

**Can an integrated obstetric emergency simulation training improve respectful maternity care?  
Results from a pilot study in Ghana**

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**Can an integrated obstetric emergency simulation training improve respectful maternity care?  
Results from a pilot study in Ghana**

**Abstract**

Background: Few evidence-based interventions exist on how to improve respectful maternity care (RMC) in low-resource settings. We sought to evaluate the effect of an integrated simulation-based training on provision of RMC.

Methods: The pilot project was in East Mamprusi district in Northern Ghana. We integrated specific components of RMC, emphasizing dignity and respect, communication and autonomy and supportive care, into a simulation training to improve identification and management of obstetric and neonatal emergencies. Forty-three providers were trained. For evaluation, we conducted surveys at baseline (N=215) and endline (N=318) six months later, with recently delivered women to assess their experiences of care using the person-centered maternity care scale. Higher scores on the scale represent more respectful care.

Results: Compared to the baseline, women in the endline reported more respectful care. The average person-centered maternity care score increased from 50 at baseline to 72 at endline, a relative increase of 43%. Scores on the sub-scales also increased between baseline and endline: 15% increase for dignity and respect, 87% increase for communication and autonomy and 55% increase for supportive care. These differences remain significant in multivariate analysis controlling for several potential confounders.

Conclusions: The findings suggest that integrated provider trainings that give providers the opportunity to learn, practice, and reflect on their provision of RMC in the context of stressful emergency obstetric simulations has the potential to improve women’s childbirth experiences in low-resource settings. Incorporating such trainings into pre-service and in-service training of providers will help advance global efforts to promote RMC.

33 **Keywords:** Person-centered maternity care, respectful maternity care, simulation training, quality of care,  
34 mistreatment, Ghana

### 35 **Introduction**

36 Respectful maternity care (RMC), which is core to person-centered care, is recognized as key to  
37 improving maternal and neonatal health outcomes.<sup>1,2</sup> RMC is highlighted in the World Health  
38 Organization recommendations for a positive childbirth experience, and is described as care during  
39 childbirth that maintains women's dignity; ensures privacy and confidentiality and freedom from harm  
40 and mistreatment; and enables informed choice and continuous support during childbirth.<sup>3</sup> Mistreatment  
41 or disrespect and abuse during childbirth represent lack of RMC, although the absence of disrespect and  
42 abuse is not equivalent to RMC.<sup>4,5</sup> Growing evidence globally has highlighted non-RMC in health  
43 facilities, and its negative effects on health seeking behavior and maternal and neonatal health  
44 outcomes.<sup>4-6</sup> There is however limited evidence on how to improve it.

45  
46 Studies in Africa suggest that multi-component interventions can improve various aspects of RMC  
47 including reducing disrespect and abuse.<sup>7-11</sup> These interventions include: training health care providers in  
48 values and attitudes transformation and communication skills; setting up quality improvement teams;  
49 monitoring disrespect and abuse; improving staff conditions; maternity open days; dispute resolution,  
50 etc.<sup>12</sup> A recent systematic review concluded that while these multi-component interventions appear to  
51 reduce some aspects of disrespect and abuse, their sustainability is unclear and the intervention  
52 components with the greatest impact have not been identified.<sup>12</sup> Additionally, the heterogeneous nature  
53 of multi-component interventions limits their feasibility and scalability in the context of limited resources.  
54 Thus, there is need for rigorous research to refine the optimum approach to deliver and achieve RMC in  
55 all settings.<sup>12</sup>

56  
57 Notably, these prior interventions were solely focused on improving RMC.<sup>7,8</sup> Disrespectful care, however,  
58 does not exist in isolation; it often emerges in the process of providing highly stressful emergency care.  
59 Thus, interventions that address RMC in the context of providing stressful clinical care may be the most  
60 effective ways of improving it. Highly-realistic clinical simulation training provides this unique  
61 opportunity to be responsive and respectful to women's needs in a meaningful context, while mimicking  
62 the stressful clinical environment that may contribute to disrespectful care. The potential effect of such a  
63 training is likely greater than the combined effect of stand alone trainings on only clinical skills or only  
64 RMC. However, no studies to our knowledge have explicitly used this integrated simulation approach to  
65 improve RMC and documented the effect of the intervention on women's experiences. Thus, as part of a  
66 pilot study in Ghana to improve intrapartum quality of maternal and newborn care, we explicitly

67 integrated concepts of RMC into a simulation-based provider training, and evaluated the effect of the  
68 training on women's experiences. We present the evaluation results in this paper.

