OBSTETRICS & GYNECOLOGY

NOTICE: This document contains correspondence generated during peer review and subsequent revisions but before transmittal to production for composition and copyediting:

- Comments from the reviewers and editors (email to author requesting revisions)
- Response from the author (cover letter submitted with revised manuscript)*

**The corresponding author has opted to make this information publicly available.*

Personal or nonessential information may be redacted at the editor's discretion.

Questions about these materials may be directed to the *Obstetrics & Gynecology* editorial office: obgyn@greenjournal.org.

Date: Jun 21, 2019
To: "Alisse Hauspurg" [redacted]
From: "The Green Journal" em@greenjournal.org
Subject: Your Submission ONG-19-931

RE: Manuscript Number ONG-19-931

Description of a postpartum remote monitoring hypertension protocol implemented at a hospital system level

Dear Dr. Hauspurg:

Your manuscript has been reviewed by the Editorial Board and by special expert referees. Although it is judged not acceptable for publication in Obstetrics & Gynecology in its present form, we would be willing to give further consideration to a revised version.

If you wish to consider revising your manuscript, you will first need to study carefully the enclosed reports submitted by the referees and editors. Each point raised requires a response, by either revising your manuscript or making a clear and convincing argument as to why no revision is needed. To facilitate our review, we prefer that the cover letter include the comments made by the reviewers and the editor followed by your response. The revised manuscript should indicate the position of all changes made. We suggest that you use the "track changes" feature in your word processing software to do so (rather than strikethrough or underline formatting).

Your paper will be maintained in active status for 21 days from the date of this letter. If we have not heard from you by Jul 12, 2019, we will assume you wish to withdraw the manuscript from further consideration.

REVIEWER COMMENTS:

Reviewer #1: Overall: This paper describes the system wide implementation of a nursing call center driven blood pressure management and treatment algorithm to improve the quality of post-partum care in women with hypertensive disorders. The goal was to evaluate feasibility of, acceptability of and compliance with protocol.

Other:
Conflicts of interest: The authors report no conflicts of interest. There is no mention of a funding source.

Abstract:
1. May be slightly over the 300 word limit for abstracts but is representative of the paper.

Title:
2. A suggestion - "a remote hypertension monitoring protocol" may be more descriptive than " a remote monitoring hypertension protocol". Also the title does not reflect that this is an initiative to improve healthcare.

Introduction:

3. The purpose of the study is clearly stated. A careful argument is constructed to speak to the relevance of the topic and the approach used to address the problem identified. This section might be strengthened by further characterizing the link between maternal mortality and hypertensive disorders in pregnancy. The Say, Chou, Gemmill et. al. reference may be of use (see reference section). Their systematic review noted that 14% of global maternal deaths were due to hypertensive disorders.

Methods:

4. Line 107: Please clarify - is the Vivify Health remote system a system that the author's institution developed or is it a proprietary platform that the institution purchased access to?

5. Lines 120-121: Please clarify how the "bring your own blood pressure device" approach is operationalized when enrollment doesn't occur until the patient is in-house (i.e. are the patients told before hospitalization that they should arrange to have a BP device available while they are in the hospital?).

6. Lines 146-147: What is the maximum time period post completion of the program that the acceptability assessment can be completed?

7. There is no mention of an IRB review for approval or exemption for this project.

8. The article type is listed as Clinical Practice and Quality. If it to be consider a QA paper then it should follow the required format. Quality assessment studies should use elements in the SQUIRE 2.0 reporting guidelines. No completed checklist was submitted.

Results:

9. Patient needed to have access to a text message-enabled smartphone. Can the authors comment on how many patients in their setting, during this timeframe did not meet this requirement and would not be eligible for this protocol?

10. Lines 167-169: The participants add up to 413 - were the categories not mutually exclusive?

11. Lines 172-173: What was the primary reason(s) for postpartum hospital readmission in this cohort?

12. Lines 174-175: Over 40% of the cohort did not require meet criteria for an in office BP check at 1 week. Were most of these patients from the no medication arm?

13. Twenty-one percent of the cohort established care with PCP postpartum. This seems like a low percentage. It isn't until the discussion section that we learn that the 21% were seen with the 42 day post-partum period and that an additional 42% have a schedule upcoming appointment with their PCP.

14. Line 185: Only 61% of the cohort completed the satisfaction survey. Can the authors describe in the methods section the approaches they used to administer these surveys?

Discussion:

15. The authors discuss how a system wide change in clinical practice was feasible in their healthcare setting. They describe improved compliance with visits and use of medication in a high risk postpartum group. They point out important secondary findings regarding titration of blood pressure medications. They discuss patient satisfaction with the new system. They compare their results with that of other publications.

16. The authors briefly touch on limitations and generalizability.

References:

17. This review article may be a reference of interest:

Curr Hypertens Rep. 2018 Oct 25;20(12):101. doi: 10.1007/s11906-018-0901-z.
Out of Office Blood Pressure Measurement in Pregnancy and the Postpartum Period.
Bello NA1,2, Miller E3, Cleary K4, Wapner R4, Shimbo D5, Tita AT6.

