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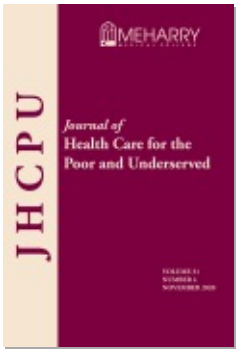

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Preeclampsia Risk and Prevention among Pregnant Medicaid Beneficiaries

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Abstract: Pregnancy-related hypertensive disorders can cause morbidity and mortality. Low-dose aspirin (LDA) reduces risk. This paper aims to assess Medicaid beneficiaries' risk factors for preeclampsia and their providers' clinical use of LDA in the federal Strong Start for Mothers and Newborns II initiative. Twenty-seven awardees with more than 200 care sites served almost 46,000 women. This mixed-methods analysis assesses rates of risks, incidence of pregnancy-related hypertensive disorders, and assessment of care teams' LDA knowledge and reported prescription practices. Many Strong Start participants had risk factors that merited LDA, but most practices reported inconsistent or non-existent prescribing. Use varied within the three care models and among all provider types. Ancillary care team members often had no knowledge of LDA's benefits, resulting in lost opportunities for educating patients and assessing adherence to LDA use. Clear policies and well-integrated care teams could increase evidence-based use, improve pregnancy outcomes, and promote women's lifelong cardiovascular health.

Key words: Hypertension, Medicaid, pregnancy risks, preeclampsia.

Pregnant and postpartum women are at increased risk for hypertensive disorders,[1] which can persist after pregnancy and lead to cardiovascular disease, which is the leading cause of death among women in the United States.[2] Preeclampsia is a serious hypertensive disorder that complicates 2% to 10% of pregnancies, can also emerge postpartum, and can lead to preterm birth, perinatal morbidities, stillbirth, and severe maternal morbidities or death.[2,3]

Women enrolled in Medicaid or the Children's Health Insurance Program (for simplicity, hereafter we refer only to Medicaid), may be at particular risk. Socioeconomic disadvantage, faced by almost all Medicaid beneficiaries, is associated with both hypertension and poor birth outcomes.[4,5,6] Effects of this disadvantage are more pro-

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nounced among African American women, who have faced a long history of systemic discrimination[7] and are disproportionately represented in the Medicaid population.[8,9] African American women also have much higher rates of maternal mortality than Hispanic, White, or Asian women, and hypertensive disorders of pregnancy are the cause of almost 7% of maternal deaths.[10]

Ongoing research indicates that low-dose aspirin (LDA) can prevent some cases of preeclampsia and its complications.[11] Potential harms of LDA to the pregnant woman and fetus have been determined to be minimal,[12] and LDA has other established benefits, such as lowering risk of preterm birth among nulliparous women[13] and preventing miscarriage in women with antiphospholipid syndrome.[14] Some researchers have recommended universal LDA prescription for pregnant women.[15] Low-dose aspirin is available over the counter and typically costs less than $10 for a six-month supply.

Evidence for LDA's effectiveness emerged in the 1980s, and in 2004 and 2007, Cochrane reviews confirmed that LDA use led to significant reductions in rates of preeclampsia and associated preterm birth and fetal or neonatal death.[16,17] The American College of Obstetricians and Gynecologists (ACOG) issued LDA guidance for women with high risk factors in 2013.[18] In 2014, the U.S. Preventive Services Task Force (USPSTF) developed expanded recommendations[11] that were subsequently adopted by ACOG.[12,19] These recommendations state that women should take 81mg LDA per day beginning at 12 weeks of pregnancy if they have a multifetal gestation or a personal history of preeclampsia, diabetes, renal disease, chronic hypertension, or autoimmune disorders. Low-dose aspirin initiation is also recommended for women with two or more moderate risk factors, which include obesity (body mass index [BMI] 30+), advanced maternal age (35+), nulliparity, family history of preeclampsia, low socioeconomic status, or African American race. Low-dose aspirin is most effective if initiated before 16 weeks,[20,21] but current recommendations endorse initiation as late as 28 weeks. Prescribing aspirin is within scope for certified nurse midwives (CNMs) and advance practice nurses (APNs) where state licensing permits, as well as for any physician providing prenatal care. Still, ACOG notes that, despite the increasing body of evidence and associated recommendations in favor of LDA, low-dose aspirin prescription remains varied in clinical practice.[12] There is a lack of information about risk prevalence among Medicaid beneficiaries specifically, as well as a lack of knowledge about prenatal care providers' understanding and use of LDA and how they might better address high levels of risk among pregnant women enrolled in Medicaid.