69

## 70 **METHODS**

### 71 **Study site and intervention**

72 The project was implemented in East Mamprusi district in the Northern Region of Ghana. The Northern  
73 Region has the highest maternal and infant mortality rates in Ghana. In 2016, the institutional maternal  
74 mortality ratio for Northern Ghana was 208 per 100,000 live births, compared to a national average of  
75 164 per 100,000 live births,<sup>13</sup> and the infant mortality rate was 53 per 1000 live births compared to the  
76 national average of 41.<sup>14</sup> The Northern region also had the lowest rate of facility-based births at 35%,  
77 compared to the national average of 73%.<sup>14</sup> Disrespectful care was a key factor driving low facility  
78 delivery rates.<sup>6,15</sup> East Mamprusi is a rural district with a population of about 121,000. The district has 13  
79 health facilities, with approximately 114 providers, including 4 medical doctors, 88 nurses, 12 midwives,  
80 and 22 community health nurses. Seven of the facilities conduct deliveries, including one mission hospital  
81 serving as the district referral hospital, four health centers, and two smaller Community-based Health  
82 Planning and Services compounds. Collectively, these seven facilities oversee more than 5000 births per  
83 year (Unpublished data, 2016). The pilot study was implemented at the five highest volume delivery  
84 facilities in the district, which were the referral hospital and four health centers.

85

86 We used provider trainings based on the methodology developed by PRONTO International: a low-tech,  
87 highly-realistic simulation and team-training with facilitated debriefing, to improve identification and  
88 management of obstetric and neonatal emergencies and team functioning.<sup>16-19</sup> The PRONTO training kit,  
89 the PRONTO Pack, includes a hybrid birth simulator called a PartoPants™ (a modified pair of surgical  
90 scrubs with anatomical landmarks necessary for delivery) worn by a patient actress (one of the female  
91 providers). The patient actress brings the patient to the center of the care and allows for direct discussion  
92 about patient experiences. Although PRONTO has always emphasized RMC prior to the current  
93 intervention, the PRONTO curriculum did not directly focus on RMC principles. In this project, we  
94 integrated RMC concepts into the curriculum and simulation scenarios in a deliberate way.

95

96

==Table 1==

97

98 The curriculum for the training included five simulation scenarios and associated case-based learning  
99 modules and skills stations capturing seven priority topics identified during a stakeholder meeting (Table  
100 1), plus interactive teamwork and communication activities. All simulations also emphasized various

