

Evaluating the statewide expansion of an educational intervention to address urgent maternal warning signs

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Abstract

Background: Recognizing the signs of life-threatening maternal complications and receiving timely, quality care can help prevent pregnancy-related deaths and adverse health consequences.

Objectives: This study evaluated the scale-up of the EMPOWER Moms initiative, one of the first statewide efforts to strengthen and standardize maternal warning signs education provided in home and community settings.

Design: The EMPOWER Moms initiative supported home visitors, community nurses, and other family support staff with training and tools to educate families in Maryland and Washington D.C. on urgent maternal warning signs. Support included online training for these educators, monthly collaborative calls, an implementation manual, and a client education toolkit with a 3-min video, illustrated handout, magnet, and discussion guide.

Methods: This mixed-methods, observational study evaluated implementation and behavioral outcomes among educators and their clients using surveys, monitoring forms, and semi-structured interviews.

Results: Two hundred and thirty-seven educators completed the training, and more than 3,300 pregnant and 3,600 postpartum clients received education between July 2022 and December 2023. The use of standardized printed materials on warning signs increased from 50.0% before training to 92.5% after ($p < 0.001$), and use of informational videos increased from 9.7% to 53.8% ($p < 0.001$). Educators showed significant improvement in their self-rated ability to educate clients about warning signs, help clients find answers to their questions, and build clients' self-confidence to discuss concerns with healthcare providers (all $p < 0.001$). Qualitative feedback endorsed the intervention's benefits in encouraging care-seeking. Educators shared stories of clients obtaining necessary care for urgent complications and suggested education had encouraged quick action when they might have otherwise hesitated. Feedback also highlighted how women were more proactively sharing their concerns and asking questions during healthcare visits.

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Conclusion: We found EMPOWER training and tools were effective in improving educators' confidence and skills to engage families in conversations about pregnancy-related complications and to support them in recognizing and obtaining prompt care.

Keywords

maternal health, urgent maternal warning signs, home visiting, community outreach, health education, patient engagement

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Introduction

Each year, more than 50,000 pregnant and postpartum women in the United States experience severe maternal morbidities that result in significant consequences for their health and approximately 700 die of maternal causes.^{1,2} Comprehensive reviews of pregnancy-related deaths have found four out of five deaths were preventable.^{3,4}

Recognizing the signs of life-threatening maternal complications and receiving timely treatment and quality care can help prevent pregnancy-related deaths and adverse health consequences. Over the past decade, professional associations have developed materials to help teach patients and their families about such warning signs. The Association for Women's Health, Obstetric, and Neonatal Nursing (AWHONN) developed a standardized teaching aid about "POST-BIRTH warning signs" for nurses to use during postpartum discharge education.⁵ Similarly, the Alliance for Innovation on Maternal Health (AIM) created illustrated materials describing "Urgent Maternal Warning Signs" that can occur during pregnancy and the year after delivery.⁶ In 2020, the Centers for Disease Control and Prevention (CDC) launched the Hear Her campaign. This campaign uses personal stories to share potentially life-saving messages about urgent maternal warning signs and to promote better communication between patients and their healthcare providers.⁷

Many healthcare professionals have adopted these educational tools, and warning signs education is frequently provided during a patient's delivery hospitalization. However, patients often receive information on many topics in the immediate postpartum period before discharge, and mental overload, stress, pain, and fatigue can make it difficult to retain this information.⁸⁻¹⁰ Moreover, postpartum discharge education only reaches patients during the narrow timeframe around birth. Complications can occur during pregnancy and up to 1 year postpartum. Thus, alternative strategies are needed to reach families outside the hospital setting and throughout this extended timeframe.

Home visiting programs, early childhood centers, and other community service providers are well-positioned to provide education on maternal warning signs, given the regular contact and long-term, trusting relationships they have with families during pregnancy and the year after

birth. Some programs already orient families to warning signs, but formative research with home visiting programs in Maryland found that few had structured training or teaching aids to support staff delivering such education.¹¹ This study evaluates the scale-up of the EMPOWER Moms initiative in Maryland and Washington D.C., one of the first statewide efforts to strengthen and standardize maternal warning signs education in home and community settings.

Methods

Intervention design

The Enhanced Maternal and Postpartum Warning signs Education and Recognition (EMPOWER Moms) initiative provided community-based service providers with training and tools to support maternal warning signs education. Guided by the "COM-B" behavior change framework, the intervention aimed to encourage care-seeking for maternal complications by addressing three pre-conditions—capability, opportunity, and motivation—necessary for care-seeking behaviors (see Theory of Change in Supplemental File 1).¹²⁻¹⁴ Home visitors, community nurses, and family support workers were trained as educators and used EMPOWER Moms tools to initiate conversations with their clients, with the goal of strengthening clients' motivation and capabilities (e.g. knowledge, skills) to recognize warnings signs and obtain healthcare that addresses their concerns. Educators also helped clients identify social support and resources to navigate obstacles to care-seeking (i.e., improve opportunities). Formative research informed the design of the intervention and selection of AIM's urgent maternal warning signs content and illustrations as the basis of client education tools.¹¹ Five home visiting programs in Maryland piloted the intervention in 2021, and their input helped refine training and tools to incorporate a conversation starter from CDC's Hear Her campaign and emphasize skills to improve patient engagement with healthcare providers.¹⁵

The current intervention included a 1.5-h online training for educators, monthly collaborative calls with program champions, an implementation manual, and a client education toolkit with a 3-min video, illustrated handout of 15 urgent maternal warning signs, magnet, and discussion guide available in multiple languages (Figure 1). Training



Figure 1. EMPOWER tools for client education. Educational materials were produced by the MDMOM and are available free-of-charge at <https://mdmom.org/warningsigns>. Images and content on the 15 urgent maternal warning signs were developed by the AIM and are used with AIM's permission in EMPOWER educational tools. MDMOM: Maryland Maternal Health Innovation Program; AIM: Alliance for Innovation on Maternal Health; EMPOWER: Enhanced Maternal and Postpartum Warning signs Education and Recognition.

and tools were produced by the Maryland Maternal Health Innovation Program and are available free-of-charge at <https://mdmom.org/warningsigns>. Content was standardized, but the delivery method was flexible. Educators most frequently provided education during home visits, but education was also provided over the phone, during group classes, and through other encounters. Education was intended to take about 15 min, and educators were encouraged to deliver education prenatally and repeat education again postpartum.

Participants and setting

We implemented EMPOWER Moms in partnership with 32 maternal, infant, and early childhood programs providing home-visiting or other community-based services in 19 of Maryland's 24 local jurisdictions and in Washington, D.C. These programs typically target low-income populations and others considered at risk of adverse maternal and child outcomes. Home visitors, community nurses, and other family support workers employed by these 32 programs were trained to deliver the EMPOWER education [henceforth, we refer to this group collectively as "educators"]. All pregnant and postpartum clients served by these 32 programs were eligible to receive the educational intervention; none were allocated to a control group.

Educators, their supervisors, and program managers at the 32 programs participating in the EMPOWER initiative were eligible to participate in the research study. Specifically, all staff who enrolled in the EMPOWER training between July 2022 and May 2023 were eligible to participate in self-administered, online surveys at three time points: immediately before training, immediately after training, and approximately 3 months after completing training (To respect the overall study timeline, some participants in the last training cohort received surveys earlier at 1–2 months after completing training. The timing for when surveys were completed is shown in Table 1). Additionally, at the study's conclusion, program champions were invited for semi-structured interviews. Champions were staff selected by their program's leadership to lead EMPOWER implementation at their site.