This paper considers results from Strong Start for Mothers and Newborns II: Prenatal Care Initiatives, a Center for Medicare and Medicaid Innovation (CMMI) model to test whether enhanced prenatal care interventions could reduce costs, lower rates of preterm birth, and improve overall health outcomes for Medicaid-enrolled women and their infants.[22] This research seeks to assess the risk prevalence among women in Strong Start for whom data indicate LDA could have been beneficial; to assess knowledge of Strong Start staff and affiliated providers regarding LDA; and to determine what policies, if any, Strong Start sites had regarding LDA prescription. Subsequently, we assess barriers to appropriate LDA prescription and offer potential strategies for increasing use.

Methods

Strong Start for Mothers and Newborns II funded enhancements to outpatient prenatal care through three models of care: freestanding Birth Centers (BCs), Group Prenatal Care (GPC), or Maternity Care Homes (MCHs). The initiative tested whether these enhanced approaches to prenatal care could reduce rates of preterm birth and low birthweight among Medicaid-enrolled women, improve overall health and experience of care, and reduce costs to Medicaid. The Strong Start model ran from 2013 to 2017 and served nearly 46,000 women through 27 awardees operating more than 200 sites in 32 states, the District of Columbia, and Puerto Rico. Awardees included health systems, academic medical centers, federally qualified health centers, and private practices (among others). Birth Centers (2 awardees, 47 sites) offered the midwifery model of care enhanced with peer counseling, GPC (15 awardees, 60 sites) offered the CenteringPregnancy model or similar care in a group, and MCHs (17 awardees, 112 sites) offered care coordination overlaid on clinical services. Of the 27 awardees, one offered all three models of care and two included both GPC and MCH sites. Overall, 19% of participants received BC care, 23% received GPC, and 58% received care in MCHs.

Strong Start's mixed-methods evaluation, conducted in partnership by CMMI and the Urban Institute (UI), was approved by UI's Institutional Review Board in December 2013 under Project Number 08575-004-00. A description of awardees, their services and site locations, model evaluation results, and data gathering methods (including copies of all qualitative and quantitative instruments) are available in the Final Evaluation Report.[23]

This analysis primarily considers participant-level model data and awardee-level case studies. Individual-level participant data provided information regarding pregnancy and birth history, demographic characteristics, prenatal care, and pregnancy risk factors related to hypertension and preeclampsia (among many other factors). Data were collected through forms that participants completed at intake, during their third trimester, and postpartum and through a limited medical chart review that awardee staff completed with information about specific risks, visit dates, and outcomes. The program data results presented in this paper are descriptive and encompass findings for each model of care and for the entire Strong Start population. Pairwise comparison of means tests were used to determine significant differences in key risk factors among models, using the MCH model as the base.

A team of trained researchers collected qualitative data annually using case study methods that included 133 focus groups with 951 pregnant or postpartum Strong Start participants and 739 in-person or telephone interviews with 1,074 providers and model staff. Researchers also conducted observations and reviewed model materials for all awardees. All interviews and focus groups were recorded digitally and by a note taker. Researchers obtained informed consent from all participants using institutional review board-approved procedures. Data were cleaned, organized by theme, and coded and analyzed using the software program NVivo.[24] The team conducted multiple rounds of qualitative database testing to obtain high inter- and intra-coder reliability.

The fourth and final round of data collection interviews (with 92 Strong Start providers and model staff), conducted from October 2016 to May 2017, included queries

specifically about aspirin use. The interviewer began by saying, "We're trying to learn more about the use of aspirin treatment for women at risk for preeclampsia during pregnancy. What role, if any, does aspirin play in your prenatal care approach?" and then asked open-ended follow-up questions as appropriate. Using a grounded theory-based analysis,[25] we began with open coding of these responses, followed by axial coding to condense categories. We then applied a constructivist approach[26] to conduct selective coding and final analysis of responses in the context of prior analysis from all four years of quantitative and qualitative data.[23]

