

after TeamSTEPPS implementation. We used SAS 9.4 (SAS Institute, Cary, NC) and GraphPad Prism (GraphPad Prism version 6 for Windows, GraphPad Software, La Jolla, CA) for data analysis. The Institutional Review Board at Beth Israel Deaconess Medical Center approved this research.

**RESULTS:** Together the most common visit types accounted for 68.5% of all visits; there were 31,156 visits prior to TeamSTEPPS implementation and 34,655 visits after implementation. These visit types consisted of contraception visits, well-woman visits, testing for sexually transmitted infections, surgical abortion, medical abortion, contraception refill visits, and follow-up visits for medical abortion. Among these visit types, overall mean cycle time decreased by 4.3 minutes after TeamSTEPPS implementation ( $P < .001$ ), for a total time savings of 2515 hours after TeamSTEPPS. With the exception of contraception visits, the mean overall cycle time decreased significantly for each visit type (all  $P \leq .02$ ; Table).

**CONCLUSION:** Team training improves visit cycle time in ambulatory health care settings. Reducing the total amount of time that patients spend at visits may improve patient satisfaction, which we previously have shown increases following TeamSTEPPS implementation<sup>2</sup> and allows for more walk-in and urgent appointments. Although our data cannot exclude other contributing factors or confirm that time savings translated into provider or clinic room utilization, they do suggest that even small team-driven improvements in cycle time have a dramatic impact on patient access, particularly in high-volume settings. ■

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This study was supported by Affiliates Risk Management Services, Inc.

Drs Nippita, Dodge, and Hacker received salary support for the presented work from a research grant provided by Affiliates Risk Management Services, Inc (ARMS) to Beth Israel Deaconess Medical Center. Ms Poitras and Ms Intondi are employed by ARMS. Dr Paul provides services to ARMS on behalf of her employer, Harvard Medical Faculty Physicians at Beth Israel Deaconess Medical Center. The other authors report no conflict of interest.

Presented at the International Federation of Gynecology and Obstetrics World Congress of Gynecology and Obstetrics, Oct. 14–19, 2018, Rio de Janeiro, Brazil; and at the North American Forum on Family Planning, Oct. 20–22, 2018, New Orleans, LA.

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## Text message remote monitoring reduced racial disparities in postpartum blood pressure ascertainment

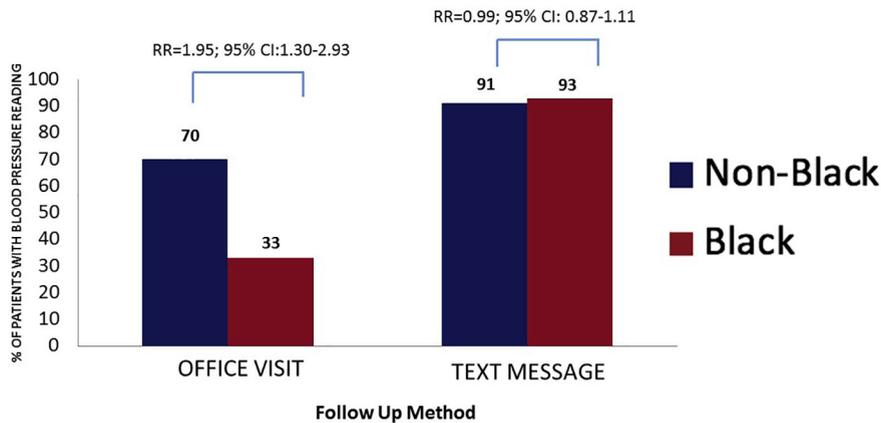


**OBJECTIVE:** Nearly 50% of maternal morbidity and death occurs after delivery, one-third of which occurs in the first week after delivery.<sup>1</sup> The American College of Obstetricians and Gynecologists recommends close monitoring of patients with

hypertensive disorders for the first 72 hours and again at 7–10 days after delivery, given the timing of peak blood pressures after delivery<sup>2</sup> and the need for optimal blood pressure management in this period of increased risk of stroke and

## FIGURE

## Postpartum blood pressure ascertainment by race and follow-up method



CI, confidence interval; RR, relative risk.

