bias in each included study was assessed by using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* [21] Seven domains related to risk of bias were assessed in each included trial since there is evidence that these issues are associated with

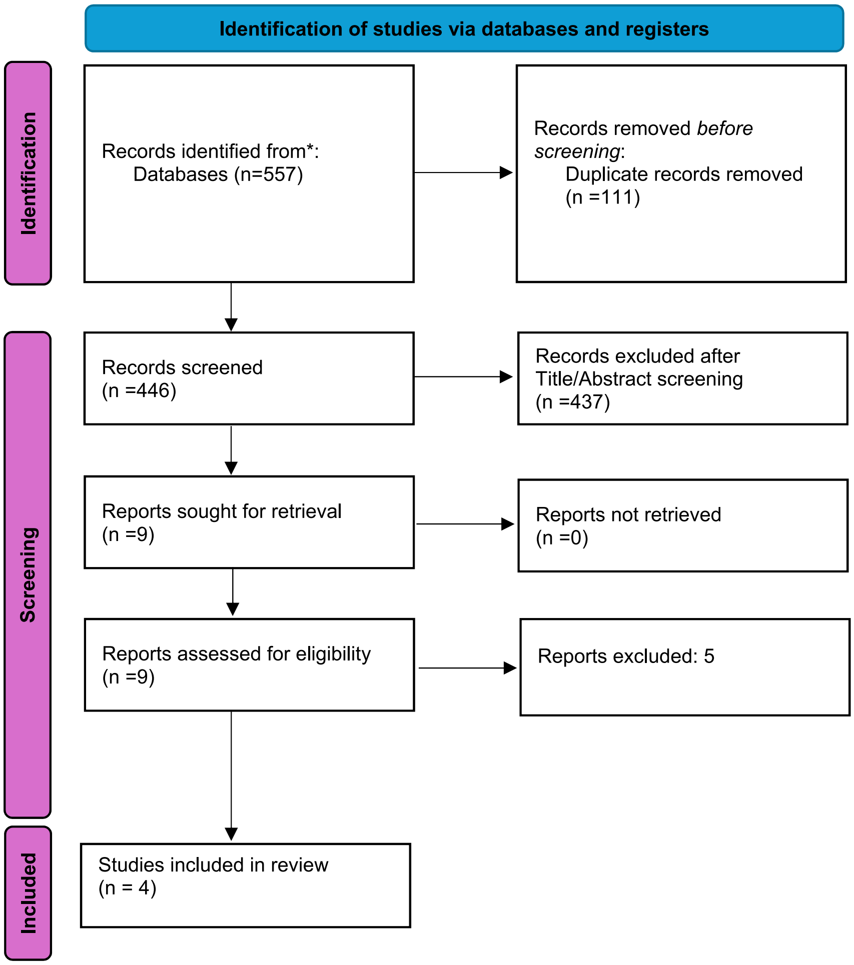

Figure 1: Prisma flow diagram.

biased estimates of treatment effect: 1) random sequence generation; 2) allocation concealment; 3) blinding of participants and personnel; 4) blinding of outcome assessment; 5) incomplete outcome data; 6) selective reporting; and 7) other bias. Review authors' judgments were categorized as "low risk," "high risk" or "unclear risk" of bias. Additionally, TRACT checklist [22] was used to asses trustworthiness of included RCT. The TRACT checklist is designed to efficiently highlight the areas and as well as levels of concern within each domain via the item ratings – either 'No Concerns', 'Some Concerns'/'Not Applicable', or 'Major Concerns'.

Primary and secondary outcomes

The primary outcome was postpartum readmission for any hypertensive related complication. Secondary maternal outcomes were obtained after randomization including stroke, eclampsia, ICU admission, maternal death, emergency department visit, ascertainment of a blood pressure measurement within 7–10 days after delivery, attendance of the 4–6 week postpartum visit.

Data extraction

Data extraction was completed by two independent authors (FZ E DDM). An agreement regarding the potential relevance was reached through consensus; a third author (SPC) was available to adjudicate any differences between reviewers that could not be reconciled. Full text copies of the articles were obtained, and the same two reviewers independently extracted the relevant data on the study characteristics and pregnancy outcomes. Inconsistencies were discussed between the reviewers or in consultation with a third author (SPC) In case of missing data in a relevant article, the corresponding and/or the primary authors were contacted for additional information.