Also the following:

Lancet Glob Health. 2014 Jun;2(6):e323-33. doi: 10.1016/S2214-109X(14)70227-X. Epub 2014 May 5.
Global causes of maternal death: a WHO systematic analysis.
Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J4, Gülmezoglu AM, Temmerman M, Alkema L.

TABLES and FIGURES:

18. Table 2: Difficult to read as the line numbers overlap with the result column.

19: It might be useful to include a table that describes outcomes by the 2 study arms: medication group, non medication group.

Reviewer #2: Dr. Hauspurg and colleagues present a description of a ongoing quality improvement project utilizing a remote blood pressure monitoring protocol to evaluate postpartum blood pressures in women with hypertension and hypertensive disorders of pregnancy after hospital discharge. Improved attention to postpartum care and follow-up, particularly in those with complications of pregnancy, is currently a focus in contemporary obstetrics.

My questions and comments for the authors are as follow:

1. It is stated that after identification of a patient with chronic hypertension or a hypertensive disorder of pregnancy and verification that the patient had a text-messaging enabled smartphone device that the patient was enrolled in the program. Between 2/2018 and 1/2019 499 patients were enrolled. Were all "eligible" patients enrolled? Were they given a choice? If

so, how many of the eligible patients enrolled and how many turned down enrollment? How many patients with hypertensive disorders did not have reliable access to a text-messaging enabled smartphone device and therefore not able to be enrolled?

The answers to these questions are important because if this was a self-selected population of those who were motivated to enroll then compliance, retention and satisfaction with the program (primary outcomes) likely would be significantly biased to the positive side.

2. It is noted that the majority of the patients enrolled were privately insured (67%). In some parts of the country the majority of those with hypertensive disorders in pregnancy are not privately insured and many may not have reliable, continuous access to a text-message based smartphone device. Therefore, there should be some discussion/disclaimer with regard to limitations of possible applicability of the study findings to a large portion of the at risk population in the United States.

3. It is noted that "anti-hypertensive agents are titrated through an algorithm protocol by the call center nurses." It is stated that this algorithm is "consistent with national guidelines on hypertension management postpartum." What national guidelines are these? It might be prudent to include a copy of this protocol at least as a supplemental appendix online. This is important as a recent review notes that there is "insufficient evidence to recommend a particular BP threshold, agent or model of care" for management of postpartum hypertension (Cairns AE, Pealing L, Duffy JMN, Roberts N, et al, Postpartum management of hypertensive disorders of pregnancy: a systematic review. BMJ Open 2017 Nov 28;7(11):e018696. doi: 10.1136/bmjopen-2017-018696).

4. It is stated that of the cohort in this study 15% had a postpartum readmission. Do the authors have any historical data on postpartum readmission rates at their institution for those with hypertension and hypertensive disorders of pregnancy? In other words, is there evidence that there might be either an increase or decrease in postpartum readmissions in those enrolled in this remote blood pressure monitoring program?

5. The authors state that 89% of the women enrolled in the program "attended a six week postpartum visit, compared to a historical background rate of 50% attendance at postpartum visits at our institution among a similar population." What constitutes a "similar population?" Is the comparison with women with hypertension or hypertensive disorders of pregnancy with the same ethnic makeup and same proportion with private insurance as the cohort in this study, or some other more general population? This also goes back to the question about whether this cohort was essentially a self-selected (motivated) cohort or not.

6. The authors state that this study "details the use of an innovative method to improve postpartum hypertension care and patient engagement." How is this "innovative" relative to other cited studies? One of the cited studies was very similar in that it was a prospective single-cohort feasibility study using telehealth for remote blood pressure monitoring (reference 13 in this paper). Another was similar but actually randomized with remote monitoring and text based messaging compared with traditional in office evaluation (reference 12 in the paper). What distinguishes this study from these prior reports?

Reviewer #3:
This study evaluated the feasibility, acceptability and compliance with a remote blood pressuring monitoring protocol implemented in the community as a quality improvement measure. The data presented here are part of this ongoing improvement programme. 499 women were enrolled into the programme between February 2018 and January 2019 and from this cohort, 409 are reported in this manuscript. Of this number, 168 had gestational hypertension, 192 had pre-eclampsia without a prior hypertension and 53 had pre-eclampsia superimposed on chronic hypertension. Anti-hypertensive treatment was initiated in 42% (171) women. 340 983%) continued the programme beyond 4 weeks and 364 (89%) attended the six-week postnatal follow-up visit. The authors conclude that this initial analysis shows a high compliance, retention and patient satisfaction but caution that further studies are needed to address how best to implement these protocols into clinical practice to maximise benefit in a broader population of women.

This is a very interesting study which supports the long-held view that care is best accepted when delivered at home or close to home and furthermore that technology should be used to improve care closer to home. The very positive message here is the number of women who were seen at the 6 weeks face-to-face postnatal follow-up.

There are minor comments on this study and these include:

1. I would suggest rewording "exacerbation of hypertension was noted between days 3-6 postpartum". The question is, does the postpartum period actually exacerbate hypertension?

2. With regards to the ACOG recommendation on checking blood pressure on days 3-10 - is this a one-off check or repeated checks? The impression from line 81 is that it's a one-off check.

3. I will suggest s sentence or two on how these patients BP are currently managed post-delivery as not everyone is familiar with your model of care.