Hirshberg. Text messaging remote blood pressure monitoring. *Am J Obstet Gynecol* 2019.

seizure.<sup>3</sup> We previously showed that a text message–based remote blood pressure monitoring program in the early postpartum period was more effective in obtaining these critical blood pressure values compared to in-person office visits in all at-risk women.<sup>4</sup> Non-Hispanic black women suffer a disproportionate amount of hypertensive-related morbidities and are 3 times more likely to die of preeclampsia than white women,<sup>5</sup> likely because of a combination of patient, community, provider, and systems factors. Our office-based follow-up experience is that nonblack women are twice as likely to return for an in-person blood pressure check shortly after discharge compared with black women (42.5% vs 24.1% attendance rate, respectively). Because early identification and treatment of women who are at risk for hypertension-related morbidities in the postpartum period may reduce maternal morbidity and mortality rates, we evaluated whether postpartum text-based remote blood pressure monitoring could reduce the disparity in postpartum blood pressure ascertainment.

**STUDY DESIGN:** This was a planned secondary analysis of a randomized clinical trial that compared the effectiveness of text-based blood pressure monitoring to conventional in-person blood pressure visits for women with pregnancy-related hypertension in the early postpartum period.<sup>4</sup> Women were assigned randomly to either 2 weeks of twice daily text-based surveillance with the use of an automated platform and home blood pressure monitor or usual care in-person blood pressure check at their prenatal office 4–6 days after discharge. A standardized hypertension management algorithm was used by a Maternal Fetal Medicine physician in the text-messaging arm and the outpatient provider in the office arm. The primary outcome was ascertainment of blood pressure, defined as either office visit attendance or at least 1 blood pressure texted.

Secondary outcomes included the need for hypertension-related readmission or oral antihypertensive medication. Women self-identified as black or nonblack race. We quantified racial disparity between black and nonblack with a risk ratio defined as the proportion with blood pressure ascertained in nonblack women divided by proportion ascertained in black participants. Poisson regression with a robust variance assumption was used to estimate risk ratios (RR) along with 95% confidence intervals (95% CI) for blood pressure ascertainment in nonblack vs black participants in each trial arm and to test for an interaction between blood pressure ascertainment and race by trial arm.

**RESULTS:** In all, 206 women participated in the trial (103 women per arm). Seventy-one percent of women in usual care and 66% in the texting program were black. Nonblack women were twice as likely as black women return for a blood pressure visit within the usual care setting (70% vs 33%; RR, 1.95; 95% CI, 1.30–2.93;  $P<.001$ ). The introduction of a text-messaging system resulted in >90% blood pressure ascertainment in both race groups (91% vs 93%; RR, 0.99; 95% CI, 0.87–1.11;  $P=.85$ ). Compared with usual care, where nonblack women were twice as likely to comply with the American College of Obstetricians and Gynecologists recommendations, blood pressure ascertainment was similar between nonblack and black women in the texting arm, with a 50% reduction in racial disparity (ratio of RR, 0.51; 95% CI, 0.33–0.78;  $P=.002$ ; Figure). There were no hypertension readmissions in the texting arm, whereas 4 readmissions (3 of 4 in black women) were observed in usual care. There was no difference in the percent of black women who required new antihypertensive medication or dose escalation by trial arm among those who had an outpatient blood pressure (19% text vs 21% office;  $P=.73$ ).

**CONCLUSION:** Although nonblack women attended in-office (usual care) postpartum blood pressure checks twice as often as black women, the use of a text-based monitoring system resulted in overall higher compliance (>90%) in both race groups and no racial differences in blood pressure ascertainment. The postpartum period is fraught with high morbidity and significant barriers to in-person visits that disproportionately affect minority populations. Text messaging as the standard of care is a safe, patient-centered means for blood pressure surveillance in this time of increased morbidity. Text messaging allowed for ascertainment of critical information and likely would have led to medication initiation in an additional  $\geq 20\%$  black women who missed an office visit. Given that most strokes and maternal morbidity from pregnancy-related hypertension occur within 10 days of delivery, text messaging has the potential to be an innovative way to engage hypertensive women of all races equally shortly after delivery and may be further evaluated as a means to reduce disparities in other aspects of postpartum care. ■

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The authors report no conflict of interest.

Presented as an oral presentation at the 39th Annual Pregnancy Meeting of the Society for Maternal-Fetal Medicine, Las Vegas, NV, Feb 11–16, 2019.

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