Data analysis

Data analysis was completed using Review Manager 5.4.1 (Copenhagen: The Nordic Cochrane Center, Cochrane Collaboration, 2020). First, we compared baseline characteristics between individuals across the two study groups using the chi-square test. For our analysis of baseline characteristics, a two-sided p value <0.05 was considered statistically significant. The summary measures were reported as summary relative risk (RR) or as summary mean difference (MD) with 95 % of confidence interval (CI) using the random effects model of DerSimonian and Laird. I-squared (Higgins I^2) greater than 50 % was used to identify heterogeneity. Potential publication biases were assessed graphically by using the funnel plot.

Results

Study selection and study characteristics

Figure 1 shows the flow diagram (PRISMA template) of information derived from our review of potentially relevant articles. Four RCTs including 714 individuals randomized to either telematic reporting of blood pressure measurements or standard postpartum care with in office BP measurements at postnatal visit [23–26]. Of the 494 individuals included in the metanalysis, 356 (49.8 %) were randomized to telemonitoring of blood pressure values and 358 (50.1 %) to standard postpartum care. The quality of RCT included in our metanalysis was assessed by the Cochrane Collaboration's Risk of Bias Tool [21] (Figure 2). TRACT analysis was performed to assess the trustworthiness of the included trial. No major concerns were raised when this analysis was performed (Supplementary Table 1).

Table 1 shows characteristics of the included studies. Two studies [23, 26] were conducted in United States and two studies [24, 25] in UK. Two studies [25, 26] were Multicenter RCT, two studies [23, 24] were single center RCT. Type of participants included individuals with a known diagnosis of hypertensive disorders of pregnancy in the postpartum period. Intervention in the included studies involved reporting of blood pressure monitoring through platforms and text-based approach compared to routine postpartum care for individuals whose pregnancy were complicated by hypertensive disorders of pregnancy. Social characteristics, including ethnicity and insurance status, are shown in Table 2. Table 3 shows baseline characteristics and comorbidities present at the moment of randomization. Types of hypertensive disorder are described in Table 4. The most common diagnosis was gestational hypertension followed by preeclampsia with severe features and preeclampsia, the least common diagnosis was eclampsia. Supplementary Table 2 shows obstetric characteristics including livebirth rate, induction of labor rate, mode of delivery and NICU admission and no significant differences were observed. Supplementary Table 3 shows, during delivery hospitalization, hypertension management characteristics and reports IV medication usage, MgSO4 need hypertensive status at discharge and antihypertensive therapy need at discharge rate.

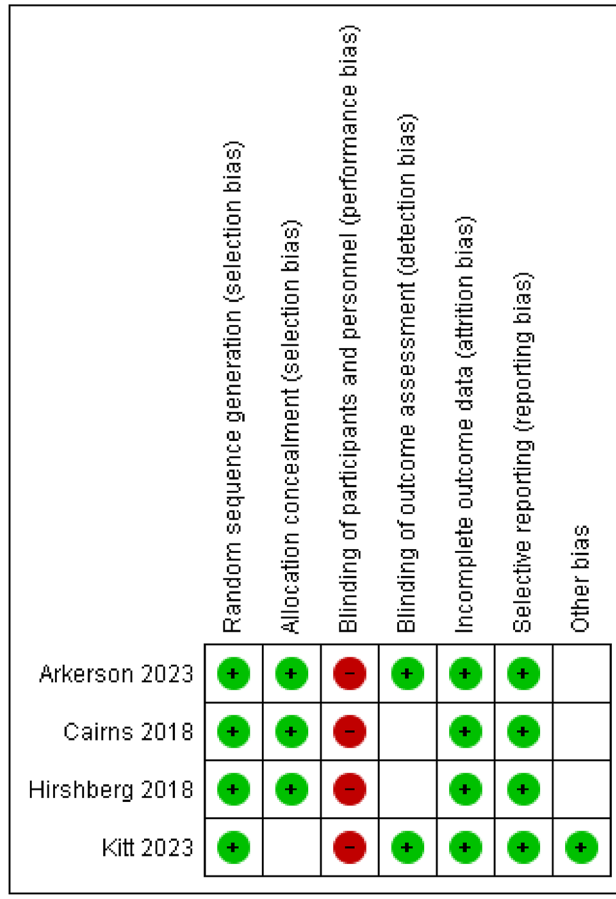

Figure 2: Risk of bias summary.