Pregnant and postpartum clients who receive services from these programs were eligible to participate in the client interviews. Interested clients were referred by educators to the study team; eligibility was limited to English or Spanish-speaking clients aged 18 years or older who were pregnant or had been pregnant within the past 2 years. The Supplemental File provides justification for the targeted sample size for staff and clients.

Study participants were offered a \$35 gift card for completing an interview and a \$20 gift card for completing the implementation survey. All participants provided informed consent. Consent was provided verbally for all interviews. Survey participants reviewed information about the study

prior to starting the web-based surveys; they were informed that submitting the survey meant they consented to participate in the study. The study was reviewed by the institutional review board of Johns Hopkins Bloomberg School of Public Health and determined to be exempt (IRB No. 21066).

Study design and purpose

We conducted a mixed-methods, observational study to evaluate the EMPOWER Moms intervention. We hypothesized that through implementation of EMPOWER education, pregnant and postpartum clients would strengthen their capabilities, learn to navigate opportunity, and build motivation to recognize warning signs and obtain care that meets their needs (Supplemental File 1). Our study, thus, aimed to, first, evaluate implementation of the EMPOWER Moms education and, second, assess the perceived impact of education on care-seeking behaviors. Specific research questions were:

Aim 1: Implementation of EMPOWER Moms education

- 1.1. What was the reach of maternal warning signs education? Was the educational intervention implemented as designed? Was it acceptable, adaptable, and feasible?
- 1.2. How did educators rate their motivation and capabilities to provide maternal warning signs education before and after training?
- 1.3. What were the barriers and facilitators to implementing maternal warning signs education?

Aim 2: Impact on care-seeking behaviors

- 2.1 What was the perceived impact of maternal warning signs education on care-seeking behaviors and behavioral determinants?

Measures

Implementation outcomes, including acceptability, adaptability, feasibility, fidelity, and reach of the intervention, were measured using mixed qualitative and quantitative methods. Staff surveys measured self-reported fidelity in delivering the educational intervention as intended (e.g. consistent use of tools), documented feasibility challenges (e.g. time, technology), and rated the acceptability of education tools using Likert scales (see Supplemental File 2). Interviews with program champions provided qualitative data on the acceptability, adaptability, and feasibility of the intervention and contextual factors affecting implementation; client interviews also documented acceptability. A trained study team member conducted interviews by phone or video conference using a semi-structured interview guide. Training records and quarterly monitoring forms

Table 1. Characteristics of educators participating in staff surveys.

Characteristics	Pre-training (n = 192)		Implementation (n = 93)	
	N	%	N	%
Role				
Home visitor, family support specialist, parent educator, or similar	110	58.2	45	48.4
Nurse or nurse practitioner	29	15.3	19	20.4
Director or program manager	21	11.1	11	11.8
Supervisor or clinical supervisor	10	5.3	7	7.5
Social worker	5	2.7	6	6.5
Doula	3	1.6	1	1.1
Other role	11	5.8	4	4.3
No response	3	—	—	—
Medical or nursing degree				
Yes	46	24.3	30	32.6
No	143	75.7	62	67.4
No response	2	—	1	—
Race/ethnicity				
Black/African American, non-Hispanic	70	37.4	30	33.0
Hispanic (any race)	49	26.2	16	17.6
White, non-Hispanic	61	32.6	41	45.1
Other/Multiple races	7	3.7	4	4.4
No response	5	—	2	—
County				
Rural	54	28.3	37	39.8
Urban	137	71.7	56	60.2
No response	1	—	—	—
Organization				
Government	96	50.3	57	61.3
Non-government	95	49.7	36	38.7
No response	1	—	—	—
Service delivery model^a				
HFA	64	33.5	31	33.3
PAT	26	13.6	15	16.1
EHS	22	11.5	8	8.6
Healthy start	17	8.9	8	8.6
Other model	80	41.9	35	37.6
No response	1	—	—	—
Prior training on maternal warning signs				
Yes, within last year	26	14.1	—	—
Yes, 2+ years ago or uncertain date	56	29.3	—	—
No	92	48.2	—	—
Don't remember	17	8.9	—	—
No response	1	—	—	—
Completed EMPOWER training				
Within the last month	—	—	5	5.4
2 months ago	—	—	9	9.8
3+ months ago	—	—	78	84.8
No response	—	—	1	—
Started EMPOWER implementation				
Within the last month	—	—	7	7.5
2 months ago	—	—	13	14.0
3+ months ago	—	—	67	72.0
Have not started	—	—	6	6.5

Among the staff trained, 192 (81.0%) completed the pre-training survey, 203 (85.7%) completed the post-training survey, and 93 (43.1%, 93/216) completed the implementation survey. This table shows demographic information for those completing the pre-training and implementation surveys; demographic data was not collected for the post-training survey, but it is expected to closely mirror the pre-training survey given the significant overlap in study participants. HFA: Healthy Families of America; PAT: Parents as teachers; EHS: Early head start; EMPOWER: Enhanced Maternal and Postpartum Warning signs Education and Recognition.

^aOrganizations may implement more than one service delivery model.

captured the reach of the intervention, including the number of educators trained and the number of clients who received warning signs education. Recognizing the importance of interpersonal factors, we also assessed behavioral determinants influencing educators. Staff used Likert scales to rate their motivation and capability to deliver warning signs education before training, after training, and after starting implementation.

We documented clients' care-seeking and care engagement behaviors—and explored determinants of those behaviors (e.g. capability, motivation, opportunity)—through a narrative evaluation approach using qualitative data collected from semi-structured interviews with clients and program champions, quarterly monitoring forms, and staff surveys. This approach, described by Tonkin and colleagues, collects stories of significant change to capture participant benefits of an intervention that may be otherwise difficult to quantify or measure.¹⁶

Data analysis

Our approach to developing codebooks and analyzing qualitative data was informed by behavioral and implementation science frameworks. The updated Consolidated Framework for Implementation Research (CFIR) guided our approach to coding implementation constructs relevant for our study's first aim.¹⁷ We grouped constructs into CFIR domains describing characteristics of the intervention, of the educator delivering the intervention, implementation strategies, and the inner and outer setting. The COM-B model and the Theoretical Domains Framework (TDF) guided our approach to coding behavioral constructs relevant for our study's second aim.^{12–14} The TDF is an extension of the COM-B model and further delineates behavioral determinants that underpin capability, motivation, and opportunity. Study team members first deductively coded interview transcripts and narrative responses from quarterly monitoring forms and surveys. Then, using an iterative approach, codes were added as new themes emerged. Lumivero *NVivo* (Release 1.7.1) software facilitated coding.¹⁸

Quantitative data collected through surveys were cleaned to remove duplicate and incomplete entries. After cleaning, we explored descriptive statistics for survey items, calculating means and percentages based on all non-missing values for each item. We used proportional-odds logistic regression to analyze differences in educators' motivation and capabilities between survey samples (i.e., before vs after training, before vs. after implementation). For binary measures, we used Pearson's chi-square to test for differences between survey samples at different time points. Statistical analyses were conducted using Stata, Version 15.¹⁹