101 aspects of RMC, which highlighted treating women with dignity and respect, communicating with them,  
102 respecting their autonomy, and supporting them in whatever way they needed including encouraging birth  
103 companions. The training content was based on evidence-based practices on the management of the  
104 complications and recommended practices known to have positive effects on birth outcomes and  
105 women's experiences such as support and mobility during labor and non-supine position at delivery.<sup>3,20-25</sup>  
106 In addition, simulation scripts had prompts for certain behaviors from the patient actress: for example, if  
107 providers did not introduce themselves, the patient actress asked "who are you?", and if providers did not  
108 explain what they were doing or found from examinations, she asked "what are you doing to me?" or  
109 "how is my baby?" Simulations were followed by a debrief to engage participants in guided self-analyses  
110 of their performance in the clinical management of the case as well as on their interactions with the  
111 patient and other medical personnel. During each debrief, the patient actress who was one of the  
112 participating providers was also asked to reflect on how she was treated during the simulation.  
113  
114 In addition, we included one simulation with a sole focus on RMC. This simulation involved a patient  
115 who initially refused to open her legs for examinations and then insisted on delivering in a squatting  
116 position. This simulation was followed by a debrief that emphasized RMC elements, such as how to  
117 communicate with patients who do not fit into perceived notions of cooperation ("difficult patients") to  
118 prevent verbal and physical abuse, and responding to women's desires for birthing in alternative  
119 positions. This simulation was paired with a clinical case review session, including a video to help  
120 providers understand the relevance of RMC and to demonstrate what RMC may look like in their setting.  
121 The providers also engaged in an interactive activity on RMC to help them understand and internalize the  
122 needs of women during childbirth.  
123  
124 Twenty-two providers from the intervention facilities first participated in a two-day training facilitated by  
125 three PRONTO trainers at a location close to the referral hospital in April 2017. Six providers who  
126 participated in the first training were then invited to a two-day Simulation Facilitator Training (SFT) led  
127 by the PRONTO trainers. The goal of the SFT was to equip the participants with the knowledge and skills  
128 to become effective simulation facilitators to serve as trainers for the district. These new trainers then led  
129 an additional two-day provider training, with support from the experienced PRONTO trainers, for an  
130 additional 21 providers, which included providers from the intervention district who had not participated  
131 in the first training and providers from the surrounding districts. This training involved the same content  
132 as the first provider training and enabled the local facilitators to gain confidence to facilitate simulations  
133 and moderate debriefing sessions. The local facilitators then conducted four 3-hour refresher trainings  
134 once a month at the intervention facilities between June 2017 and October 2017. Except for changes in

135 timing of implementation and training location due to logistical issues, the protocol for the training was  
136 implemented as planned. Of the 43 providers trained, 22 were midwives, two were medical doctors, one  
137 an anesthetist, and the remaining nurses (including enrolled, public, and community health nurses). Most  
138 providers (72%) of the 35 providers who filled out a baseline survey had never participated in a  
139 simulation-based training prior to this training.

140

#### 141 **Data collection, measures, and analysis**

142 To evaluate the effect of the training on RMC, we conducted interviews with recently delivered women in  
143 the five intervention facilities before and after the intervention. Our planned sample size was 300 women  
144 at each time point, which we estimated would detect an effect size of 0.45 (assuming 80% power and 5  
145 clusters (health facilities)), and the assumption that we could recruit about half of eligible women in the  
146 intervention facilities. Women were eligible if they were aged 15-49 years and delivered in a health  
147 facility within the preceding 8 weeks. Research assistants approached women as they exited the health  
148 facilities after they had received care and invited them to participate in the study. All eligible women  
149 contacted consented to participate. The interviews were then conducted by the research assistants in the  
150 local languages (Mampruli and Kokomba) at the facility or the woman's home. The Baseline survey was  
151 conducted in March and April 2017 just before the initial provider training and the endline conducted in  
152 November of 2017, 6 months after the initial provider training and 1 month after the fourth refresher. A  
153 total of 268 and 320 women were interviewed at baseline and endline, respectively. We restricted the  
154 analytic sample to women who had complete information on the outcome variable (N=215 for baseline  
155 and 318 endline). All participants provided written informed consent. The study was approved by the  
156 ethics review boards of University of California, San Francisco and the Navrongo Health Research Center  
157 in Ghana and deemed exempt at University of Michigan.

158

159 Our measure of RMC (the dependent variable) was the score on the person-centered maternity care scale.  
160 The person-centered maternity care scale was initially validated in Kenya and India, and shown to have  
161 high content, construct, and criterion validity and with good reliability.<sup>26,27</sup> The original scale has 30 items  
162 with three sub-scales for dignity and respect, communication and autonomy, and supportive care. Each  
163 item has a 4-point frequency response option—0: “no, never,” 1: “yes, a few times,” 2: “yes, most of the  
164 time,” and 3: “yes, all the time.” Minor modifications were made to the wording of one question during  
165 pretesting in Ghana. Exploratory factor analysis using both the baseline and endline data supported a  
166 three-factor structure with a single dominant factor. Three items (time to care, delivery support, and  
167 crowding), however, had low loadings (<0.1) in the one factor structure analysis. Thus, we decided to  
168 exclude these three items from the scale. We also excluded three items on availability of water,