Results

Participant-level data. All awardees enrolled women who exhibited high and moderate risk factors for pre-eclampsia as reported in the participant-level data. Birth centers served women at lower medical risk than the Strong Start population generally, and BC participants had statistically significant lower rates of all key risk factors identified ($p<.05$). High-risk factors were similar between women enrolled in GPC sites and MCH sites, though MCH participants were more likely to be obese and of advanced maternal age, and GPC participants were more likely to be nulliparous and to have pre-pregnancy diabetes ($p<.05$). In the full Strong Start population, 6% of women had pre-pregnancy hypertension, and 3.7% had pre-pregnancy diabetes. Moderate risk factors were far more prevalent, including obesity (36.3%), first pregnancy (37.5%), identifying as African American (39.8%) or being age 35 or older (9.1%). As all women were enrolled in Medicaid, they were near-universally of low socioeconomic status and thus would require only one other moderate risk factor for LDA to be merited. Table 1 shows the proportion of women in each model with key risk factors, significant differences between MCH rates and rates in the other two models, and the proportion with the risk in the Strong Start initiative overall.[26]

Participant-level data also indicate that women in all three models experienced social disadvantage and related stressors that are known contributors to hypertensive disorders. The most common stressors reported by participants in surveys and focus groups included joblessness (48.5% were neither employed nor in school), food insecurity (20%), lack of transportation or other barriers to attending prenatal care appointments (33%), depression (28%), anxiety (35%), and lack of social support (43.1% had no cohabiting partner or no partner at all).[23]

The proportion of women who developed gestational hypertension or preeclampsia varied substantially among the three models. Birth Center rates were 1–2% for both. Rates were significantly higher ($p<.05$) in MCHs and were highest among GPC participants, where 8.1% developed gestational hypertension and 6% developed preeclampsia (see Table 2).*

Qualitative case studies. Despite the high prevalence of risk factors for preeclampsia among Strong Start participants, case studies found LDA prescription to be inconsistent

* The number of women with complete information for these variables is lower than for risk factors because approximately 23% of participants left the initiative before giving birth. Reasons for leaving included pregnancy loss, moving out of the area, and transferring care to another local provider.

Table 1.

PERCENTAGE OF STRONG START BENEFICIARIES WITH EACH KNOWN RISK FACTOR FOR PREECLAMPSIA

Risk Factor % with risk (sample size)	Model of Care			All Strong Start
	Birth Center	Group Prenatal Care	Maternity Care Home (base)	
Pre-pregnancy hypertension	.08%[a] (8,752)	8.3% (6,757)	7.5% (22,046)	6.1% (38,857)
Pre-pregnancy diabetes	.06%[a] (8,750)	6.8%[b] (6,757)	4.0% (21,525)	3.7% (37,032)
Obese at entry to prenatal care (BMI 30+)	25%[a] (8,474)	36.0%[a] (7,052)	40.4% (20,908)	35.8% (36,434)
Nulliparous	26.2%[a] (8,785)	31.2%[b] (10,156)	27.2% (25,427)	27.9% (44,368)
African American	16.1%[a] (7,313)	45% (9,645)	44.8% (24,804)	39.8% (41,762)
Advanced Maternal Age (35+)	9.1%[a] (7,364)	7.6%[a] (9,805)	9.5% (24,804)	9% (42,297)

Note:
[a]significantly less likely to have this risk factor (p<.05)
[b]significantly more likely to have this risk factor (p<.05)

Table 2.

PREGNANCY-RELATED HYPERTENSIVE DISORDERS AMONG STRONG START PARTICIPANTS

Disorder % with risk (sample size)	Model of Care			All Strong Start
	Birth Center	Group Prenatal Care	Maternity Care Home (base)	
Gestational Hypertension	1.4%[a] (8,722)	8.1%[b] (7,631)	7.2% (20,216)	6.0% (36,687)
Preeclampsia	1.5%[a] (8,722)	6.0%[b] (7,767)	5.8% (20,070)	4.9% (36,559)

Note:
[a]significantly less likely to develop this condition (p<.05)
[b]significantly more likely to develop this condition (p<.05)

and generally underused. Analysis of the full four years of qualitative data (Table 3) showed a general lack of coordination among care team members at Strong Start sites.[9] Few sites held regular team meetings that included all staff. Care coordinators and peer counselors sometimes had little contact with primary clinicians, with most or all of their supervision conducted by a program manager. Care coordinators, particularly at MCHs, complained that they could not access health records or that when they could, providers did not read the notes they entered or even general medical histories of patients. Providers who were interviewed often did not understand the role of care coordinators or peer counselors, either over- or underestimating their range of responsibilities. When women had multiple providers, either because the practice routinely scheduled women for available spots rather than to a consistent clinician or because they had separate visits for specialty care, it was rare for providers to collaborate or to share records. Lack of knowledge about LDA, especially for non-clinical staff, and lack of information sharing among care team members were predominant themes across all

Table 3.