We compared findings from quantitative and qualitative analyses to identify similarities and differences, explore nuances, and help explain results. For example, surveys

and quarterly monitoring reports provided quantitative measures of implementation outcomes, such as acceptability, fidelity, and reach, whereas qualitative results identified characteristics of the intervention, educators, implementation processes, and inner and outer settings that facilitated or hindered these outcomes. The study adhered to the SQUIRE 2.0 guidelines for reporting quality improvement studies (see Supplemental File).²⁰

Results

A total of 237 home visitors, community nurses, and other family support staff completed the EMPOWER educator training. Among staff trained, 192 (81.0%) completed the pre-training survey, 203 (85.7%) completed the post-training survey, and 93 (43.1%, 93/216) completed the implementation survey (The number of eligible respondents for the implementation survey was lower than the pre- and post-training surveys, because some staff were on leave or no longer employed with the organization). Survey respondents were primarily home visitors, parent educators, or similar roles (48.4%–58.2% across surveys) or nursing professionals (15.3%–20.4%) (Table 1). Many worked with home visiting programs implementing the Healthy Families of America (33.3%–33.5%), Parents as Teachers (13.6%–16.1%), Early Head Start (8.6%–11.5%), or Healthy Start (8.6%–8.9%) models; others provided services at early learning centers, with parent groups, or through community outreach. A total of 18 champions and 12 clients participated in semi-structured interviews between November 2023 and March 2024 (Table S1–S2).

Aim 1: Evaluate implementation of EMPOWER Moms education

Reach and fidelity in provision of education and use of standardized tools. More than 3300 pregnant and 3600 postpartum clients received education during the 1.5-year study period: July 2022–December 2023. Prior to the EMPOWER training, most educators reported discussing maternal warning signs with clients, but fewer used standardized educational materials. The use of standardized printed materials on warning signs increased significantly from 50.0% before training to 92.5% after ($p < 0.001$), and use of informational videos increased from 9.7% to 53.8% ($p < 0.001$) (Table S3). Qualitative feedback reinforced these findings. Overall, for many staff, the introduction of EMPOWER materials was a welcome improvement over current practice (see *relative advantage* in Table 2). However, some noted they had already been using AWHONN's or AIM's standardized materials before joining the EMPOWER initiative, so these did not observe much change in their practice.

Within EMPOWER Mom, we received additional training that we didn't receive with the other, so we were able to do a better

Table 2. Qualitative feedback on the EMPOWER intervention and implementation barriers and facilitators.

Construct	Authors' summary of qualitative feedback	Illustrative quotes
INTERVENTION. The brief educational intervention to teach urgent maternal warning signs and strategies for improving the quality of interactions with healthcare providers. This consists of a discussion between the educator and their client using standardized education tools.	<p>Design</p> <p>Educators appreciated the simplicity of the materials, with their colorful illustrations to communicate the content. Several commented that the integration of multiple learning materials (video, magnet, handout) enhanced the quality of the education. Some clients appreciated having something concrete to share with their partner or family, so they would also know what to look for and what to do in an emergency. Some particularly mentioned liking the video, although not everyone was aware of the video.</p>	<p>"The colorful handouts make it so the patients are more engaged, interested, and understand the signs, because they can 'see' what it looks like via the handout." (Champion, urban county)</p> <p>"I think that videos are very useful. . . the magnet was really nice, because it was just something small that you can put on your fridge. I remember writing my doctor's name and phone number just in case something happens to me. I don't know if I'm going to lose consciousness, and then my partners is the one that needs to contact them. So, I had that handy for him or someone else at home." (Client, rural county)</p> <p>"While on a more recent home visit with a Haitian Creole speaking mother. . . This client pointed to the picture of 'chest pain or fast beating heart' and then verbalized something to me in Creole. While using the Language Line interpreter over the phone, the interpreter stated ' . . . the words for 'chest' and 'stomach' are sometimes used interchangeably and I want to verify which body part she is referring to'. I was instantly aware of how important it was that I was able to visualize with the client that she was pointing at the picture of chest pain so there was no confusion if she was experiencing chest pain or severe belly pain which are both urgent warning signs but would require very different follow up testing/work-up and treatment." (Champion, rural county)</p>
Acceptability	<p>Education was perceived as useful in providing important information to families and giving them the confidence and language to describe their symptoms to medical professionals.</p>	<p>"The materials with visuals and the simplistic language is very helpful in getting most all moms to understand the warning signs. Home visitors have been trying to help families advocate for themselves for a long time and these materials/videos, which are credited by educators and medical personnel, have helped them succeed in talking about things with their medical staff they may have dismissed." (Supervisor, rural county)</p>
Complexity	<p>Educators agreed that the educational materials were easy to use and to understand. A few particularly highlighted how the illustrations helped communicate the content to low literacy populations.</p>	<p>"If you're a visual learner. . . It's an easier way for people to connect to the information, especially if you're a first-time mom, and you have these worries and these stressors. And I think yes, it's nice to read the information, but it's also nice to have the information on the screen with actors and doctors talking about the information." (Champion, rural county)</p>
Adaptability	<p>Programs spoke about how they used materials not only during home visits, but also shared these in mail-outs, on social media, and at community events. Additionally, educators said having handouts in many languages was useful for sharing content with families who spoke different languages. A few wished the video and magnet could likewise be translated into more languages.</p>	<p>"We enjoyed being able to share the Maternal Warning Signs more broadly this past quarter during health fairs and back-to-school events. It was well received by families even in a brief touch during outreach events." (Champion, urban county)</p> <p>". . . having a structured handout in their native language that they can bring with them to appointments to help guide discussions with their OB a huge help!" (Champion, rural county)</p>
Relative advantage	<p>Many educators felt the materials provided useful training and new tools that complemented their existing curriculum. They appreciated the training for staff and the integration of multiple teaching tools (video, magnet, handout) to enhance the quality of education on maternal warning signs. Some emphasized their appreciation of the visuals and multiple language translations, which helped them navigate language barriers and respond to warning signs appropriately. Conversely, a few educators noted that they had already been providing similar education on warning signs before the EMPOWER training, so they hadn't observed much change from previous practice.</p>	<p>"Within EMPOWER Mom, we received additional training that we didn't receive with the other, so we were able to do a better job quite frankly, and I think spent more time. Of course, it wasn't just a fact sheet, there was the video, there was magnets. So, it really was more comprehensive, thus better quality of education that was able to be provided. . . it provided more structure to the program as well." (Champion, rural county)</p>
IMPLEMENTATION PROCESS. The activities and strategies used by the Program to implement the EMPOWER education.	<p>Implementation process</p> <p>Champions discussed ways their sites are institutionalizing maternal warning signs education as a part of their programming. Some mentioned incorporating maternal warning signs education into their home visiting protocols and checklists. Several programs now include the EMPOWER training as part of their onboarding process for new staff. One program mentioned that, as part of their program planning process, they are strategically identifying opportunities to share information on warning signs with families. Others spoke about the different strategies they've used to disseminate information, including home visits, center visits, group classes, community events, care coordination calls, and mail-outs.</p>	<p>"[staff] . . . know that they need to bring this form that we use with it, write down all of the topics that they went over, check off the boxes of like, yes, we went over the EMPOWER Moms material. So, it's definitely embedded in our training materials and our checklists." (Champion, urban county)</p> <p>"The most significant change has been using the maternal warning signs in our program planning process. We are intentionally discussing what programs and events we can share the information at and looking at ways we can get the word out to the community." (Champion, rural county)</p> <p>"We noticed that families were much more open to hearing/ discussing the information in a home visiting fashion as opposed to center enrollment intakes and center-based groups. Meeting families where they are, on their 'turf', and having organic, fluid conversations about maternal warning signs was highly received." (Champion, rural county)</p>