169 electricity, and perception of enough staff since the intervention did not include improvements to  
170 infrastructure or number of providers. The analysis was therefore based on a 24-item version of the scale.  
171 The items excluded were all part of the supportive care subscale, decreasing the number of items in that  
172 subscale from 15 in the original scale to 9 in the 24-item version. The dignity and respect and  
173 communication and autonomy subscales have 6 and 9 items respectively, as in the original scale. The full  
174 24-item scale and sub-scales have good internal consistency, with Cronbach's alpha of 0.9 for the full  
175 scale and over 0.7 for the sub-scales. We summed items in the full scale and sub-scales (with negative  
176 items reverse coded) to generate person-centered maternity care and sub-scale scores. To enable  
177 comparison across the domains, we rescaled the scores—scores shown as a fraction of the total possible  
178 score on that domain multiplied by 100, which puts each score between 0 (lowest quality) and 100 (best  
179 quality).

180  
181 The key independent variable was the time of data collection in relation to the intervention, with options  
182 as baseline (before the intervention) or endline (after the intervention). We also collected data on  
183 confounders including demographic, health, and socioeconomic factors as well facility and provider  
184 characteristics, which have been shown in previous studies to be associated with women's  
185 experiences,<sup>28,29</sup> and could differ for the baseline and endline samples.

186  
187 For the analysis, we first examined the distribution of variables for the baseline and endline samples using  
188 descriptive and bivariate analysis. Next, we examined the distributions of the individual items in the scale  
189 using chi-squared test to assess differences between the baseline and endline responses. We then  
190 generated the full scale and subscale scores and examined mean differences in scores between the  
191 baseline and endline using two-sample t-tests. Because our outcome variables (scores on the scale and  
192 sub-scales) were continuous, we used ordinary least squares regressions (bivariate and multivariate linear  
193 regressions) to examine the differences in scores at baseline and endline. We controlled for confounders  
194 in the multivariate models by including all variables that were associated with scores in the bivariate  
195 models or which had strong theoretical rationale for inclusion. The beta coefficients obtained from the  
196 linear regression models represent the degree of change in the scale scores for every 1-unit of change in  
197 continuous predictors, or the difference between any category and the reference category for categorical  
198 variables.<sup>30</sup> The coefficients for the endline in the multivariate models therefore represent differences  
199 between the scores at endline and baseline, controlling for potential confounders. The positive scores  
200 represent increases in the scores. We also ran sensitivity analysis using multivariate multilevel linear  
201 regression models with random intercepts at the individual and facility level, to assess if using that

202 method of accounting for clustering within facilities changed the results.<sup>31,32</sup> We used STATA 15 for the  
203 analysis.

204

## 205 **RESULTS**

206 There were small but statistically significant differences in the characteristics of women interviewed in  
207 the baseline and endline (Table 2). For example, women in the endline were more likely to be younger  
208 and primiparous (average age was 27 years with 31% primiparous in the endline compared to average age  
209 of 30 years and 19% primiparous in the baseline). Also compared to women in the baseline, women in  
210 endline were slightly more educated and literate, from wealthier households, and their partners had more  
211 education.

212

213 ==Table 2==

214

215 With a few exceptions, the responses on most of the individual items suggest women in the endline  
216 received more respectful care than those at baseline (Table 3 and S1). For example, only 12% of women  
217 at baseline felt they were treated with respect all the time, and 8% felt they were treated in a friendly  
218 manner all the time compared to 64% and 65% respectively at endline. At baseline, 87% of women  
219 reported providers never introduced themselves to them, and 43% reported providers never called them  
220 by their names, compared to 60% at and 20% respectively at endline. Also, over 50% reported providers  
221 did not explain the purpose of examinations, procedures, or medications at baseline compared to less than  
222 25% at endline; and 43% reported providers never asked for permission before examinations and  
223 procedures at baseline, compared to 11% at endline. Over half (59%) did not feel they could adopt a  
224 birthing position of their choice during delivery at baseline compared to 31% at endline. Women were  
225 more likely to be allowed to have labor companions at endline than at baseline: 32% reported they were  
226 never allowed to have a companion during labor at baseline compared to 10% at endline.