4. What was the eligibility criteria for enrolment into the study? (line 111)

5. Who and where are the manufacturers of the "Drive automatic upper arm blood pressure monitor"?- line 123

6. Its not clear how engagement was measured other than retention and compliance? Was there another measure for this? I am not sure continuing with the programme is a surrogate for being engaged.

7. How do the numbers of those who started anti-hypertensive treatment compare to published data? Did this reduce the numbers? This would be a real advantage of this model of care

8. There are minor grammatical errors that should be corrected

9. The references are not in keeping with the style for the journal. Perhaps the authors can have a look at the instructions for authors for details.

STATISTICAL EDITOR'S COMMENTS:

1. lines 122-123: Should give more detail on how the device BP was compared to nurses' recording or some other method of validating the at home device.

2. lines 147-149, 185-191 and Suppl Table 1: The methods cites a Likert scale response to the 9 questions. The Results should include more detail regarding all the questions in the Likert format. Should consider including as a Table in the main text.

3. Table 1: Please re-check the %s. For instance, 305/409 = 74.6%;87/409=21.3%;45/402=11.2%

4. Table 2: Also, re-check the %s. 164/402=40.8%.

5. Fig 1: Would be useful to summarize the empiric results of proportions entering the various pathways.

6. Fig 2: Since the total "N" was ~ 400, should round the %s to nearest 0.1%, the data do not support precision to nearest 0.01%.

EDITORIAL OFFICE COMMENTS:

1. The Editors of Obstetrics & Gynecology are seeking to increase transparency around its peer-review process, in line with efforts to do so in international biomedical peer review publishing. If your article is accepted, we will be posting this revision letter as supplemental digital content to the published article online. Additionally, unless you choose to opt out, we will also be including your point-by-point response to the revision letter. If you opt out of including your response, only the revision letter will be posted. Please reply to this letter with one of two responses:
A. OPT-IN: Yes, please publish my point-by-point response letter.
B. OPT-OUT: No, please do not publish my point-by-point response letter.

2. As of December 17, 2018, Obstetrics & Gynecology has implemented an "electronic Copyright Transfer Agreement" (eCTA) and will no longer be collecting author agreement forms. When you are ready to revise your manuscript, you will be prompted in Editorial Manager (EM) to click on "Revise Submission." Doing so will launch the resubmission process, and you will be walked through the various questions that comprise the eCTA. Each of your coauthors will receive an email from the system requesting that they review and electronically sign the eCTA.

Any author agreement forms previously submitted will be superseded by the eCTA. During the resubmission process, you are welcome to remove these PDFs from EM. However, if you prefer, we can remove them for you after submission.

3. Our journal requires that all evidence-based research submissions be accompanied by a transparency declaration statement from the manuscript's lead author. The statement is as follows: "The lead author* affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained." *The manuscript's guarantor.

If you are the lead author, please include this statement in your cover letter. If the lead author is a different person, please ask him/her to submit the signed transparency declaration to you. This document may be uploaded with your submission in Editorial Manager.

4. Responsible reporting of research studies, which includes a complete, transparent, accurate and timely account of what was done and what was found during a research study, is an integral part of good research and publication practice and

not an optional extra. Obstetrics & Gynecology supports initiatives aimed at improving the reporting of health research, and we ask authors to follow specific guidelines for reporting randomized controlled trials (ie, CONSORT), observational studies (ie, STROBE), meta-analyses and systematic reviews of randomized controlled trials (ie, PRISMA), harms in systematic reviews (ie, PRISMA for harms), studies of diagnostic accuracy (ie, STARD), meta-analyses and systematic reviews of observational studies (ie, MOOSE), economic evaluations of health interventions (ie, CHEERS), quality improvement in health care studies (ie, SQUIRE 2.0), and studies reporting results of Internet e-surveys (CHERRIES). Include the appropriate checklist for your manuscript type upon submission. Please write or insert the page numbers where each item appears in the margin of the checklist. Further information and links to the checklists are available at http://ong.editorialmanager.com. In your cover letter, be sure to indicate that you have followed the CONSORT, MOOSE, PRISMA, PRISMA for harms, STARD, STROBE, CHEERS, SQUIRE 2.0, or CHERRIES guidelines, as appropriate.

5. Standard obstetric and gynecology data definitions have been developed through the reVITALize initiative, which was convened by the American College of Obstetricians and Gynecologists and the members of the Women's Health Registry Alliance. Obstetrics & Gynecology has adopted the use of the reVITALize definitions. Please access the obstetric and gynecology data definitions at https://www.acog.org/About-ACOG/ACOG-Departments/Patient-Safety-and-Quality-Improvement/reVITALize. If use of the reVITALize definitions is problematic, please discuss this in your point-by-point response to this letter.

6. Because of space limitations, it is important that your revised manuscript adhere to the following length restrictions by manuscript type: Original Research reports should not exceed 22 typed, double-spaced pages (5,500 words). Stated page limits include all numbered pages in a manuscript (i.e., title page, précis, abstract, text, tables, boxes, figure legends, and print appendixes) but exclude references.