(Continued)

Table 2. (Continued)

Construct	Authors' summary of qualitative feedback	Illustrative quotes
EDUCATORS. The roles and characteristics of the home visitors, nurses, community health workers, and family support workers who deliver the education.	Some educators mentioned how the maternal warning signs education resonated with them in a personal way and how this motivated them to share this information with the mothers. Others mentioned how their motivation came from learning more about the high rates of maternal mortality in the United States.	"Some people absorb the information and like really connected with it, because of a personal experience with dealing with complicated pregnancies or complicated postpartum periods, and [having that] . . . I understand this matters, or I've lost someone, or I've had someone who experienced them . . . and therefore it really matters to me." (Champion, urban county)
Educator capability	Educators shared that the training and tools helped give them greater confidence to have conversations with their clients about urgent maternal warning signs and to encourage them to seek care promptly. Some shared specific examples of how they supported clients to recognize signs and seek care.	"Since joining the EMPOWER initiative, staff have been more aware about how speaking with families about maternal health can have significant outcomes on the health and well-being of mothers and infants. One example of this happened after a Family Support Specialists (FSS) reviewed the warning signs with a new prenatal mom. Mom's blood pressure was high, and she had difficulty breathing but wanted to wait until her next appointment to review it with her provider. With encouragement from her FSS, she called her doctor and scheduled a same-day appointment after her home visit. During her appointment, mom was sent to the hospital where she needed to have an emergency c-section." (Champion, rural county) ". . . we have heard from program families that receive their prenatal or postpartum care at [health center name] that this information has been shared with them briefly during their appointments. However, families have also shared that they appreciate that their FSWs (family support workers) take the time to go over the warning signs and support their understanding not only with videos and brochures but with meaningful conversations." (Champion, urban county)
Interpersonal relationship (Educators-clients)	Educators shared how this education became an important moment to connect with their client. The trusted rapport, safety of the home environment, and dedicated time facilitated meaningful conversations and helped clients open up about concerns they might otherwise hesitate to share.	". . . Material is shared with each and every client. It's not difficult to incorporate into what we do, because this is what we do right? So it is easy to do it." (Champion, urban county)
INNER SETTING. The setting in which the education is implemented, e.g. home visiting program, early childhood center).	Educators discussed the ease of incorporating the EMPOWER education into their current workflow because it was related to things they already discussed with their clients.	"We've been through a lot of internal transitions within the department and program. So a lot of the new home visitors or educators they weren't really given opportunity to learn about [the EMPOWER Moms Program] . . . They kind of just see the handout, and [use it] as a reference versus a lesson." (Champion, urban county)
Alignment	One of the main challenges to implementing the EMPOWER education discussed by several champions was the lack of staffing or frequent changes in staffing.	"We are expanding the ways that we talk about the postpartum period, we are trying to shift even more focus to mom's health and recovery. Moms often share with us how much emphasis they are putting on baby's needs and how little effort they're able to put on their own health. EMPOWER Moms gave us a great jumping off point and renewed our commitment to caring for moms." [during this period]. (Champion, urban county)
Staffing	Champions highlighted how staff share common values about the importance of this work and see it as complementary to the services they already provide families. For programs that primarily focused on early childhood, they spoke of how the EMPOWER training and tools had helped them to integrate more content on maternal health.	"We are expanding the ways that we talk about the postpartum period, we are trying to shift even more focus to mom's health and recovery. Moms often share with us how much emphasis they are putting on baby's needs and how little effort they're able to put on their own health. EMPOWER Moms gave us a great jumping off point and renewed our commitment to caring for moms." [during this period]. (Champion, urban county)
Workplace culture	The broader setting in which the EMPOWER intervention was deployed. It examines how the social, political, and economic context within the community, state, or national level interplay with the Inner Setting, and how this affects implementation.	"There is limited OB care in [our] county, so many families are forced to go out of county or out of state for care. This complicates things for many families, but especially those who have Maryland Medicaid because they are unable to obtain care [outside the state] because MD Medicaid is not accepted at [out-of-state] providers. This can lead to long wait times for care of families obtaining late prenatal care." (Champion, rural county)
Local conditions	The pandemic had an adverse impact on many home visiting programs, disrupting service delivery and staffing. While in-person visits had resumed for most, several programs mentioned that they are still rebuilding and restaffing.	"The pandemic significantly affected service delivery across home visiting programs city and statewide. While remote service delivery was a solution, it was not enough to address ALL of the gaps in health access or prevent adverse maternal health events (i.e. severe maternal morbidity, maternal mortality, infant mortality, etc.)." (Champion, urban county)
Critical incidents		

EMPOWER: Enhanced Maternal and Postpartum Warning signs Education and Recognition.

job quite frankly, and I think spent more time [on education]. Of course, it wasn't just a fact sheet, there was the video, there was magnets. So, it really was more comprehensive, thus better quality of education that was able to be provided. . . it provided more structure to the program as well. (Champion, rural county)

Among those using EMPOWER tools, 72.2% of educators almost always discussed the handout, and nearly half (48.8%) almost always watched the video together with their clients (Table S4). Although programs reported widespread use of tools, interviews revealed some gaps in implementation fidelity. Some clients did not recall receiving education on warning signs, and several educators reported being unaware of the 3-min video, consistent with the relatively lower frequency of video use reported in the survey. Educators reported that clients sometimes faced challenges in viewing the video due to poor internet access, data limits, or other technology issues, but most did not identify this as a major problem (Figure S1). Qualitative data identified strategies that facilitated implementation fidelity; for example, some programs incorporated warning signs education into checklists or policies defining content that should be covered during visits with parents (see *implementation process* in Table 2).

[staff]. . . know that they need to bring this form that we use with it, write down all of the topics that they went over, check off the boxes of like, yes, we went over the EMPOWER Moms material. So, it's definitely embedded in our training materials and our checklists. (Champion, urban county)

Acceptability of training and tools

Educators gave the EMPOWER training an overall average rating of 3.7 points on a 4-point scale: 98.5% rated it excellent or good (Figure 2). Educators agreed EMPOWER materials were easily understood (93.2%) and improved clients' knowledge of when to seek care for potential complications (94.5%). While a few educators felt it may cause unnecessary worry, the majority (63%) did not, and qualitative feedback emphasized educator and clients' shared beliefs that education was important and potentially life-saving (see *acceptability* in Table 2). Educators appreciated the simplicity of the materials, with their colorful illustrations to communicate content and translations into multiple languages (see *design and complexity* in Table 2). Several shared stories of how these tools helped them navigate language barriers and assist clients to seek appropriate care for complications. They also liked having multiple teaching tools (video, magnet, handout) to enhance the quality of education on maternal warning signs. Clients appreciated having something concrete to share with their partner or family so they too would know what to do in an emergency, and something concrete they could use during visits with providers to help them explain their symptoms

and concerns. Overall, staff surveys found approximately four out of five educators agreed or strongly agreed the EMPOWER tools were an improvement over previous materials they used, if any (Table S5).