227

228 ==Table 3==

229

230 The full scale and sub-scale scores also suggest women in the endline received more respectful care than  
231 those at baseline (Table S2 and Figure 1). The average rescaled person-centered maternity care score  
232 increased from 50 at baseline to 72 at endline, a relative increase of 43%. Scores on the sub-scales also  
233 increased between baseline and endline: from 76 to 87 for dignity and respect (15% relative increase), 31  
234 to 58 for communication and autonomy (87% relative increase) and 52 to 75 for supportive care (45%



235 relative increase). Person-centered maternity care scores increased between baseline and endline in all  
236 facilities.

237

238 ==Figure 1==

239

240 The differences between the baseline and endline scores remained significant in the multivariate analysis  
241 (Table 4). After controlling for several potential confounders, the endline person-centered maternity care  
242 score was about 18 points higher than the baseline scores ( $\beta=17.6$ ; 95% CI=15.6-19.6). Controlling for  
243 other factors, the difference between the baseline and endline scores for dignity and respect,  
244 communication and autonomy, and supportive care were 2.4, 7.7, and 7.4 respectively. The results were  
245 essentially the same in the multilevel analysis. The multivariate analysis also showed that in general  
246 women received more respectful care in the health centers than in the referral hospital (Table S3). In  
247 addition, women's experiences differed by various factors including parity, literacy, household wealth,  
248 employment, and partner's education and employment.

249

250 ==Table 4==

251

## 252 **DISCUSSION**

253 Following implementation of an integrated, low-tech, high-fidelity obstetric emergency simulation  
254 training in Northern Ghana, RMC measured with the person-centered maternity care scale was  
255 substantially higher at endline than at baseline. The findings suggest that integrated low-tech high-fidelity  
256 simulation trainings have the potential to improve RMC in low-resource settings. It adds to the growing  
257 research suggesting that interventions targeting RMC can improve women's childbirth experiences.  
258 Specifically, it highlights that situating RMC in the context of broader quality of care initiatives may have  
259 great potential to improve women's childbirth experiences.

260

261 The highest change was in the domain of communication and autonomy, where the score almost doubled.  
262 A potential reason for this is that the PRONTO training has an emphasis on teamwork and  
263 communication and all simulations and debriefings included various elements of provider-provider and  
264 provider-patient communication. The training also emphasized patient autonomy, including asking for  
265 consent and respecting patient preference for delivering in alternative positions. One provider even shared  
266 a picture after the training showing how she had been able to assist a woman deliver in her preferred  
267 position, which was on a sheet on the floor instead of the delivery bed.

268

269 Supportive care also increased substantially, as this was emphasized in the form of asking women how  
270 they were feeling and having birth companions in all simulations. In debriefings, however, discussion of  
271 constraints of having a companion in the delivery room (e.g. privacy when two women are delivering at  
272 the same time), led to compromises of at least allowing companions during labor, where they could  
273 provide support not only to the woman, but also to the provider. These challenges of providing  
274 continuous support are described in detail elsewhere.<sup>33</sup>

275  
276 The smallest change was in dignity and respect. Potential reasons for this include the relatively high  
277 scores for dignity and respect at baseline. Additionally, reports of verbal and physical abuse paradoxically  
278 increased, despite the increase in reports of being treated with respect. Such contradictory effects have  
279 been observed in some prior studies when examining individual aspects of disrespect and abuse.<sup>12</sup> One  
280 potential reason is that, while treating women with dignity and respect was emphasized in the training,  
281 verbal and physical abuse never actually occurred in the simulations. Thus, there was no opportunity for  
282 discussion of abuse in the debriefings—except for after the simulation with a “difficult patient” in which  
283 facilitators brought up the issue of abuse in the context of how providers might respond when they deem a  
284 patient as difficult. Prevention of abuse was therefore not reinforced in the training, which was a  
285 weakness of the training. The socioeconomic differences between women in the baseline and endline may  
286 also have contributed to this finding, as women of higher socioeconomic status may be more likely to  
287 report mistreatment than women of lower socioeconomic status.<sup>34</sup> The effect of the training may therefore  
288 be potentially higher than estimated from these surveys.