7. Titles in Obstetrics & Gynecology are limited to 100 characters (including spaces). Do not structure the title as a declarative statement or a question. Introductory phrases such as "A study of..." or "Comprehensive investigations into..." or "A discussion of..." should be avoided in titles. Abbreviations, jargon, trade names, formulas, and obsolete terminology also should not be used in the title. Titles should include "A Randomized Controlled Trial," "A Meta-Analysis," or "A Systematic Review," as appropriate, in a subtitle. Otherwise, do not specify the type of manuscript in the title.

8. Specific rules govern the use of acknowledgments in the journal. Please note the following guidelines:

* All financial support of the study must be acknowledged.
* Any and all manuscript preparation assistance, including but not limited to topic development, data collection, analysis, writing, or editorial assistance, must be disclosed in the acknowledgments. Such acknowledgments must identify the entities that provided and paid for this assistance, whether directly or indirectly.
* All persons who contributed to the work reported in the manuscript, but not sufficiently to be authors, must be acknowledged. Written permission must be obtained from all individuals named in the acknowledgments, as readers may infer their endorsement of the data and conclusions. Please note that your response in the journal's electronic author form verifies that permission has been obtained from all named persons.
* If all or part of the paper was presented at the Annual Clinical and Scientific Meeting of the American College of Obstetricians and Gynecologists or at any other organizational meeting, that presentation should be noted (include the exact dates and location of the meeting).

9. The most common deficiency in revised manuscripts involves the abstract. Be sure there are no inconsistencies between the Abstract and the manuscript, and that the Abstract has a clear conclusion statement based on the results found in the paper. Make sure that the abstract does not contain information that does not appear in the body text. If you submit a revision, please check the abstract carefully.

In addition, the abstract length should follow journal guidelines. The word limits for different article types are as follows: Original Research articles, 300 words. Please provide a word count.

11. Only standard abbreviations and acronyms are allowed. A selected list is available online at http://edmgr.ovid.com/ong/accounts/abbreviations.pdf. Abbreviations and acronyms cannot be used in the title or précis. Abbreviations and acronyms must be spelled out the first time they are used in the abstract and again in the body of the manuscript.

12. The journal does not use the virgule symbol (/) in sentences with words. Please rephrase your text to avoid using "and/or," or similar constructions throughout the text. You may retain this symbol if you are using it to express data or a measurement.

13. Please review the journal's Table Checklist to make sure that your tables conform to journal style. The Table Checklist is available online here: http://edmgr.ovid.com/ong/accounts/table_checklist.pdf.

14. Authors whose manuscripts have been accepted for publication have the option to pay an article processing charge and publish open access. With this choice, articles are made freely available online immediately upon publication. An information sheet is available at http://links.lww.com/LWW-ES/A48. The cost for publishing an article as open access can be found at http://edmgr.ovid.com/acd/accounts/ifauth.htm.

Please note that if your article is accepted, you will receive an email from the editorial office asking you to choose a

publication route (traditional or open access). Please keep an eye out for that future email and be sure to respond to it promptly.

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If you choose to revise your manuscript, please submit your revision via Editorial Manager for Obstetrics & Gynecology at http://ong.editorialmanager.com. It is essential that your cover letter list point-by-point the changes made in response to each criticism. Also, please save and submit your manuscript in a word processing format such as Microsoft Word.

If you submit a revision, we will assume that it has been developed in consultation with your co-authors and that each author has given approval to the final form of the revision.

Again, your paper will be maintained in active status for 21 days from the date of this letter. If we have not heard from you by Jul 12, 2019, we will assume you wish to withdraw the manuscript from further consideration.

Sincerely,

The Editors of Obstetrics & Gynecology

2017 IMPACT FACTOR: 4.982
2017 IMPACT FACTOR RANKING: 5th out of 82 ob/gyn journals

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MAGEE-WOMENS RESEARCH INSTITUTE

June 29, 2019

Dear Dr. Chescheir,

Thank you for your consideration of our manuscript, “Description of a postpartum remote hypertension monitoring protocol implemented at a hospital system level” for consideration for publication in *Obstetrics and Gynecology.*

We have carefully reviewed the comments provided by the reviewers and addressed them as outlined below.

Our responses appear in bold with underlining to signify the text that has been added to the manuscript.

The lead author affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Thank you in advance for your consideration of our manuscript for publication.

Sincerely,

Alisse Hauspurg, MD
[redacted]

REVIEWER COMMENTS:

Reviewer #1:

Abstract:

1. May be slightly over the 300 word limit for abstracts but is representative of the paper.

Thank you, we have shortened the abstract to 300 words.

Title:

2. A suggestion - "a remote hypertension monitoring protocol" may be more descriptive than " a remote monitoring hypertension protocol". Also the title does not reflect that this is an initiative to improve healthcare.

Thank you, we have updated the title based on the reviewers suggestion to: "Description of a postpartum remote hypertension monitoring protocol implemented at a hospital system level"

Introduction:

3. The purpose of the study is clearly stated. A careful argument is constructed to speak to the relevance of the topic and the approach used to address the problem identified. This section might be strengthened by further characterizing the link between maternal mortality and hypertensive disorders in pregnancy. The Say, Chou, Gemmill et. al. reference may be of use (see reference section). Their systematic review noted that 14% of global maternal deaths were due to hypertensive disorders.