I think that videos are very useful. . . the magnet was really nice, because it was just something small that you can put on your fridge. I remember writing my doctor's name and phone number just in case something happens to me. I don't know if I'm going to lose consciousness, and then my partner is the one that needs to contact them. So, I had that handy for him or someone else at home. (Client, rural county)

Feasibility and adaptability of education

Educators agreed that the educational materials were easy to use. In qualitative feedback, multiple educators said education was well-aligned and complementary to topics they already discussed with their clients, making it easy to incorporate the EMPOWER education into their current workflow (see *alignment* in Table 2). Implementation did face challenges, including staff turnover and minor problems reaching families at the right time—some families were referred late in the postpartum period or when their child was already a toddler. To address staff turnover, some programs adopted onboarding procedures requiring new staff complete EMPOWER training (see *staffing and implementation process* in Table 2). Time was not considered a major constraint (Figure S1). The majority of educators spent between 5 and 15 min on warning signs education, a similar time before and after training (Table S3).

Material is shared with each and every client. It's not difficult to incorporate into what we do, because this is what we do right? So it is easy to do it. (Champion, urban county)

Materials were adaptable for use in different contexts. Educators routinely discussed materials during home visits and other one-on-one interactions with parents. Additionally, some programs shared materials through mail-outs, on social media, during group classes, and at community events (see *adaptability and implementation process* in Table 2). A few programs shared information with fathers during fatherhood classes and family visits. Those who tried different approaches spoke of the relative advantages of each. For example, group sessions provided an opportunity for parents to share experiences and build community. Conversations during home visits provided a safe setting where parents felt comfortable asking questions and sharing their concerns with home visitors.

We enjoyed being able to share the Maternal Warning Signs more broadly this past quarter during health fairs and back-to-school events. It was well received by families even in a brief touch during outreach events. (Champion, urban county)

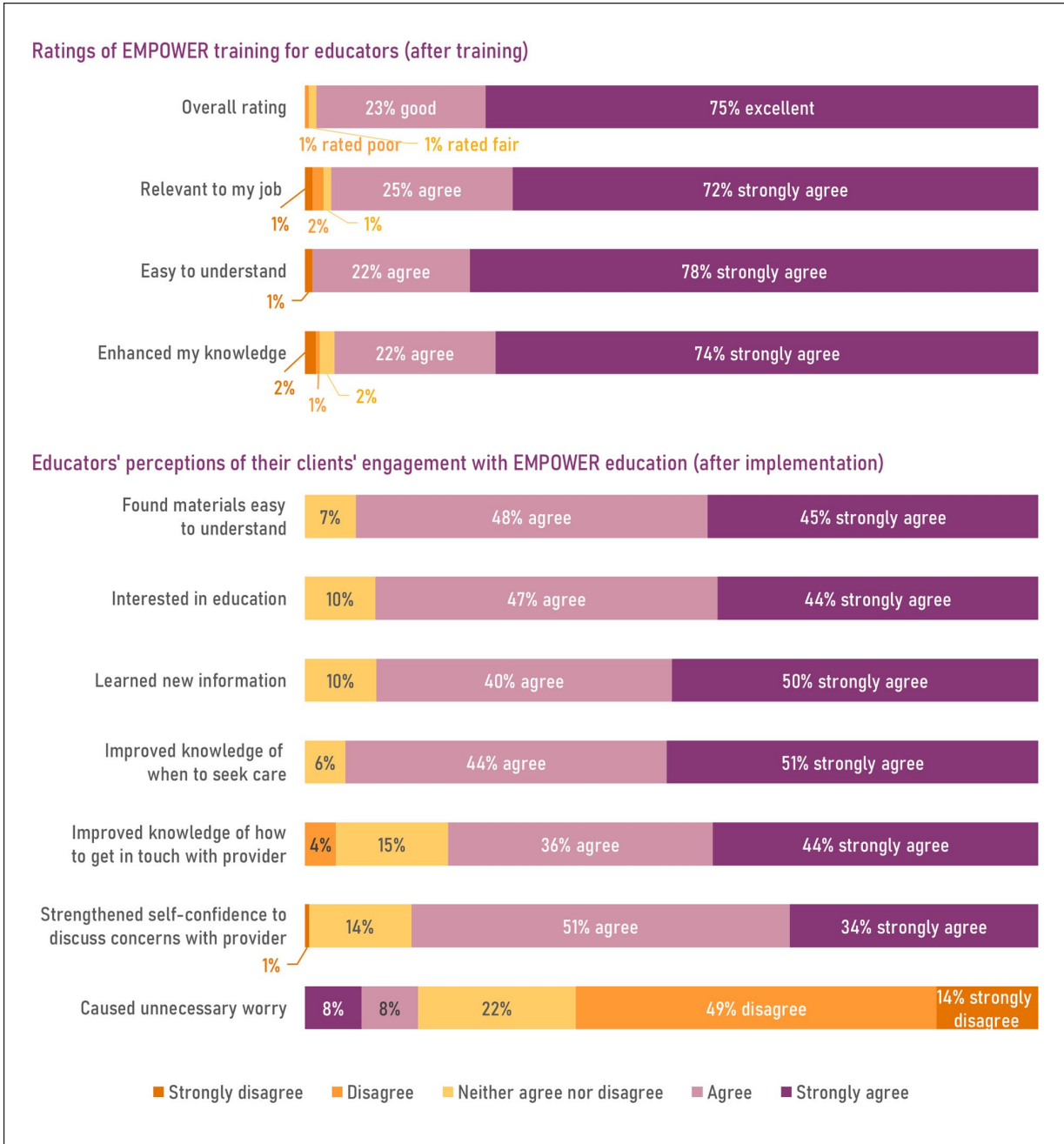


Figure 2. Ratings of EMPOWER training and education tools. Results from staff surveys administered immediately after training and after implementation of EMPOWER intervention. EMPOWER: Enhanced Maternal and Postpartum Warning signs Education and Recognition

Educators' motivation and capabilities

Educators showed significant improvements in their familiarity with maternal warning signs and their self-rated ability to educate clients about signs, help clients find answers to their questions, and build clients' self-confidence to discuss their concerns with healthcare providers (all $p < 0.001$) (Figure 3, Table S6). Motivation remained high before and after training, with more than 80% strongly

agreeing that it is important to educate clients about warning signs of maternal complications (Table S7). Some educators shared their motivation came from personal experience, from their interactions with families they served, or their workplace culture and values (see *educator motivation and workplace culture* in Table 2). Others cited the high rates of maternal mortality in the United States and their communities as their motivation. Educators shared how the EMPOWER training and tools gave them