Synthesis of results

Table 5 shows the primary and secondary outcomes. There was no significant difference in the rate of hospital readmission for hypertensive related causes (5.33 % vs. 11.8 % (RR 0.55, 95 % CI 0.19–1.52, p=0.24) (Figure 3). Similarly, no significant difference was found when considering blood pressure assessment at 10 days postpartum (90.4 % vs. 70.1 % RR 1.34 95 % CI 0.72–2.48 p=0.35). No

Table 1: Characteristic of the included studies.

	Hirshberg et al. (2018)	Arkerson et al. (2023)	Cairns et al. (2018)	Kitt et al. (2023)
Location	United States	United States	England, UK	England, UK
Type of study	Single center RCT	Multicenter RCT	Multicenter RCT	Single center RCT
Time frame	August 2016–January 2017	April 2021–September 2021	April 2015–April 2016	February 2020–November 2021
Intervention	Text based surveillance of self-assessed blood pressure.	Remote blood pressure monitoring using a home blood pressure cuff and smartphone application (app).	Daily self-monitoring transmitted via text message or the internet by the app	Daily self-monitored blood pressure measurements through a smartphone app that transmitted data to secure NHS-hosted, web-based platform
Control	Follow-up at the location of their prenatal care 4–6 days post discharge from the hospital for a nursing blood pressure visit	In-office blood pressure check within 10 days of discharge	BP monitored by community midwife and antihypertensive medication adjusted by a general practitioner	Blood pressure review in a minimum of 7–10 days with a community midwife, and a 6–8 week review with their general practitioner
Inclusion criteria	Postpartum individuals with gestational hypertension, pre-eclampsia, chronic hypertension with superimposed pre-eclampsia or HELLP syndrome based on ACOG criteria	Postpartum individuals with gestational hypertension, pre-eclampsia, chronic hypertension with superimposed pre-eclampsia based on ACOG criteria	Postpartum individuals aged ≥18 years, with gestational hypertension or preeclampsia requiring antihypertensive treatment	Postpartum individuals aged ≥18 years, with a clinician-confirmed diagnosis of either gestational hypertension or preeclampsia, still requiring anti-hypertensives at hospital discharge
Exclusion criteria	– Women readmitted for postpartum hypertension – Younger than 18 – Not English speaking – Did not have cellphone with unlimited texting ability	– BMI >50 kg/m^2 – Younger than 18 – Not English speaking – Did not have cellphone with unlimited texting ability	– Prescription of >3 antihypertensive medications – Self report of hypertension diagnose outside of pregnancy – Not English speaking	– Hypertension before pregnancy – Medical conditions that made self-monitoring impractical orunsafe, (e.g., severe postpartum anxiety or depression) unable to follow the English app-based instructions – Unable to provide written consent
Primary outcome(s)	– Ascertainment of any blood pressure within 10 days postpartum	– Ascertainment of any blood pressure within 10 days postpartum	– Feasibility: specifically recruitment, retention, and compliance with follow-up rates.	– 24 h mean diastolic blood pressure, measured by an ambulatory blood pressure monitor at visit 4 (6–9 months postpartum)
Secondary outcomes	– Initiation of antihypertensive medication, – Number of additional postpartum office or emergency room visits – Readmission for persistent hypertension – Attendance of the 4–6 week postpartum visit, – Patient satisfaction with blood pressure surveillance	– Rates of initiation or up titration of antihypertensive medications, – Unscheduled outpatient or obstetric triage visits for hypertension, – Readmission for hypertension – Attending standard postpartum follow-up 6–8 weeks after delivery.	– Mean SBP, DBP, and mean arterial pressure, – Postnatal readmission – Safety data, – Side effects, – Quality of life scores	– 24 h, diurnal, and nocturnal ambulatory blood pressure parameters at visit 4, – Clinic blood pressure at visits 2, 3, and 4 – Transthoracic echocardiography at baseline and visit 4 – Cardiovascular MRI assessment of cardiac structure at visit 4.

significant difference was also found in the 4–6 weeks postpartum visit attendance rate (82.6 % vs. 75.9 % RR 1.06 95 % CI 0.98, 1.14 p=0.17). Emergency department visit rate differed significantly among the two groups (9.0 % vs. 4.4 % RR 2.04 95 % CI 1.01, 4.09 p=0.05) (Figure 4). No included RCT provided data on the following secondary outcomes: stroke, eclampsia, ICU admission, maternal death and pulmonary oedema.