Thank you, we have added to our introduction section to reflect this suggestion with the following sentences: Hypertension complicates 10-20% of pregnancies in the United States and is a significant contributor to maternal deaths worldwide, with 14% of global maternal mortality directly related to hypertension.

Methods:

4. Line 107: Please clarify - is the Vivify Health remote system a system that the author's institution developed or is it a proprietary platform that the institution purchased access to?

Thank you for this question. The UPMC health system created a remote patient monitoring platform that leveraged Vivify Health® as its core vendor. This sentence has been added to the text to clarify: The UPMC health system created a remote patient monitoring platform that leveraged Vivify Health® as its core vendor. The monitoring platform was integrated with electronic health records for both ordering and results, and it was able to increase education, engagement, and monitor blood pressures in the postpartum period at our institution.

5. Lines 120-121: Please clarify how the "bring your own blood pressure device" approach is operationalized when enrollment doesn't occur until the patient is in-house (i.e. are the patients told before hospitalization that they should arrange to have a BP device available while they are in the hospital?).

Thank you for this comment. The "bring your own device" refers more to the patient using their own device. The system can be set up while the patient is in the hospital without access to the individual blood pressure cuff. If women do not have access to a blood pressure cuff, then the hospital will provide one for them.

6. Lines 146-147: What is the maximum time period post completion of the program that the acceptability assessment can be completed?
The acceptability assessment is currently sent out on day 35 of the program. Women are prompted to complete it each remaining day of the program. They are not sent the survey beyond the 42 days of the program. We are currently expanding access to the survey beyond the 42 days of the program in order to increase our response rate. The following sentence was added to the text to clarify this question: Patients were prompted to complete the survey through the telehealth platform beginning on day 35 of the program.

7. There is no mention of an IRB review for approval or exemption for this project.
The project was a quality improvement project and was approved by our Quality Improvement Review Committee and analysis of follow up data has been approved by the IRB at the University of Pittsburgh. This has been added to the text: This was a quality improvement project and was approved by our Quality Improvement Review Committee. Review of follow up data was approved by the University of Pittsburgh Institutional Review Board (IRB number: STUDY 19040366).

8. The article type is listed as Clinical Practice and Quality. If it to be consider a QA paper then it should follow the required format. Quality assessment studies should use elements in the SQUIRE 2.0 reporting guidelines. No completed checklist was submitted.
Thank you for this comment, we had completed the checklist previously and we apologize that it was not appropriately attached. It has been re-uploaded into the system.

Results:

9. Patient needed to have access to a text message-enabled smartphone. Can the authors comment on how many patients in their setting, during this timeframe did not meet this requirement and would not be eligible for this protocol?
Thank you for this comment. According to the Pew Institute (https://www.pewinternet.org/fact-sheet/mobile/**) within our target demographic (women aged 18-49), 92-96% own a smartphone and 99% own a cellphone. Of the women who had the program ordered, 2 women declined to participate because of owning a government-issued cellphone that did not accept text messages. Because the program is initiated after a provider places an order in the Electronic Medical Record, we unfortunately cannot account for the number of women who were approached by their providers and declined because of lack of access to a text-enabled device. We have added the following to our discussion section: The program requires that women have access to a text-messaging enabled smartphone. Prior studies have shown that approximately 92-96% of reproductive-aged women have access to a smartphone.[25] Within our study period, 2 women (0.5%) declined to participate because of not owning an appropriate device.**

10. Lines 167-169: The participants add up to 413 - were the categories not mutually exclusive? **We have updated this to reflect discharge diagnoses in order to minimize confusion.**

11. Lines 172-173: What was the primary reason(s) for postpartum hospital readmission in this cohort? **The primary reason for postpartum hospital readmission was for**

hypertension. We have added this into our results section: Of our cohort, 60 women (15%) had a readmission postpartum, most commonly secondary to severe hypertension.

12. Lines 174-175: Over 40% of the cohort did not require meet criteria for an in office BP check at 1 week. Were most of these patients from the no medication arm?
The majority were from the no medication arm. Of the 177 women who did not require a blood pressure check, 112 (63.2%) were from the no medication arm. We have included this in our results and clarified the description of the protocol in the methods to reflect that women who are on medications may not need an in office BP check if all blood pressures are at goal.
Based on the protocol, 177 (43%) women did not require the previously scheduled in-office blood pressure check at one week postpartum, the majority (112; 63.3%) were in the no medication arm.

In week 1, if all blood pressures are at goal, the one week postpartum in-office blood pressure check appointment is canceled.

13. Twenty-one percent of the cohort established care with PCP postpartum. This seems like a low percentage. It isn't until the discussion section that we learn that the 21% were seen with the 42 day post-partum period and that an additional 42% have a schedule upcoming appointment with their PCP.
Thank you for this comment, we have clarified this in the results: An ongoing goal of the program is to bridge care from obstetricians to primary care physicians (PCP), and currently 87 (21%) of participants have established care with a PCP postpartum with an additional 42% reporting that they have scheduled an appointment with their PCP.

14. Line 185: Only 61% of the cohort completed the satisfaction survey. Can the authors describe in the methods section the approaches they used to administer these surveys?
The surveys were administered through the remote monitoring platform. In the same way the patient was prompted to enter their blood pressure, they were administered the survey. This has been added to the methods section: Patients were prompted to complete the survey through the telehealth platform beginning on day 35 of the program.