289  
290 The observed effects should be considered in light of the fact that this study did not include any effort to  
291 change existing infrastructure (such as lack of screens for privacy) or to address systemic issues (such as  
292 provider shortage and lack of supplies) that might make practicing in this setting difficult for providers.  
293 Such issues, while important to maintaining a motivated workforce that can in turn provide high-quality  
294 respectful care, are beyond the scope of training-based interventions. But they are crucial to creating  
295 sustainable change.

296  
297 This study also adds to the growing evidence on predictors of RMC. The higher person-centered  
298 maternity care scores for women of higher socioeconomic status (literate, employed, and wealthier) and  
299 those who delivered in lower-level facilities (compared to women of lower socioeconomic status and  
300 those who delivered in the higher-level facilities) are consistent with findings from studies in Kenya and  
301 India.<sup>28,29,34</sup> The potential reasons for these disparities have been described in detail elsewhere,<sup>28,34,35</sup> and  
302 include: literate women being more empowered to advocate for themselves, employed and wealthier

303 women having the resources to access facilities that provide higher quality care, and differential positive  
304 treatment of women of higher socioeconomic status. Higher patient loads, as well as lower social costs to  
305 providers in higher-level facilities who mistreat women (because they may be less easily identified and  
306 have limited interactions with the communities they serve) may also account for the less respectful care in  
307 these facilities. For the purpose of evaluation, these disparities highlight the need to collect data on and  
308 account for factors that might affect women's experiences as well as their reporting.

309  
310 There have been a limited number of studies assessing the effects of an intervention on RMC in Sub-  
311 Saharan Africa, and to our knowledge ours is the first to do so in the context of a clinical simulation  
312 training. There are however a number of limitations to this study. First, funding limitations precluded our  
313 recruitment of a control group, thus it is possible that other external factors could account for the results  
314 given the increasing interest in RMC globally. There were however, no other specific activities targeting  
315 RMC in the intervention district during the project period, thus we believe the training accounts for most  
316 of the effects. Second, not all providers in the intervention facilities were exposed to both the initial  
317 trainings and refreshers due to workforce turnover. The observed effect could therefore be smaller than  
318 the potential effect of the intervention. Third, given the short timeline for the intervention and evaluation  
319 (6 months), we are unable to assess long-term sustainability. Fourth, interviewers were not blinded to the  
320 study and this could have affected how interviewers asked questions or interpreted women's responses.

321  
322 In addition, the evaluation data presented are based on cross-sectional surveys with different groups of  
323 women, meaning that other factors that affect reporting of women's experiences could explain some of  
324 the results. However, given that the findings are significant after controlling for other potential predictors,  
325 it is not likely that these other factors can explain all of the observed associations. It was also not possible  
326 to conduct longitudinal data collection from the same group of women as the same women were unlikely  
327 to receive maternity care within the project period. Because the data are based on self-reporting, social  
328 desirability and recall bias are potential issues. Also, women's reports of their experiences are often  
329 influenced by their expectations, which could result in women reporting respectful care, even when they  
330 have been mistreated. However, self-reports are a valid source for assessing people's experiences as their  
331 interpretation of the event may be more likely to affect their response to the encounter than what actually  
332 happened. Additionally, the use of a validated multidimensional scale helps to reduce bias based on  
333 responses to individual items. Finally, the findings may not be generalizable to other settings given  
334 unique aspects of the study district. Nonetheless, we believe this intervention could be adapted to many  
335 low-resource settings.

336

337 **Conclusions**

338 These findings highlight the feasibility and potential effectiveness of integrated low-tech, high-fidelity  
339 simulation trainings to improving RMC. The findings suggest that trainings that give providers the  
340 opportunity to learn, practice, and reflect on their provision of RMC in the context of providing stressful  
341 emergency care have the potential to improve women's experiences in developing settings. Incorporating  
342 such trainings into pre-service and in-service training of providers may advance global efforts to promote  
343 RMC. Future research is needed to more rigorously evaluate the effect of the intervention on not just  
344 RMC, but also on other maternal and neonatal health outcomes such as health seeking behaviors,  
345 morbidity, and mortality. Studies based on more rigorous methodologies such as cluster randomized  
346 controlled trials, as well as longer and larger-scale studies are needed to assess effectiveness,  
347 sustainability and scaling mechanisms. Cost-effectiveness studies are also needed. Such research would  
348 provide stronger evidence to advocate for government uptake for scalability and sustainability.