INTERVIEW RESPONDENTS AND THEMATIC RESPONSES BY MODEL

Model	Total respondents (clinician/non-clinician)	Main themes
Birth Centers	23 (9/14)	Lack of information for almost all non-clinical staff and some clinicians Lack of communication between clinical and non-clinical staff Underuse Concerns about scope
Group Prenatal Care	38 (15/23)	Lack of information for almost all non-clinical staff and some clinicians Lack of coordination among clinicians Lack of information sharing with non-clinical staff Inconsistent use and underuse Misunderstanding of patient risk profiles
Maternity Care Homes	47 (13/32)	Lack of information for most non-clinical staff and some clinicians Lack of communication between clinical and non-clinical staff Lack of coordination among clinicians Inconsistent use and underuse

Note:
One awardee offered all three models of care and two awardees offered both GPC and MCH. Therefore, four respondents are counted in all three categories and and additional eight are counted for GPC and MCH. The total number of unique respondents is 92.

three models of care. Other consistent themes included lack of practice-based policies on LDA use; gaps in coordinating care; and for GPC and BCs, interpretations of patient risk profiles and provider scope.

By design, BCs follow the midwifery model of care, which offers a holistic approach that prioritizes patient education and shared decision making.[27] Birth Centers generally refer women with high medical risks to a physician's care; as such, participant data indicate that BCs enrolled few women with the highest risks for hypertensive disorders. Moderate risk factors and overall social stressors were more prevalent, though rates were generally still lower than those in GPC and MCHs; for instance, 25% of BC participants were obese, but rates were 36% in GPC and 40% in MCHs (see Table 1).

A key informant for the American Association of Birth Centers, the convening awardee for all but one of the 47 BCs that participated in Strong Start, indicated that LDA prescription is within scope for CNMs, but that most would not prescribe aspirin on their own: "[LDA use] is something that will depend on the community standard where the birth center is located and what the consulting physicians are doing in that community. I think a birth center would not just initiate aspirin treatment without a collaborative or consultation-type discussion [with a physician]." Some CNMs at BCs confirmed this perspective. For instance, one said, "I have not incorporated [LDA] as of yet, but I'm considering [it]. I want to discuss [with our] consulting physician who would be an appropriate candidate—risks, drawbacks." Other CNMs felt comfortable initiating LDA treatment on their own. One said that at her birth center, "All women that have a history of preeclampsia, we have them start baby aspirin as soon as they get pregnant. We've been doing it for a while." Still other CNMs did not accept current scientific findings regarding LDA and had their own beliefs about risks and prevention. One explained, "We don't [prescribe LDA] because aspirin, in my opinion, increases their [risk of] bleeding. We prefer to try to prevent preeclampsia through nutrition, like good diet and exercise kind of things."

Although the midwives generally reported an awareness of LDA and its indications, whether they followed prescription recommendations or not, the BC Strong Start-funded peer counselors expressed little to no awareness of LDA. Peer counselors were intended to reinforce health messages and provide additional education, but as one said, "I haven't heard anything about [aspirin]. I have no idea." When asked about aspirin, most peer counselors indicated it was "a midwife question."

Almost all GPC sites provided CenteringPregnancy[28] or a close variant. The Centering program recommends a series of 10 two-hour prenatal care appointments in groups of eight to 10 women beginning in the second trimester. The program dedicates the first half hour of the visit to individual medical checks by a clinician (physician, CNM, or APN) in a private area while the other women socialize and conduct self-health monitoring. For the remaining 90 minutes, the clinical provider and a partner (often a nurse), co-facilitate a discussion on a predetermined topic, such as nutrition or signs of labor. Most Strong Start participants had enrolled in individual care before Centering began at around 18 weeks; thus, most women at risk should have initiated LDA prior to Centering.

Centering provider-facilitators reported not being involved in LDA prescription, and many GPC informants reported that at their sites, they screened out "high-risk"

women. As one said, "I don't remember saying anything about aspirin. We also refer out all of our high-risk pregnancies, so if we knew they were at risk, they would have already been in a different clinic." Participant data, however, indicate that GPC sites overall—including this key informant's site—had many participants with high and moderate risks for preeclampsia. Many GPC sites offered supplementary specialist appointments for women who developed complications and rarely defined specific risks that would make women ineligible for GPC.