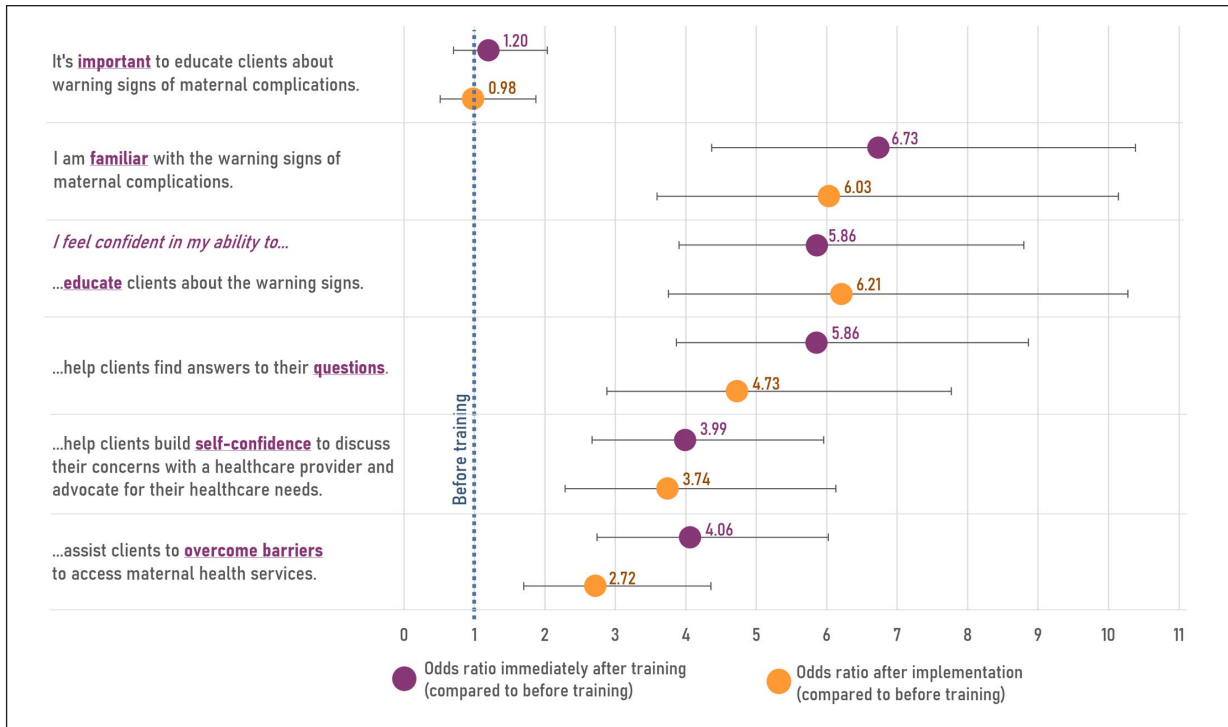


Figure 3. Change in educators’ self-rated motivation and capabilities to provide maternal warning signs education: Odds of self-rated improvement before vs. immediately after training and before vs. after starting implementation.

greater confidence to talk about maternal warning signs with their clients, and how this sparked more intentional and meaningful conversations with clients about their health (see *educator capability and interpersonal relationships* in Table 2).

“Moms often share with us how much emphasis they are putting on baby’s needs and how little effort they’re able to put on their own health. EMPOWER Moms gave us a great jumping off point and renewed our commitment to caring for moms [during this period].” (Champion, urban county)

Aim 2: Assess perceived impact on clients’ care-seeking behaviors

Qualitative feedback highlighted how education had increased families’ awareness of urgent maternal warning signs and encouraged women to pay greater attention to their health before and after giving birth (see *client capability and client motivation* in Table 3). Some clients said they previously thought such signs were normal and, before receiving education, would have ignored them.

... It’s my first baby. I had no knowledge about any of these things that could happen during and after pregnancy. So, I think that if I hadn’t seen the video, I think I would have said ‘no, it’s normal for pregnancy’, ... So, it does help me, because I’m more aware that if any of those emergencies

happen, I can go directly to the hospital to say what it is, how I feel, and what is happening to me. (Client, urban county)

Educators likewise spoke of clients being more attentive to their health needs and less likely to ignore signs. Education helped equip families with language to communicate their concerns to healthcare providers. Several educators shared stories of families bringing the handout with them to healthcare visits to help explain their concerns or using the conversation starter to ask questions. According to educators, their clients demonstrated greater confidence asking questions and advocating for themselves.

We also have noticed that families feel confident in sharing their own health needs, more comfortable in asking questions and advocating for their own health as well as their children’s. They are keeping doctors’ appointments and sharing feedback. (Champion, urban county)

Educators also shared examples of times when clients had recognized signs and promptly sought care (see *impact* in Table 3). Several educators believed their clients were motivated to take quick action because of the warning signs education, suggesting clients might have otherwise hesitated or delayed seeking care. Some cases resulted in clients being immediately admitted to the hospital for surgery or treatment, underscoring that consequences might have been worse had immediate action not been taken.

Table 3. Qualitative feedback on factors influencing care-seeking and care engagement.

Construct	Authors' summary of qualitative feedback	Illustrative quotes
<i>Client Capability.</i> Knowledge	The client has interpersonal competence, knowledge, and skills to recognize warning signs, seek care, and engage with providers to meet their healthcare needs. Clients and educators shared how the education increased awareness and familiarity with warning signs. Some clients shared they thought such signs were normal and, before the education, would have ignored them. They appreciated having concrete signs to look out for. However, some clients remarked that they didn't remember receiving education on warning signs from their home visitors; some enrolled in home visiting after giving birth, so they hadn't had the opportunity to receive this information from home visitors during their pregnancy.	". . . And as I told you, it's my first baby. I had no knowledge about any of these things that could happen during and after pregnancy. So, I think that, if I hadn't seen the video, I think I would have said 'no, it's normal for pregnancy' . . . So, yes, it helps me because, at least, I know, that anything that happens to me like fever, bleeding, [audio unclear], dizziness, body pain and all that is something. It's a bad thing for my health. So, it does help me, because I'm more aware that if any of those emergencies happen, I can go directly to the hospital to say what it is, how I feel, and what is happening to me." (Client, urban county)
Beliefs about capabilities	Education helped build pregnant and postpartum clients' confidence in their own abilities to identify concerns, ask questions, and engage with their providers to meet their healthcare needs.	"My staff has informed me that the clients are now more aware and confident that they can seek medical help when the signs are noted. Before, they would hesitate or thought it could 'wait until the next appointment.'" (Supervisor, urban county)
Skills	Education helped equip families with language and strategies to communicate their concerns with healthcare providers. Several educators shared examples of how families brought the handout with them to their healthcare visits to help explain their concerns or used the conversation starter to ask questions.	"Families have learned new terminology which helps them feel more confident when speaking to medical providers about their health concerns during and after pregnancy." (Champion, urban county)
<i>Client/Motivation.</i> Intentions	The client is committed to seeking care and engaging with providers to meet their healthcare needs. Educators spoke of how EMPOWER education sparked meaningful conversations with their clients about their health. These conversations encouraged clients to pay greater attention to their health and how they are feeling.	"I think that it allows more focus to be placed on how mom is actually feeling, especially during the postpartum period, where so much messaging and information is focused on the baby's health. I think this prompts moms to check in with themselves, to know what signs are typical in postpartum versus when they should seek medical attention." (Educator, urban county)
Emotions	A few clients spoke about how their fears and anxieties had prompted them to reach out to healthcare providers about their concerns. They feared the potential health consequences of inaction, so they sought medical advice. Others spoke about how positive emotions, such as self-confidence or resolve, encouraged women to ask questions and engage with providers about their health concerns.	". . . Like I had my first 3 kids before I was 21, so I was older, and this one and I was just really scared about that. But at the same time, I have really bad anxiety. And I just kept telling them something was gonna happen. It was gonna happen. I just didn't know when. And then happened. I don't know it's just that, I guess a mother's intuition, you can tell.'" (Client, rural county)
Reinforcement (positive or negative)	Some clients hesitated to seek care or share their concerns because of previous negative experiences with their medical providers. They sometimes felt their concerns were dismissed by providers. Others, especially in rural areas, felt discouraged by previous difficulties trying to obtain medical care, including limited provider availability and long delays in scheduling appointments. Home visitors were able to mitigate some of these negative experiences, by validating clients' concerns and encouraging them to seek care and ask questions.	"Clients seem to do very well recognizing the warning signs in themselves but feel discouraged when they are dismissed by a healthcare provider. I have begun encouraging clients to bring the Urgent Maternal Warning Signs handout with them to their provider office/ER when they are experiencing a problem and show them that this symptom IS in fact a warning sign and not 'just a normal part of pregnancy'. I encourage them to use the back of the handout to guide a discussion with their provider, especially asking 'what tests can be done to make sure this isn't a more serious issue?' Clients seem to like having something tangible to guide their conversation." (Champion, rural county)
<i>Opportunity.</i> Social influences	The client has availability, scope, and power to obtain timely, quality care that meets their healthcare needs. Some social influences discouraged clients from seeking care. For example, some shared how patients hesitated to share their concerns with healthcare providers, because they didn't want to appear foolish and felt the providers must know better than them. Conversely, having conversations with their home visitor or sharing materials with their family or friends encouraged moms to speak up about their concerns.	"Some people think I didn't go to college. They're going to think I'm stupid if I ask. . . So I feel like a lot of times, there's some stigma, like, oh, they're [doctors are] smarter than me or something, so I guess the patients need to feel more at ease to ask, and it could probably help a lot of maternal deaths or horrible other things that keep happening in the world." (Client, rural county) "They are more open to discussing maternal health warning signs with their families, friends, and peers. We did an hour-long group with our pregnant and postpartum moms where we discussed the maternal warning health signs and how to have discussions with providers. Many families opened up about their personal experiences which helped to universalize and normalize it for participants." (Educator, rural county)