349

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# Author Manuscript



**Table 1: Training content for simulation-based provider training**

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<b>Obstetrics and neonatal care topics</b>
1. Normal birth practices and evidence-based maternity care
2. Immediate newborn evidence-based care
3. Neonatal Resuscitation
4. Obstetric Hemorrhage (Postpartum hemorrhage and Antepartum Hemorrhage)
5. Pre-Eclampsia/ Eclampsia
6. Sepsis
7. Preterm labor and birth

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<b>Aspects of RMC emphasized during training</b>
1. Providers introducing themselves to the women
2. Calling women by their names
3. Asking women how they are feeling
4. Allowing women to have a support person of their choice
5. Ensuring privacy during examinations
6. Explaining examinations, procedures, and medications
7. Obtaining consent before procedures,
8. Communicating findings of examinations to women and their families
9. Encouraging the women and their families to ask questions
10. Allowing women to move during labor and birth in their preferred position

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**Table 2: Characteristics of women, East Mamprusi district, Ghana, 2017**

	Baseline (N=215) N (%)	Endline (N= 318) N (%)	p-value
<b>Intervention facility</b>			0.00
Referral Hospital	37 (17.2)	100 (31.4)	
Health center 1	51 (23.7)	54 (17.0)	
Health center 2	39 (18.1)	66 (20.8)	
Health center 3	56 (26.0)	60 (18.9)	
Health center 4	32 (14.9)	38 (11.9)	
<b>Age</b>			0.00
15 to 19 years	11 (5.1)	48 (15.1)	
20 to 29 years	102 (47.7)	156 (49.1)	
30 to 48 years	101 (47.2)	114 (35.8)	
<b>Currently married</b>	202 (94.0)	288 (90.6)	
<b>Parity</b>			0.04
1	40 (18.9)	97 (30.8)	
2	48 (22.6)	60 (19.0)	
3	38 (17.9)	54 (17.1)	
4 to 9	86 (40.6)	104 (33.0)	
<b>Highest education</b>			0.05
No school/Primary	157 (73.0)	205 (64.5)	
Post-primary/vocational/Secondary	55 (25.6)	100 (31.4)	
College or above	3 (1.4)	13 (4.1)	
<b>Literate (able to read and write)</b>	7 (3.3)	49 (15.4)	0.00
<b>Household wealth quintile</b>			0.00
Poorest	62 (30.2)	73 (23.1)	
Poorer	57 (27.8)	106 (33.5)	
Middle	80 (39.0)	103 (32.6)	
Richer/Richest	6 (2.9)	34 (10.7)	
<b>Partner's education</b>			0.01
No school/Primary	156 (73.2)	184 (58.8)	
Post-primary/vocational/Secondary	34 (16.0)	79 (25.2)	
College or above	18 (8.5)	39 (12.5)	
No Partner	5 (2.3)	11 (3.5)	
<b>Delivery Provider type</b>			0.00
Nurse/Midwife	184 (85.6)	245 (77.0)	

Doctor/ Medical Officer	18 (8.4)	29 (9.1)	
Non-skilled attendant	10 (4.7)	1 (0.3)	
1 or more skilled providers	3 (1.4)	43 (13.5)	
Delivery provider sex			
Male	11 (5.1)	31 (9.7)	0.15
Female	201 (93.9)	285 (89.6)	
Both	2 (0.9)	2 (0.6)	
Has health insurance	209 (97.2)	312 (98.1)	0.49
Had any complications	107 (49.8)	188 (59.1)	0.03
Prior facility delivery	156 (72.6)	205 (64.5)	0.05
Self or household member work in health facility	18 (8.4)	56 (17.6)	0.00
First antenatal visit in first trimester	164 (76.6)	220 (69.2)	0.24
4 or more antenatal visits	196 (92.0)	287 (90.8)	0.36
Mampruli ethnicity	102 (47.4)	175 (55.0)	0.09
Religious affiliation			
Muslim	161 (75.9)	261 (82.6)	0.01
Christian	51 (24.1)	46 (14.6)	
Other	0 (0.0)	9 (2.8)	
Postpartum length less than 5weeks	154 (71.6)	177 (55.7)	0.00