Many GPC providers were unaware of LDA protocols for preventing preeclampsia. For instance, one who did sometimes prescribe aspirin said she only used it for women with the methylene tetrahydrofolate reductase mutation. Co-facilitators and model staff often had no awareness of LDA; as one key informant told her interviewer, "I know nothing about this aspirin thing." Though there were some sites where providers did prescribe LDA, interviews indicated no consistent policies within or among sites. One key informant explained, "Some of our patients are definitely on it. But it's a little bit doctor-specific." Few reported formal or informal coordination between specialists and primary Centering providers in general, and no one reported any coordination regarding LDA.

Maternity care homes had the most variation in services offered to Strong Start beneficiaries, but all at least provided typical clinical care with short, individual prenatal visits supplemented with care coordination. The number, type, and length of contacts with care coordinators varied by awardee and were often dictated by individual needs. Many Strong Start participants said that cursory clinical appointments and provider discontinuity led to a patient preference for communicating with care coordinators, who were usually the same at each visit and could spend more time with patients. Though most MCHs specifically intended to enroll women at high medical risk, in practice, the Strong Start participants enrolled in MCHs overall had similar medical and social risk levels to those enrolled in GPC.

Key informants at MCHs were most likely to indicate that providers prescribed LDA to prevent preeclampsia. As one care coordinator said, "Our doctors are very interested in and impacted by research on positive impacts of aspirin use. They have criteria for different risk factors that they screen every patient for . . . It started within the past year." However, providers at other practices said that recent changes in recommendations made it difficult to understand and implement consistent LDA prescription. One physician explained, "Obviously we try to follow evidence-based practice. There has been somewhat of a moving target on the role of aspirin, but we use the latest maternal medicine guidelines to determine what we do."

Knowledge and application of practice varied among awardees, among sites under the same awardee umbrella, and among providers within a site. One physician indicated that providers in the practice were not all in agreement: "I would say it is growing and emerging and we are starting to adapt it in our practice. The use of aspirin is becoming more common." At an academic medical center, a care coordinator said that use was "not across the board" and added, "Of course the community health workers do not advise one way or another . . . My sense is [the head of obstetrics] doesn't see that [using LDA offers] big improvement." In another practice, the care coordinator said, "In some instances we give it to preeclampsia patients but not always."

Most care coordinators reported having little direct contact with clinicians, and at some practices, they were not able to access participants' medical records. Some noted that medical histories were not collected in a timely way and that not everyone on a care team was up-to-date on each patient's risks and needs. Even when care coordinators knew LDA was prescribed, they did not always understand why. One explained, "[LDA] wasn't just [for] people who were at risk for preeclampsia. I think they were just having people do it in general." A nurse in the same practice mentioned that the physicians gave out LDA "like candy." A care coordinator from a different MCH awardee told the interviewer, "I know that our doctors use aspirin occasionally. That's all I know about it." Other care coordinators were entirely unaware of LDA use in their practices. As one said, "I have no idea if aspirin is being used."

Discussion

Prior research has established that LDA is an inexpensive, easily accessible, and effective tool for preventing pregnancy-related hypertension and its complications. Even though a large proportion of Strong Start participants met the risk criteria for LDA, LDA use did not appear to be well-established in maternity care practices serving Medicaid beneficiaries enrolled in Strong Start. In most cases, though not always, MCHs in academic medical centers did use LDA consistently. Though these centers served large geographic regions, sometimes including an entire state, their locations may have excluded many residents in rural areas who were not high-risk enough to travel long distances for care. Smaller MCH practices and BC sites where LDA was not used were more commonly in rural areas. Overall, however, variation in acceptance of LDA existed within all models.

Though prescribing practices were inconsistent among all provider types, BC midwives sometimes said they preferred alternative prevention measures, such as healthy lifestyle habits. Providers and program managers at physician-based practices were more likely to say only that their sites didn't use LDA or that some providers did not. In many cases, physicians, midwives, and program managers indicated that their particular practice sites did not handle high-risk patients and would refer women elsewhere. Moderate risk factors, such as socioeconomic disadvantage and nulliparity, did not seem to register as risk factors for most respondents who were aware of LDA therapy. In addition, some respondents, especially in GPC and BC sites, indicated that they did not accept medically high-risk participants in their programs (e.g., women with preeclampsia in a prior pregnancy or current diabetes or hypertension). This was true for some BC sites, but GPC sites had women at risk levels similar to those in MCHs, which often emphasized serving women at higher medical risk. Providers, both midwives and physicians, expressed the view that LDA should be recommended by a provider who handled higher-risk patients, with midwives believing they should refer to obstetricians and some obstetricians believing women considered at risk for preeclampsia should see a maternal-fetal medicine specialist.