Discussion

Summary of main findings

The present meta-analysis synthesized evidence from four randomized controlled trials (RCTs) investigating the efficacy of remote blood pressure monitoring vs. standard postpartum care in individuals with hypertensive disorders of pregnancy

Table 2: Baseline social characteristics (intervention vs. control).

	n	White	AA	Asian	Hispanic	Other	Priv insurance	Medicaid
Hirshberg 2018	103 vs. 103	28/103 *(27.2)* **vs.** 25/103 *(24.3)*	68/103 *(66.0)* vs. 73/103 *(70.9)*	2/103 *(1.9)* vs. 4/103 *(3.9)*	NM	5/103 *(4.8)* vs. 1/103 *(1.0)*	44/103 *(42.7)* vs. 42/103 *(40.8)*	59/103 *(57.3)* vs. 61/103 *(59.2)*
Arkerson 2023	96 vs. 101	56/96 *(58.3)* **vs.** 59/101 *(58.4)*	28/96 *(29.2)* vs. 34/101 *(33.7)*	0/96 *(0)* vs. 3/101 *(3)*	11/96 *(11.5)* vs. 4/101 *(4 %)*	1/96 *(1)* vs. 1/101 *(1)*	NM	NM
Cairns 2018	45 vs. 46	41/45 *(91.1)* **vs.** 43/46 *(93.4)*	1/45 *(2)* vs. 1/46 *(2)*	3/45 *(6.6)* vs. 2/46 *(4.3)*	NM	NM	NM	NM
Kitt 2023	112 vs. 108	92/112 *(82.1)* **vs.** 88/108 *(81.5)*	6/112 *(5.4)* vs. 4/108 *(3.7)*	10/112 *(8.9)* vs. 8/108 *(7.4)*	4/112 *(3.6)* vs. 5/108 *(4.6)*	0/112 *(0)* vs. 3/108 *(2.8)*	NM	NM
Totals	**356 vs. 358**	**217/356 *(60.1)* vs. 215/358 *(60.0)***	**103/356 *(28.9)* vs. 112/358 *(31.3)***	**15/356 *(4.2)* vs. 17/358 *(4.7)***	**15/208 *(7.2)* vs. 9/209 *(4.3)***	**6/308 *(1.9)* vs. 5/312 *(1.6)***	**44/103 *(42.7)* vs. 42/103 *(40.8)***	**59/103 *(57.3)* vs. 61/103 *(59.2)***
Chi square p values	NA	0.06 p=0.8	0.47 p=0.4	0.11 p=0.7	1.60 p=0.2	0.10 p=0.74	NA	NA

AA, African American; NM, not mentioned; NA, not available; percentage in italic; totals in bold.

Table 3: Baseline characteristics.