Discussion:

15. The authors discuss how a system wide change in clinical practice was feasible in their healthcare setting. They describe improved compliance with visits and use of medication in a high risk postpartum group. They point out important secondary findings regarding titration of blood pressure medications. They discuss patient satisfaction with the new system. They compare their results with that of other publications.

16. The authors briefly touch on limitations and generalizability.

References:
17. This review article may be a reference of interest:

Curr Hypertens Rep. 2018 Oct 25;20(12):101. doi: 10.1007/s11906-018-0901-z.

Out of Office Blood Pressure Measurement in Pregnancy and the Postpartum Period.
Bello NA1,2, Miller E3, Cleary K4, Wapner R4, Shimbo D5, Tita AT6.

Also the following:

Lancet Glob Health. 2014 Jun;2(6):e323-33. doi: 10.1016/S2214-109X(14)70f227-X. Epub 2014 May 5.
Global causes of maternal death: a WHO systematic analysis.
Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J4, Gülmezoglu AM, Temmerman M, Alkema L.

Thank you, we have included these references.

TABLES and FIGURES:

18. Table 2: Difficult to read as the line numbers overlap with the result column.
Apologies for the formatting difficulty. Tables have been shifted over to account for the line numbers.

19: It might be useful to include a table that describes outcomes by the 2 study arms: medication group, non medication group.
Thank you for this comment. We have added a table with the obstetric outcomes stratified by study arm (Table 3).

Reviewer #2: Dr. Hauspurg and colleagues present a description of a ongoing quality improvement project utilizing a remote blood pressure monitoring protocol to evaluate postpartum blood pressures in women with hypertension and hypertensive disorders of pregnancy after hospital discharge. Improved attention to postpartum care and follow-up, particularly in those with complications of pregnancy, is currently a focus in contemporary obstetrics.

My questions and comments for the authors are as follow:

1. It is stated that after identification of a patient with chronic hypertension or a hypertensive disorder of pregnancy and verification that the patient had a text-messaging enabled smartphone device that the patient was enrolled in the program. Between 2/2018 and 1/2019 499 patients were enrolled. Were all "eligible" patients enrolled? Were they given a choice? If so, how many of the eligible patients enrolled and how many turned down enrollment? How many patients with hypertensive disorders did not have reliable access to a text-messaging enabled smartphone device and therefore not able to be enrolled?

The answers to these questions are important because if this was a self-selected population of those who were motivated to enroll then compliance, retention and satisfaction with the program (primary outcomes) likely would be significantly biased to the positive side.

Thank you for this comment. This is a significant limitation of this study, which we have further described in our limitations section. Because an individual provider had to place the order in the medical record system, we are unable to account for the number of

women who were eligible and not enrolled. According to the Pew Institute (https://www.pewinternet.org/fact-sheet/mobile/) within our target demographic (women aged 18-49), 92-96% own a smartphone and 99% own a cellphone. Of the women who had the program ordered, 2 women declined to participate because of owning a government-issued cellphone that did not accept text messages. We have added the following to our discussion section: <u>The program requires that women have access to a text-messaging enabled smartphone. Prior studies have shown that approximately 92-96% of reproductive-aged women have access to a smartphone.[25] Within our study period, 2 women (0.5%) declined to participate because of not owning an appropriate device.</u>

2. It is noted that the majority of the patients enrolled were privately insured (67%). In some parts of the country the majority of those with hypertensive disorders in pregnancy are not privately insured and many may not have reliable, continuous access to a text-message based smartphone device. Therefore, there should be some discussion/disclaimer with regard to limitations of possible applicability of the study findings to a large portion of the at risk population in the United States.

Thank you for this comment. We have added the following statements to our discussion section: <u>The program requires that women have access to a text-messaging enabled smartphone. Prior studies have shown that approximately 92-96% of reproductive-aged women have access to a smartphone.[26] However, it is possible that a larger proportion of high-risk women may not have access to a text-messaging enabled smartphone, thus the applicability of our findings to a broader population within the United States may be limited. Within our study period, 2 women (0.5%) declined to participate because of not owning an appropriate device.</u>

3. It is noted that "anti-hypertensive agents are titrated through an algorithm protocol by the call center nurses." It is stated that this algorithm is "consistent with national guidelines on hypertension management postpartum." What national guidelines are these? It might be prudent to include a copy of this protocol at least as a supplemental appendix online. This is important as a recent review notes that there is "insufficient evidence to recommend a particular BP threshold, agent or model of care" for management of postpartum hypertension (Cairns AE, Pealing L, Duffy JMN, Roberts N, et al, Postpartum management of hypertensive disorders of pregnancy: a systematic review. BMJ Open 2017 Nov 28;7(11):e018696. doi: 10.1136/bmjopen-2017-018696).