All Strong Start participants received prenatal care from a licensed, clinical provider, but most had frequent interactions with others, such as care coordinators, peer counselors, nurses, social workers, nutritionists, medical assistants, and physician specialists.

Despite the robust qualifications and areas of expertise among Strong Start care team members, in most practices, these teams did not meet for case discussions or information exchange, nor did they make effective use of medical histories or electronic health records for this purpose. Recent literature indicates a strong association between integrated care teams and improved care quality and pregnancy outcomes.[29,30] While it can take significant effort to generate support for new care models from physicians and administrators,[31,32] integrated care teams can have substantial benefits for Medicaid beneficiaries, practitioners, and payers.[33] In practices that made use of LDA, fragmentation of care and incomplete information made for lost opportunities for identifying risks, offering supplemental education on LDA's purpose and importance, offering help in overcoming barriers to access (e.g., conflicting recommendations from pharmacists), and assessing treatment adherence, which is essential for LDA to be effective.[34,35]

The absence of clear LDA policies at most sites meant recommendations were provider-specific, especially for women in GPC and MCHs, which could cause confusion among women who did not see the same provider at each visit. Policies for BCs were more likely to be consistent across a site, but in many cases, that simply meant that no one was prescribing LDA. Because Medicaid participants have especially high incidence of risk factors for preeclampsia, especially as all enter care with the moderate risk factor of socioeconomic disadvantage, establishing LDA policies and protocols in practices serving Medicaid beneficiaries has particular potential for reducing maternal death, stillbirth, neonatal death, and other complications of preeclampsia. African American women are at particularly elevated risk for preeclampsia, a primary cause of maternal morbidity and mortality, so evidence-based prescription has potential to reduce disparities between African American women and their Hispanic, White, and Asian counterparts.

Limitations. This study has a number of limitations. Though we know rates of common risks among Strong Start participants, we have no direct knowledge of how many women were prescribed LDA or of how many may have used it. Strong Start case studies involved hundreds of interviews and focus groups with more than a thousand key informants and Strong Start participants, which provided context for this analysis, but aspirin use was only addressed in the final year of data collection. The information presented is descriptive in nature. However, it offers a nationwide sample of Medicaid beneficiaries and practices that provided their prenatal care. Furthermore, the results indicate that LDA prescription lacked coordination and consistency for most sites, despite the risks among patients served.

Conclusion and implications for practice. Our analysis indicates that many Strong Start participants with primary risk factors, such as pre-pregnancy hypertension or a history of preeclampsia, may not have been offered LDA. Key informant interviews indicated that many providers were unaware of evidence regarding LDA, believed effects were negligible, or felt that risks generally outweighed benefits. Risks, in fact, are very low. Some poorly controlled studies have identified a correlation between maternal aspirin use and gastroschisis in the child, a result ACOG suggests interpreting with caution. There are no other known fetal risks that stand up to scientific scrutiny.[12] Women should be screened for allergy before aspirin therapy is initiated and should be warned of bleeding risks associated with long-term daily aspirin use (more than

five years).[12] The benefits of aspirin for pregnant teens should be considered against the small risk of Reye syndrome, a rare condition that can occur in children under 18 who take aspirin while in recovery from a viral illness.[12]

Though ACOG has revised its recommendations during the last decade, updates expanded eligibility criteria, with current recommendations first published in July of 2016.[19] Current U.S. Preventive Services Task Force recommendations were established with a B rating in 2014.[11] Thus, by the time we began our interviews in October 2016, if clinicians were keeping current on the recommendations, practice changes would be expected to show increased LDA use. Targeted education for providers and patients, accompanied by practice-level policies for LDA prescription and follow-up that included all care team members, could increase evidence-based practice and potentially reduce morbidity and mortality among women and their infants at very little cost. Education for the maternity health care workforce may be especially useful in order to differentiate recommendations for pregnant women from recently revised recommendations stating that older adults should not receive universal aspirin prescription to prevent cardiovascular disease.[35] Preventing pregnancy-related hypertension and preeclampsia does have long-term potential to improve cardiovascular health.