	Age	Tobacco	Chronic HTN	BMI	DM1	DM2	PGDM	GDM	CKD
Hirshberg 2018	NM	5/103 *(4.9)* vs. 5/103 *(4.9)*	14/103 *(13.6)* vs. 13/103 *(12.6)*	NA	NM	NM	5/103 *(4.8)* vs. 3/103 *(2.9)*	6/103 *(5.8)* vs. 8/103 *(7.8)*	5/103 *(4.9)* vs. 5/103 *(4.9)*
Arkerson 2023	NM	12/96 *(12.5)* vs. 13/101 *(13)*	17/96 *(17.7)* vs. 26/101 *(26.0)*	NM	1/96 *(1.0)* vs. 2/101 *(2.0)*	5/96 *(5.2)* vs. 2/101 *(2.0)*	6/96 *(6.2)* vs. 4/101 *(4.0)*	20/96 *(20.8)* vs. 10/101 *(9.9)*	11/96 *(11.6)* vs. 11/101 *(10.9)*
Cairns 2018	31.7 *(±5.3)* vs. 31.7 *(±5.3)*	NM	NM	28.0 *(±8.3)* vs. 29.0 *(±7.5)*	NM	NM	NM	NM	NM
Kitt 2023	33.4 *(±5.1)* vs. 32.6 *(±5.0)*	25/112 *(22)* vs. 28/108 *(26)*	NM	28.1 (±5.1) vs. 28 (±7.6)	NM	NM	NM	NM	NM
Totals	**NA**	**42/311 *(13.5)* vs. 43/312 *(13.8)***	**31/199 *(15.6)* vs. 39/204 *(19.1)***	**NA**	**1/96 *(1.0)* vs. 2/101 *(2.0)***	**5/96 *(5.2)* vs. 2/101 *(2.0)***	**11/199 *(5.5)* vs. 7/204 *(3.4)***	**26/199 *(13.0)* vs. 18/204 *(8.8)***	**16/199 *(8.0)* vs. 16/204 *(7.8)***
Chi square/MD p values	MD 0.58 (−0.56, 1.72) p=0.32	0.01 p=0.92	0.88 p=0.34	MD-0.14 (−1.7, 1.4)	NA	NA	1.03 p=0.308	1.86 p=0.17	0.005 p=0.94

HTN, hypertension; BMI, body mass index; DM1, diabetes mellitus type 1; DM2, diabetes mellitus type 2; PGDM, pregestational diabetes mellitus; GDM, gestational diabetes mellitus; CKD, chronic kidney disease. Percentage in italic; totals in bold.

Table 4: Baseline characteristics relative to hypertensive status.

	GHTN	GHTN/PE	SI-PEC	PE	PESF	HELLP	ECLAMPSIA	FGR
Hirshberg 2018	NM	63/103 (*61.2*) vs. 68/103 (*66.0*)	14/103 (*13.6*) vs. 10/103 (*9.7*)	NM	25/103 (*24.3*) vs. 22/103 (*21.4*)	0/103 (*0.0*) vs. 3/103 (*2.9*)	1/103 (*1.0*) vs. 0/103 (*0.0*)	NM
Arkerson 2023	42/96 (*43.8*) vs. 37/101 (*36.6*)	NM	NM	7/96 (*7.3*) vs. 15/101 (*14.9*)	43/96 (*44.8*) vs. 48/101 (*47.5*)	2/96 (*2.1*) vs. 0/101 (*0*)	2/96 (*2.1*) vs. 1/101 (*1*)	NM
Cairns 2018	20/45 (*44.4*) vs. 22/46 (*47.8*)	NM	NM	25/45 (*55.6*) vs. 24/46 (*52.2*)	NM	NM	NM	12/45 (*26.7*) vs. 15/46 (*32.6*)
Kitt 2023	44/112 (*39.3*) vs. 43/108 (*39.8*)	NM	NM	68/112 (*60.7*) vs. 65/108 (*60.2*)	NM	5/112 (*4.5*) vs. 1/108 (*0.9*)	NM	25/112 (*22.3*) vs. 28/108 (*25.9*)
Totals	**106/253 (*41.9*) vs. 103/255 (*40.4*)**	63/103 (*61.2*) vs. 68/103 (*66.0*)	14/103 (*13.6*) vs. 10/103 (*9.7*)	**100/253 (*39.5*) vs. 104/255 (*40.7*)**	**68/199 (*34.2*) vs. 70/204 (*34.3*)**	**7/311 (*2.25*) vs. 4/312 (*1.3*)**	**3/199 (*1.5*) vs. 1/204 (*0.5*)**	**37/157 (*23.6*) vs. 43/154 (*27.9*)**
Chi square	0.11	NA	NA	0.08	0.0009	0.84	1.06	2.27
p values	p=0.7			p=0.8	p=0.9	p=0.36	p=0.30	p=0.09

GHTN, gestational hypertension; PE, preeclampsia; SI-PE, superimposed preeclampsia; PESF, preeclampsia with severe features; FGR, fetal growth restriction. Percentage in italic; totals in bold.

(HDP). Overall, the analysis revealed no significant difference in the rate of hospital readmissions for hypertensive-related causes between the telemonitoring group and the standard care group. Additionally, there was no significant disparity in the attendance rate at the 4–6 weeks postpartum visit or in the rate of blood pressure assessment at 10 days postpartum between the two groups. Notably, a higher rate of emergency department visits was observed in the telemonitoring group compared to standard care.