Thank you for this comment. While there is no standardized management algorithm published in national guidelines, the American College of Obstetricians recommends goal blood pressure parameters. As such, an alert was sent to the call center at blood pressures above a blood pressure of 140/90 and an emergent referral for evaluation in the emergency room was sent at blood pressure above 180/110, as shown in figure 1. We have modified this statement to reflect that the management was more individualized. The initial choice of anti-hypertensive agent was dictated by the clinical care team while the patient was inpatient. Following hospital discharge, titration of medication or in the case of medication initiation, selection of the anti-hypertensive agent was based on clinical judgment from the call center physician. We have added the following into our methods section and included the above mentioned reference: <u>This algorithm was developed by local expert stakeholders, consistent with national guidelines on goals for hypertension management postpartum.[15] The initial choice of anti-hypertensive agent is dictated by the clinical care team while the patient is inpatient. Following hospital</u>

discharge, titration of medication or in the case of medication initiation, selection of the anti-hypertensive agent was based on clinical judgment from the call center physician as there are no standardized management guidelines for specific anti-hypertensive agents or parameters for medication titration.[16]

4. It is stated that of the cohort in this study 15% had a postpartum readmission. Do the authors have any historical data on postpartum readmission rates at their institution for those with hypertension and hypertensive disorders of pregnancy? In other words, is there evidence that there might be either an increase or decrease in postpartum readmissions in those enrolled in this remote blood pressure monitoring program?

Thank you for this question. At this time we do not have an accurate way of comparing our readmission rates to a historical cohort, but that is an ongoing goal of this program. Administrative-level data shows that in the year prior to initiation of the remote monitoring program (2017), we had 71 readmissions for hypertensive disorders of pregnancy, however, the limitations of quantifying this using only administrative data must be noted. As such drawing any conclusions about changes related to the monitoring program at this time would be premature. Prior studies, including the study cited by Hirshberg, et al, note an increased readmission rate in the group randomized to text-messaging based monitoring (3.9% vs. 0%). In their study, only 44% of women randomized to the office visit were seen for an in-office BP check, underscoring that the increase in readmissions may be secondary to missed opportunities related to poor attendance at the clinic visit.

5. The authors state that 89% of the women enrolled in the program "attended a six week postpartum visit, compared to a historical background rate of 50% attendance at postpartum visits at our institution among a similar population." What constitutes a "similar population?" Is the comparison with women with hypertension or hypertensive disorders of pregnancy with the same ethnic makeup and same proportion with private insurance as the cohort in this study, or some other more general population? This also goes back to the question about whether this cohort was essentially a self-selected (motivated) cohort or not.

Thank you for this comment, the 50% rate was from prior years (2012-2017) and given that we have more updated data available now, we have updated this in the text. In our general population of all deliveries from 2017, our postpartum follow up rate is 60% (5,017/8,392). This is similar to rates reported in the literature (~60%). Among all women with hypertensive disorders of pregnancy, the rate of follow up is slightly higher at 66%. The characteristics of our cohort are overall representative of the demographics of the deliveries at our hospital (approximately 20% African American, 60% privately insured). Prior studies have shown an increase in postpartum visit attendance in women in remote monitoring arms. For example, Hirshberg et al showed a 2-fold increase in postpartum visit attendance (58.2% -> 68.9%, p=0.04), suggesting that remote monitoring may increase patient engagement in this period.

However, because this is a quality improvement project and not a randomized trial, the reviewer is correct that this may be a self-selected more motivated cohort. We have attempted to address this in our discussion in the following ways:

Among women enrolled in the program, 364 (89%) attended a six-week postpartum visit, compared to a historical background rate of 60% attendance among all deliveries and 66% attendance among women with a hypertensive disorder of pregnancy in the year prior to implementation of the program (2017).

Finally, it is possible that patients who were enrolled in the program were self-selected and more motivated than a general patient population, which could have contributed to our observed engagement, satisfaction and compliance rates with postpartum visit attendance.

6. The authors state that this study "details the use of an innovative method to improve postpartum hypertension care and patient engagement." How is this "innovative" relative to other cited studies? One of the cited studies was very similar in that it was a prospective single-cohort feasibility study using telehealth for remote blood pressure monitoring (reference 13 in this paper). Another was similar but actually randomized with remote monitoring and text based messaging compared with traditional in office evaluation (reference 12 in the paper). What distinguishes this study from these prior reports?
Thank you for this comment. We feel this study is innovative due to its integration with the electronic medical record system and ability to be easily adaptable into other hospital settings. While the reviewer is correct in that other studies have been published demonstrating the feasibility of home blood pressure monitoring in this patient population, neither of the cited studies were scalable to a system-wide level, offering the opportunity to impact a broader population of women.

Reviewer #3:
This study evaluated the feasibility, acceptability and compliance with a remote blood pressuring monitoring protocol implemented in the community as a quality improvement measure. The data presented here are part of this ongoing improvement programme. 499 women were enrolled into the programme between February 2018 and January 2019 and from this cohort, 409 are reported in this manuscript. Of this number, 168 had gestational hypertension, 192 had pre-eclampsia without a prior hypertension and 53 had pre-eclampsia superimposed on chronic hypertension. Anti-hypertensive treatment was initiated in 42% (171) women. 340 983%) continued the programme beyond 4 weeks and 364 (89%) attended the six-week postnatal follow-up visit. The authors conclude that this initial analysis shows a high compliance, retention and patient satisfaction but caution that further studies are needed to address how best to implement these protocols into clinical practice to maximise benefit in a broader population of women.

This is a very interesting study which supports the long-held view that care is best accepted when delivered at home or close to home and furthermore that technology should be used to improve care closer to home. The very positive message here is the number of women who were seen at the 6 weeks face-to-face postnatal follow-up.