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References

1. Sharma KJ, Kilpatrick SJ. Postpartum hypertension: etiology, diagnosis, and management. Obstet Gynecol Surv. 2017 Apr;72(4):248–52. https://doi.org/10.1097/OGX.0000000000000424 PMID: 28426127
2. Garovic VD, August P. Preeclampsia and the future risk of hypertension: the pregnant evidence. Curr Hypertens Rep. 2013 Apr;15(2):114–21. https://doi.org/10.1007/s11906-013-0329-4 PMID: 23397213
3. Steegers EA, von Dadelszen P, Duvekot JJ, et al. Pre-eclampsia. Lancet. 2010 Aug 21;376(9741):631–44. Epub 2010 Jul 2.

https://doi.org/10.1016/S0140-6736(10)60279-6
PMID: 20598363

4. Blumenshine P, Egerter S, Barclay CJ, et al. Socioeconomic disparities in adverse birth outcomes: a systematic review. Am J Prev Med. 2010 Sep;39(3):263–72. https://doi.org/10.1016/j.amepre.2010.05.012 PMID: 20709259
5. Spruill TM. Chronic psychosocial stress and hypertension. Curr Hypertens Rep 2010 Feb;12(1):10–6. https://doi.org/10.1007/s11906-009-0084-8 PMID: 20425153
6. Williams DR, Priest N, Anderson NB. Understanding associations among race, socioeconomic status, and health: Patterns and prospects. Health Psychol. 2016 Apr;35(4):407–11. https://doi.org/10.1037/hea0000242 PMID: 27018733
7. Adler N, Cutler D, Fielding J, et al. Addressing Social Determinants of Health and Health Disparities: A Vital Direction for Health and Health Care. Washington, DC: National Academy of Medicine, 2016. https://doi.org/10.31478/201609t
8. Kaiser Family Foundation (KFF). State Health Facts: Medicaid enrollment by race/ethnicity. San Francisco, CA: KFF, 2013. Available at https://www.kff.org/medicaid/state-indicator/medicaid-enrollment-by-raceethnicity/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D
9. Kaiser Family Foundation (KFF). State Health Facts: Population distribution by race/ethnicity. San Francisco, CA: KFF, 2014. Available at https://www.kff.org/other/state-indicator/distribution-by-raceethnicity/?currentTimeframe=4&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D
10. Centers for Disease Control and Prevention (CDC). Pregnancy Mortality Surveillance System. Atlanta, GA: CDC, 2019. Available at https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-mortality-surveillance-system.htm.
11. Henderson JT, Whitlock EP, O'Connor E. Low-dose aspirin for prevention of morbidity and mortality from preeclampsia: a systematic evidence review for the US Preventive Services Task Force. Ann Intern Med 2014 May 20;160(10):695–703. https://doi.org/10.7326/M13-2844 PMID: 25329211
12. American College of Obstetricians and Gynecologists. ACOG Committee Opinion No. 743. Low-dose aspirin use during pregnancy. Obstet Gynecol 2018 Jul;132(1):e44–52. https://doi.org/10.1097/AOG.0000000000002708 PMID: 29939940
13. Hoffman MK, Goudar SS, Kodkany BS, et al. Low-dose aspirin for the prevention of preterm delivery in nulliparous women with a singleton pregnancy (ASPIRIN): a randomised, double-blind, placebo-controlled trial. Lancet. 2020 Jan 25;395(10220):285–93.
14. Saccone G, Berghella V, Maruotti GM, et al. Antiphospholipid antibody profile based obstetric outcomes of primary antiphospholipid syndrome: the PREGNANTS study. Am J Obstet Gynecol 2017 May;216(5):525–e1–12. Epub 2017 Jan 30. https://doi.org/10.1016/j.ajog.2017.01.026 PMID: 28153662