(Continued)

Table 3. (Continued)

Construct	Authors' summary of qualitative feedback	Illustrative quotes
Healthcare context and experience of care	While some patients shared positive interactions with healthcare professionals who listened and cared for them, several mentioned that they felt unheard or that the medical provider(s) did not listen to their concerns or requests during prenatal appointments and the delivery. Some believe that adverse outcomes could have been avoided if providers had listened to their concerns and taken action sooner. Clients sometimes felt rushed during their visits, and that providers didn't always take the time to fully explain procedures to them.	<p>"They said I was a first-time mom, which is true. I was, but still they weren't taking me serious. They kept saying that I was nervous, and all these other things, which is probably true, but there's merit to what I was saying, because look what happened. He [her baby] passed away. They didn't listen to me." (Client, rural county)</p> <p>"So, while I was pushing, I noticed the heart rate dropping again, and I kept saying something was wrong. Something was wrong, and nobody was listening." (Client, rural county)</p> <p>"When she came in, she just laid it flat out like we couldn't find a heartbeat, and it was the way she said it. I'm just like, wait a minute, what? It was like she had no care in her voice. . . and telling me that news, the way she said it to me, made everything worse." (Client, rural county)</p> <p>"As far as the doctors, I mean, I know they're busy, but I think sometimes, you know, just taking a couple of minutes to look over the chart to really study, you know, the patient that you're getting ready to go and see, and things like that could definitely help a lot of situations." (Client, rural county)</p>
Preconceptions and differential treatment	A few clients reported feeling that certain personal attributes, such as their age, weight, or race/ethnicity, their insurance (having public vs. private), or even being a first-time mom may have caused medical staff to treat them differently or not to take their concerns as seriously.	<p>"I was a teen parent. So, I had people already looking down on me for that. Like healthcare professionals and stuff." (Client, rural county)</p> <p>"But I wonder sometimes, did they? Just because I paid more, because I had actual insurance, is that what made the difference?" [when asked why she received better care for later births compared to the first birth that was covered by public insurance] (Client, rural county)</p>
Environmental context and resources	Lack of a reliable means of transportation, childcare, and health insurance coverage were mentioned as obstacles to accessing medical care. Other factors, such as low incomes, lack of steady employment, housing instability, or legal status, exacerbated challenges in accessing care for some.	<p>". . . A lot of the families who are referred to us are living below the poverty level, so [they] do not have reliable transportation. They do not have reliable income, so housing is constantly a worry for them." (Champion, rural county)</p>
<i>Impact.</i> The client recognizes and acts when they experience a warning sign.	They seek care and engage with healthcare professionals to meet their healthcare needs.	
Care-seeking	Multiple examples were shared of clients identifying warning signs and promptly seeking care. In some cases, these urgent cases might have been much more severe if they had waited. Several mentioned they were motivated to take quick action because of the warning signs education that was provided.	<p>"Clients feel more empowered to know what the warning signs are prenatally and postnatally. I recently had a postpartum client experiencing chest pain. Instead of ignoring what she was feeling, she shared this warning sign with her doctor and was able to get the care that she needed. Possibly saving her life. People all too often ignore warning signs and the EMPOWER initiative encourages them to discuss these warning signs with their doctor." (Educator, urban county)</p> <p>"One of my moms had shortness of breath and dizziness. She was going to wait until her appointment to discuss with the doctor. After learning about the urgency of warning signs, she called her doctor and was seen that day. She was sent to the hospital and had a C-section." (Educator, rural county)</p>
Engagement in care	Many educators shared that the EMPOWER education has improved clients' confidence to share their concerns with their healthcare provider and ask more questions. They appreciated having terminology and materials they can take with them to their visits to better communicate with their providers.	<p>"We also have noticed that families feel confident in sharing their own health needs, more comfortable in asking questions and advocating for their own health as well as their children's. They are keeping doctors' appointments and sharing feedback. Families who were once uncomfortable of sharing their own family's routine are now open to share and even more so showing openness to feedback and suggestions." (Champion, urban county)</p> <p>"Clients are more apt to go to the doctor when they have an issue. They are also asking more questions during visits." (Educator, rural county)</p>

EMPOWER: Enhanced Maternal and Postpartum Warning signs Education and Recognition.

Clients feel more empowered to know what the warning signs are prenatally and postnatally. I recently had a postpartum client experiencing chest pain. Instead of ignoring what she was feeling, she shared this warning sign with her doctor and was able to get the care that she needed. Possibly saving her life. People all too often ignore warning signs and the EMPOWER initiative encourages them to discuss these warning signs with their doctor. (Educator, urban county)

However, feedback also highlighted the challenges clients face in obtaining care. Educators perceived the biggest challenge was that clients sometimes felt unable to obtain medical care even if they were worried about a possible complication. Nearly half (44%) of educators identified this as a problem (Figure S1), and qualitative feedback provided further insight and validation (see *opportunity* in Table 3). Several respondents shared experiences in which they, or their clients, felt unheard or mistreated by health-care providers; these experiences made them feel care was not attainable when they needed it. While some tried to seek care elsewhere, this was not always feasible or timely. Especially in areas experiencing shortages of maternity care professionals, it could be difficult to obtain appointments, and patients had few alternatives if they were not satisfied with their provider. Limited or lack of transportation, childcare, and insurance also made it difficult for some clients to seek care.