Comparison with existing literature

Our findings contribute to the evolving body of literature surrounding postpartum hypertension management strategies. While prior studies have explored the efficacy of remote blood pressure monitoring in diverse clinical contexts, including essential hypertension management and chronic disease surveillance [27, 28], our meta-analysis uniquely focuses on its application in the postpartum period specifically for individuals with hypertensive disorders of pregnancy.

Recently, Hirshberg et al. [29] in a retrospective study found that patients enrolled in a remote blood pressure monitoring program were less likely to be readmitted for hypertensive related cause thus resulting in lower postpartum total medical costs compared with both control cohorts. These findings are in contrast with the RCT [23] on the topic published by the same author were no differences were proven in terms of postpartum readmission, consistently with the finding of the present metanalysis.

However, the absence of statistically significant reductions in hospital readmissions and the absence of data on improvements in postpartum visit attendance rates with remote monitoring underscores the ambiguity surrounding its efficacy. By offering an alternative to routine in-person assessments, telemonitoring enables healthcare providers to maintain regular contact with patients, to give continuity and support during the critical postpartum period and might enhance healthcare access, particularly for individuals facing logistical barriers or geographical difficulties. Despite its potential, remote monitoring of blood pressure via telehealth failed to demonstrate a clear advantage over traditional care practices, and its broader implications remain uncertain. While it's tempting to view telemonitoring as a solution to logistical barriers, the reality is far from clear-cut, and further scrutiny is warranted.

Strengths and limitations

Strengths of this meta-analysis include the rigorous search strategy, adherence to established protocols for systematic

Table 5: Primary and secondary outcomes.

	Readmission	ED visit	BP assessment 10 days	PP visit (4–6 weeks) attendance rate
Hirshberg 2018	0/103 (0.0) vs. 4/103 (3.9)	3/103 (2.9) vs. 2/103 (1.9)	95/103 (92.2) vs. 45/103 (43.7)	71/103 (68.9) vs. 60/103 (58.2)
Arkerson 2023	4/96 (4.2) vs. 5/101 (5.0)	12/96 (12.5) vs. 5/101 (5.0)	88/96 (91.7) vs. 59/101 (58.4)	75/96 (78.1) vs. 71/101 (70.3)
Cairns 2018	7/45 (15.5) vs. 4/45 (88.9)	7/45 (15.5) vs. 4/45 (88.9)	41/45 (91.2) vs. 42/45 (93.3)	41/45 (91.2) vs. 42/45 (93.3)
Kitt 2023	8/112 (7.14) vs. 29/108 (26.7)	NA	111/112 (99.1) vs. 106/108 (98.1)	107/112 (95.5) vs. 98/108 (90.7)
Totals	**19/359 (5.33) vs. 42/357 (11.76)**	**22/244 (9.0) vs. 11/249 (4.4)**	**335/356 (90.4) vs. 525/357 (70.1)**	**294/356 (82.6) vs. 271/357 (75.9)**
(p; RR 95 % CI)	0.24; 0.55 (0.19, 1.52)	**0.05; 2.04 (1.01, 4.09)**	0.35; 1.34 (0.72, 2.48)	0.17; 1.06 (0.98, 1.14)

BP, blood pressure; ED, emergency department; PP, postpartum. Percentage in italic; totals in bold.

review, and comprehensive assessment of study quality using the Cochrane Collaboration's Risk of Bias Tool. The inclusion of only RCTs enhances the robustness of the findings by minimizing bias and confounding factors. Additionally, TRACT analysis was performed to evaluate the trustworthiness of the included trials, providing further insights into the reliability of the evidence.

However, several limitations should be acknowledged. First, the relatively small number of included studies and participants may have limited the statistical power to detect significant differences in certain outcomes. Second, variations in study design, participant characteristics, and intervention protocols across the included trials may have introduced heterogeneity, potentially influencing the pooled estimates. Third, a limitation of this meta-analysis is also the heterogeneity in the primary outcomes of the included studies. While our analysis focuses on hospital readmission and emergency department visits, none of the studies selected shared this as their predefined primary outcome. Instead, these outcomes were often reported as secondary or exploratory findings. This could introduce variability in study design and reporting. Fourth, the absence of detailed data on the severity and outcomes of emergency visits also represents a limitation. Future studies should explore whether telehealth's increased emergency visit rates serve as a substitute for inpatient care by managing complications more effectively in outpatient settings.