15. Werner EF, Hauspurg AK, Rouse DJ. A Cost–benefit analysis of low-dose aspirin prophylaxis for the prevention of preeclampsia in the United States. Obstet Gynecol 2015 Dec;126(6):1242–50.
https://doi.org/10.1097/AOG.0000000000001115
16. Duley L, Henderson-Smart DJ, Knight M, et al. Antiplatelet agents for preventing pre-eclampsia and its complications. Cochrane Database Syst Rev. 2004;(1):CD004659.
https://doi.org/10.1002/14651858.CD004659
PMID: 17636639
17. Duley L, Henderson-Smart DJ, Meher S, et al. Antiplatelet agents for preventing pre-eclampsia and its complications. Cochrane Database Syst Rev. 2007 Apr 18;(2):CD004659.
https://doi.org/10.1002/14651858.CD004659.pub2
PMID: 14974075
18. American College of Obstetricians and Gynecologists. Hypertension in pregnancy. Report of the American College of Obstetricians and Gynecologists' task force on hypertension in pregnancy. Obstet Gynecol 2013 Nov;122(5):1122–31.
PMID: 24150027
19. American College of Obstetricians and Gynecologists (ACOG). Practice advisory on low-dose aspirin and prevention of preeclampsia: updated recommendations. Washington, DC: ACOG, 2016. Available at: http://www.losolivos-obgyn.com/info/md/acog/Low-dose%20aspirin,%20ACOG%20Practice%20Advisory%202016.pdf.
20. Ghazanfarpour M, Sathyapalan T, Banach M, et al. Prophylactic aspirin for preventing pre-eclampsia and its complications: an overview of meta-analyses. Drug Discov Today. 2020 May 29;S1359-6446(20)30202-6.
21. Roberge S, Bujold E, Nicolaides KH. Aspirin for the prevention of preterm and term preeclampsia: systematic review and metaanalysis. Am J Obstet Gynecol. 2018 Mar;218(3):287–93.e1. Epub 2017 Nov 11.
https://doi.org/10.1016/j.ajog.2017.11.561
PMID: 29138036
22. Center for Medicare & Medicaid Innovation (CMS). Strong Start for Mothers and Newborns Initiative: general information. Baltimore, MD: CMS, 2020. Available at: https://innovation.cms.gov/initiatives/strong-start/
23. Hill I, Dubay L, Courtot B, et al. Final Evaluation Report: Strong Start for Mothers and Newborns, Enhanced Prenatal Care Models, Volume 1. Baltimore, MD: Centers for Medicare & Medicaid Services, 2018. Available from: https://innovation.cms.gov/initiatives/strong-start/
24. NVivo qualitative data analysis Software; QSR International Pty Ltd. Version 10, 2012.
25. Strauss A, Corbin J. Basics of qualitative research techniques. Thousand Oaks, CA: Sage Publications, 1998.
26. Charmaz, K. Constructing grounded theory: a practical guide through qualitative analysis. Thousand Oaks, CA: Sage Publications, 2006.
27. American Association of Birth Centers (AABC). Standards for birth centers. Perkiomenville, PA: AABC, 2017. Available at: https://www.birthcenters.org/page/Standards.
28. Centering Healthcare Institute. CenteringPregnancy. Boston, MA: Centering Healthcare Institute, 2020. Available at: https://www.centeringhealthcare.org/what-we-do/centering-pregnancy.
29. Shaw D, Guise JM, Shah N, et al. Drivers of maternity care in high-income countries: Can health systems support woman centred care? Lancet 2016 Nov 5;388(10057):2282–95.

https://doi.org/10.1016/S0140-6736(16)31527-6
PMID: 27642026

30. Vedam S, Stoll K, MacDorman M, et al. Mapping integration of midwives across the United States: impact on access, equity, and outcomes. PLoS One. 2018 Feb 21;13(2):e0192523.
https://doi.org/10.1371/journal.pone.0192523
PMID: 29466389
31. Skillman M, Cross-Barnet C, Singer RF, et al. Physician engagement strategies in care coordination: findings from the Centers for Medicare & Medicaid Services' Health Care Innovation Awards program. Health Serv Res 201 7 Feb;52(1):291–312.
https://doi.org/10.1111/1475-6773.12622
PMID: 27910099
32. Pekkala J, Cross-Barnet C, Silow-Carroll S, et al. Key considerations for implementing group prenatal care: lessons from 60 practices. J Midwifery Womens Health. 2020 Mar;65(2):208–15. Epub 2019 Oct 23.
https://doi.org/10.1111/jmwh.13047
PMID: 31642589
33. Cross-Barnet C, Ruiz S, Skillman M, et al. Higher quality at lower cost: community health worker interventions in the Health Care Innovation awards. J Health Dispar Res Pract. 2018 Summer;11(2):150–64.
34. Wright D, Poon LC, Rolnik DL, et al. Aspirin for Evidence-Based Preeclampsia Prevention trial: influence of compliance on beneficial effect of aspirin in prevention of preterm preeclampsia. Am J Obstet Gynecol. 2017 Dec;217(6):685–e1–5. Epub 2017 Sep 6.
https://doi.org/10.1016/j.ajog.2017.08.110
PMID: 29505771
35. O'Brien CW, Jurasche, SP, Wee CC. Prevalence of aspirin use for primary prevention of cardiovascular disease in the United States: Results from the 2017 National Health Interview Survey. Ann Intern Med. 2019 Oct 15;171(8):596–8. Epub 2019 Jul 23.
https://doi.org/10.7326/M19-0953
PMID: 31330542