They said I was a first-time mom, which is true. I was, but still they weren't taking me serious. They kept saying that I was nervous, and all these other things. . . They didn't listen to me. (Client, rural county)

Discussion

This educational intervention sought to empower women to obtain timely, quality care for maternal complications by addressing three pre-conditions: capability, opportunity, and motivation. Qualitative feedback from educators and their clients endorsed the intervention's benefits in strengthening clients' capabilities and motivation. Women appreciated having concrete materials, endorsed by professional associations, that they could share with their healthcare providers to help them explain their symptoms, as well as use as conversation starters with sample questions to facilitate a better healthcare interaction. Similar to other studies, some women previously hesitated to share their concerns because they believed symptoms were "normal" for pregnancy, and they did not wish to bother their provider or seem ignorant.^{21,22} Having these professionally reviewed materials, alongside coaching from their home visitor, gave them greater confidence to voice their concerns. By dedicating time to discuss warning signs during visits, educators also provided space for meaningful conversations about maternal health and motivated women to pay greater attention to their own health needs. Several

educators shared stories of clients obtaining care for urgent complications, and some suggested the warning signs education likely encouraged clients to seek care promptly when they might have otherwise hesitated.

The intervention's impact on opportunity was mixed. The intervention sought to help clients navigate obstacles to care-seeking (i.e., improve opportunities) by helping clients identify social support and resources. In some cases, education helped strengthen social support. Consistent with other studies,^{9,21} participants highlighted the value of engaging partners and family members, recognizing their role in helping women seek care and advocating on their behalf should they be unable to communicate themselves. Additionally, some educators helped clients connect with resources, such as enrolling in insurance or finding lower-cost care, but other obstacles were outside their control. This intervention focused on personal health behaviors; it could not address the broader environment affecting access to health services. The location of facilities, opening hours, appointment mechanisms, and insurance policies are just a few examples of supply-side factors that influence the availability and affordability of health-care.²³ Moreover, professional values, norms, beliefs, and other characteristics of healthcare professionals influence the quality of patient-provider interactions.²³ Like other studies, healthcare experiences varied widely. Some reported positive interactions, whereas others noted delays in securing an appointment or getting in contact with their provider, or felt their concerns were sometimes ignored or dismissed by healthcare professionals.^{9,21,22}

Limitations

This study was an observational, non-randomized study. As such, we are unable to compare outcomes with a counterfactual of what would have happened should participants not receive the educational intervention. Additionally, community-based programs voluntarily enrolled in the EMPOWER study; these programs may differ from those who chose not to participate. For example, leadership may be more committed to maternal health education and more willing to invest staff time and resources toward training and implementation. Similarly, participants choosing to respond to surveys and participate in interviews may be more enthusiastic about the intervention or have more compelling stories to share than non-respondents. Furthermore, while a wide variety of programs across the state participated in the study, the clients interviewed came from a few programs and may not represent the broader range of client experiences. Staff attitudes and practices relevant to warning signs education were assessed at multiple timepoints; however, surveys were administered anonymously. Thus, we are unable to link records to measure changes in staff attitudes and practices at an individual level; instead, we report changes in aggregate. Finally, we

rely on self-reported information from educators and clients to evaluate implementation processes and outcomes; study participants may not be able to assess their own capabilities accurately, or they may tend to focus on positive examples of the intervention's impact. To mitigate these limitations, we use a combination of quantitative and qualitative methods to explore nuances in data and validate our findings.

Implications for policy and practice

Our results suggest high acceptability and positive benefits to integrating education about urgent maternal warning signs into home visits and other community outreach. Given their trusted relationships and sustained engagement with families during pregnancy and the year after birth, home visitors and other family support workers are well-placed to reinforce and extend education on urgent maternal warning signs outside the hospital setting. Our study demonstrated that this brief educational intervention was feasible and adaptable to various home and community settings, and educational materials were considered useful and easy-to-understand. Another statewide program in Ohio likewise showed the feasibility and positive benefits of delivering education on urgent maternal warning signs at Women, Infants, and Children (WIC) clinics.²⁴ In both Maryland and Ohio, these statewide initiatives included staff training and monthly collaborative calls to foster peer-to-peer learning and provide technical guidance to assure quality implementation. Other states may benefit from similar strategies to support community-based cadres as they expand warning signs education into new settings.

This study adds to our understanding of the benefits and limitations of patient-facing interventions. A systematic review of randomized trials found that similar interventions to increase patient and family involvement in escalation of care may improve knowledge of warning signs and care-seeking responses.²⁵ However, there are few randomized studies of such interventions, and insufficient evidence exists to determine their impact on health outcomes. Likely, patient-facing interventions alone will be insufficient to overcome the array of factors contributing to pregnancy-related morbidity and death. Data from maternal mortality reviews show how multiple factors often contribute to each pregnancy-related death and illustrate the need for a comprehensive approach to address factors at the patient, provider, community, health facility, and system level.²⁶ For example, improving patient-provider communication and reducing missed or delayed diagnoses will require engagement with maternity care professionals and with staff in emergency departments (EDs) where women may seek care for pregnancy-related complications. Recognizing this need, CDC's Hear Her campaign developed resources for healthcare professionals,²⁷ and the

Reproductive Health National Training Center produced training and tools for non-obstetric providers that emphasize the importance of screening for pregnancy-related complications in ED and outpatient settings.²⁸ These complementary tools mirror AIM's patient-facing materials on urgent maternal warning signs, and they may help in standardizing terminology and building a shared sense of urgency across patients and providers to promptly address such concerns.

Finally, our study highlights the need for policy and system changes to reduce obstacles to care-seeking. Health facilities may consider expanding office hours or providing ways to contact providers outside hours to reduce delays to care-seeking, and they may offer transportation or childcare for medical appointments. Care coordination and patient navigation can also help improve patient outcomes by facilitating enrollment in care, care continuity, and access to community resources.²⁹⁻³¹ At the policy level, strategies are needed to address shortages in maternity care providers and closures of maternity wards, especially in rural areas. While Maryland has relatively better access to maternity care than other states, the limited choice and long waiting times to access maternity providers were common themes mentioned by rural participants. Nationwide, more than one-third of U.S. counties are considered maternity care deserts, without a single obstetric clinician or hospital offering obstetric services.³²

Conclusion

Home visitors, community nurses, and other family support workers are well-positioned to educate families on the urgent warning signs of maternal complications during pregnancy and the year after birth. Education can be feasibly integrated into home visits or community outreach, and standardized education materials, adapted from AIM's Urgent Maternal Warning Signs and CDC's Hear Her campaign, are considered easy-to-understand, visually appealing, and useful. Brief, meaningful conversations facilitated by a trained educator in the home or community can encourage care-seeking and more active engagement with healthcare professionals. However, patient engagement alone is insufficient to assure timely, quality care. Improving maternal care and outcomes requires a comprehensive approach that involves patients, families, healthcare professionals, and policy and social systems.


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Ethical considerations

The study was reviewed by the institutional review board of Johns Hopkins Bloomberg School of Public Health and determined to be exempt (IRB Number 21066).

Consent to participate

All participants provided informed consent. Consent was provided verbally for all interviews. Survey participants reviewed information about the study prior to starting the web-based surveys; they were informed that submitting the survey meant they consented to participate in the study.

Consent for publication

Not applicable. We do not publish any personally identifiable data, images, or videos.

Author Contributions

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.*

Supplemental material

Supplemental material for this article is available online.

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