There are minor comments on this study and these include:

1. I would suggest rewording "exacerbation of hypertension was noted between days 3-6 postpartum". The question is, does the postpartum period actually exacerbate hypertension?
Thank you for this question. We have clarified this statement in the manuscript with: In prior observational studies of women with hypertensive disorders of pregnancy, worsening of hypertension was noted between days 3-6 postpartum.

2. With regards to the ACOG recommendation on checking blood pressure on days 3-10 - is this a one-off check or repeated checks? The impression from line 81 is that it's a one-off check.
Yes, ACOG recommends a single in-office BP check at days 3-10. For women who are having medication titrated or have persistent hypertension postpartum, additional weekly follow up visits are often employed in clinical practice.

3. I will suggest s sentence or two on how these patients BP are currently managed post-delivery as not everyone is familiar with your model of care.
Thank you, we have added a few sentences clarifying this: At present, women are typically discharged from the hospital on postpartum day 2-4 and ACOG recommends a single blood pressure check be performed between 3-10 days postpartum for women with a hypertensive disorder of pregnancy. For women with persistent hypertension or the need for titration of anti-hypertensive medications, women are typically seen more frequently in the postpartum period for medication management, however, this varies by institution, and there are no clear guidelines on optimal blood pressure management in this period. Subsequently, women are typically seen at 4-6 weeks postpartum for a "postpartum visit" and referred to their primary care physician (PCP) if there are additional needs for anti-hypertensive medication management.

4. What was the eligibility criteria for enrolment into the study? (line 111)
Eligibility criteria are outlined in the methods: Eligible women have one of the following hypertension related diagnoses: chronic hypertension, chronic hypertension with superimposed preeclampsia, gestational hypertension, preeclampsia, eclampsia or new onset postpartum hypertension. Women must be English-speaking and are also required to have access to a text messaging-enabled smartphone device.

5. Who and where are the manufacturers of the "Drive automatic upper arm blood pressure monitor"?- line 123
We have expanded the description of the device. We now state: We utilize the Drive Medical BP 3600 automatic upper arm blood pressure monitor.

6. Its not clear how engagement was measured other than retention and compliance? Was there another measure for this? I am not sure continuing with the programme is a surrogate for being engaged.
Thank you for this comment. We assessed engagement in several ways. Because continuing the program requires ongoing blood pressure monitoring and reporting, we felt that this reflects patient engagement. Further, attendance at the postpartum visit and establishment of care with a primary care physician are other measures of ongoing patient engagement with the healthcare system.

7. How do the numbers of those who started anti-hypertensive treatment compare to published data? Did this reduce the numbers? This would be a real advantage of this model of care
Thank you for this comment. 62 women were started on medication in our study (20% of women not discharged on an anti-hypertensive, or 15% of total cohort). There are also women who had medication dose titration or discontinued through the program. In the Hirshberg study cited in the discussion, they report that 9.7% (10/103) of women in the office visit group were started on medication and 16.5% of women in the text message group were started on medication, however, only 44% of women in the office visit group

were seen for an office visit. Among those who had an office visit, 22.2% were started on medication. They note that a greater proportion of women had at least one severe range blood pressure in the text messaging group compared to the office visit group. In fact, home blood pressure monitoring may increase the use of anti-hypertensive medications, as previously unrecognized severe hypertension may be increasingly recognized and treated, which in turn has the potential to decrease severe postpartum morbidity related to hypertension.

8. There are minor grammatical errors that should be corrected
We thank the reviewers for noting this and we have attempted to address all grammatical errors.

9. The references are not in keeping with the style for the journal. Perhaps the authors can have a look at the instructions for authors for details.
Thank you for this comment, we have updated our references to reflect the journal's style.

STATISTICAL EDITOR'S COMMENTS:

1. lines 122-123: Should give more detail on how the device BP was compared to nurses' recording or some other method of validating the at home device.
Thank you for this comment. We have included this in our methods: <u>Prior to discharge from the hospital, nursing staff record blood pressure on both the home blood pressure monitoring device and the hospital device to confirm accuracy.</u>

2. lines 147-149, 185-191 and Suppl Table 1: The methods cites a Likert scale response to the 9 questions. The Results should include more detail regarding all the questions in the Likert format. Should consider including as a Table in the main text.
Thank you for this suggestion, we have included this as a table 3 and added additional detail on the questions in the Likert format.

3. Table 1: Please re-check the %s. For instance, 305/409 = 74.6%;87/409=21.3%;45/402=11.2%
Thank you for the comment, we have reviewed the percentages and corrected the table as indicated.

4. Table 2: Also, re-check the %s. 164/402=40.8%.
Thank you for the comment, we have reviewed the percentages and corrected the table as indicated.

5. Fig 1: Would be useful to summarize the empiric results of proportions entering the various pathways.
Thank you for this comment. We have added this to table 1 and the manuscript text. We chose not to add this to figure 1 in order to minimize confusion about the numbers in the pathways versus the actual algorithms.

6. Fig 2: Since the total "N" was ~ 400, should round the %s to nearest 0.1%, the data do not support precision to nearest 0.01%.
Agreed – we have changed this in the figure.