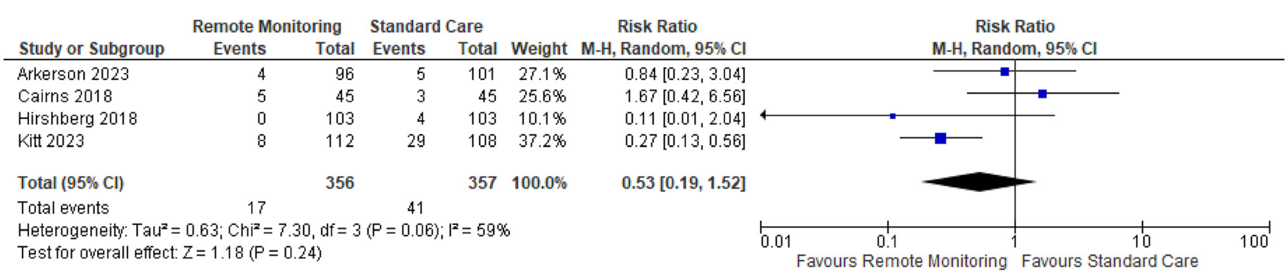

Figure 3: Forest plot for the rate of readmission.

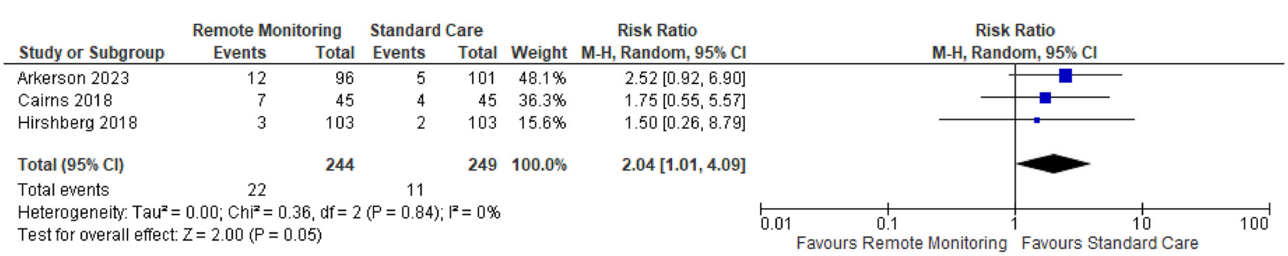

Figure 4: Forest plot for the rate of emergency department visits.

Fifth, only one study [26] provided data on outpatient adjustments to antihypertensive regimens or other clinical interventions aimed at lowering blood pressure and preventing adverse outcomes and the absence of detailed reporting on clinician responses to elevated blood pressure detected through remote monitoring represents a limitation. Furthermore, the lack of data on secondary outcomes, such as stroke, eclampsia, and maternal death, restricts the comprehensiveness of the analysis.

Future developments

Large-scale multicenter RCTs with standardized protocols are needed to provide more robust evidence regarding the effectiveness of remote blood pressure monitoring in postpartum HDP management. Moreover, investigations into the impact of telemonitoring on short term outcome prevention as well as long-term maternal outcomes, including cardiovascular health and quality of life, are warranted. Additionally, efforts to optimize telehealth platforms and enhance patient engagement are essential for maximizing the potential benefits of remote monitoring in clinical practice. Until then, caution must be exercised in adopting remote monitoring as a panacea for postpartum HDP management.

Conclusions

To date, remote blood pressure monitoring is not superior to standard care to prevent hypertensive related readmission and increases emergency department visits.

Highlights

- Remote monitoring of blood pressure in the postpartum period does not reduce the risk of hypertensive-related readmission, compared with standard care.
- Among patients allocated in the telemonitoring of blood pressure, there was an increased likelihood of emergency department visit.
- No included RCT provided data on maternal secondary outcome like pulmonary edema, stroke, maternal death and ICU admission.

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Informed consent: Not applicable.
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