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Notes: P-value indicates significance of difference between baseline and endline. Household wealth is calculated from a wealth index based on 13 questions on household assets from the equity tool developed by metrics for measurement.<sup>36</sup> The distribution across the wealth quintiles is not equal because the calculation is weighted to reflect the wealth quintile a participant will fall in when compared to other people in the country, not the sample.

**Table 3: Percent of women responding "Yes, most of the time" or "Yes, all the time" to items in the person-centered maternity care scale, East Mamprusi district, Ghana, 2017**

	Baseline (N=215) N (%)	Endline (N=318) N (%)
<b>Dignity and Respect subscale</b>		
1. Did the doctors, nurses, or other staff at the facility treat you with respect?	130 (60.5)	280 (88.1)
2. Did the doctors, nurses, and other staff at the facility treat you in a friendly manner	130 (60.5)	278 (87.4)
3. During examinations in the labor room, were you covered up with a cloth or blanket or screened with a curtain so that you did not feel exposed?	193 (89.8)	296 (93.1)
4. Do you feel like your health information was or will be kept confidential at this facility?	155 (72.1)	304 (95.6)
5. Did you feel the doctors, nurses, or other health providers shouted at you, scolded, insulted, threatened, or talked to you rudely?	10 (4.7)	50 (15.7)
6. Did you feel like you were treated roughly like pushed, beaten, slapped, pinched, physically restrained, or gagged?	2 (0.9)	24 (7.5)
<b>Communication and Autonomy subscale</b>		
1. During your time in the health facility did the doctors, nurses, or other health care providers introduce themselves to you when they first came to see you?	18 (8.4)	67 (21.1)
2. Did the doctors, nurses, or other health care providers call you by your name?	91 (42.3)	167 (52.5)
3. Did the doctors and nurses explain to you why they were doing examinations or procedures on you?	45 (20.9)	190 (59.7)
4. Did the doctors and nurses explain to you why they were giving you any medicine?	39 (18.1)	193 (60.7)
5. Did you feel you could ask the doctors, nurses or other staff at the facility any questions you had?	53 (24.7)	160 (50.3)
6. Did the doctors, nurses or other staff at the facility speak to you in a language you could understand?	175 (81.4)	295 (92.8)
7. Did the doctors, nurses or other staff at the facility ask your permission/consent before doing procedures on you?	66 (30.7)	252 (79.2)
8. Did you feel like the doctors, nurses or other staff at the facility involved you in decisions about your care?	54 (25.1)	188 (59.1)
9. During the delivery, do you feel like you were able to be in the position of your choice?	50 (23.3)	165 (51.9)
<b>Supportive Care subscale</b>		
1. Did the doctors and nurses at the facility talk to you about how you were feeling?	40 (18.6)	194 (61.0)
2. When you needed help, did you feel the doctors, nurses or other staff at the facility paid attention?	45 (20.9)	207 (65.1)

3. Did the doctors, nurses or other staff at the facility try to understand your anxieties?	106 (49.3)	247 (77.7)
4. Did you feel the doctors, nurses or other staff at the facility took the best care of you?	164 (76.3)	287 (90.3)
5. Were you allowed to have someone you wanted (outside of staff at the facility, such as family or friends) to stay with you during labor?	105 (48.8)	212 (66.7)
6. Do you feel the doctors or nurses did everything they could to help control your pain?	98 (45.6)	210 (66.0)
7. Did you feel you could completely trust the doctors, nurses or other staff at the facility with regards to your care?	159 (74.0)	289 (90.9)
8. In general, did you feel safe in the health facility?	166 (77.2)	306 (96.2)
9. Thinking about the wards, washrooms and the general environment of the health facility, will you say the facility was very clean, clean, dirty, or very dirty? (% clean or very clean)	206 (95.8)	309 (97.2)

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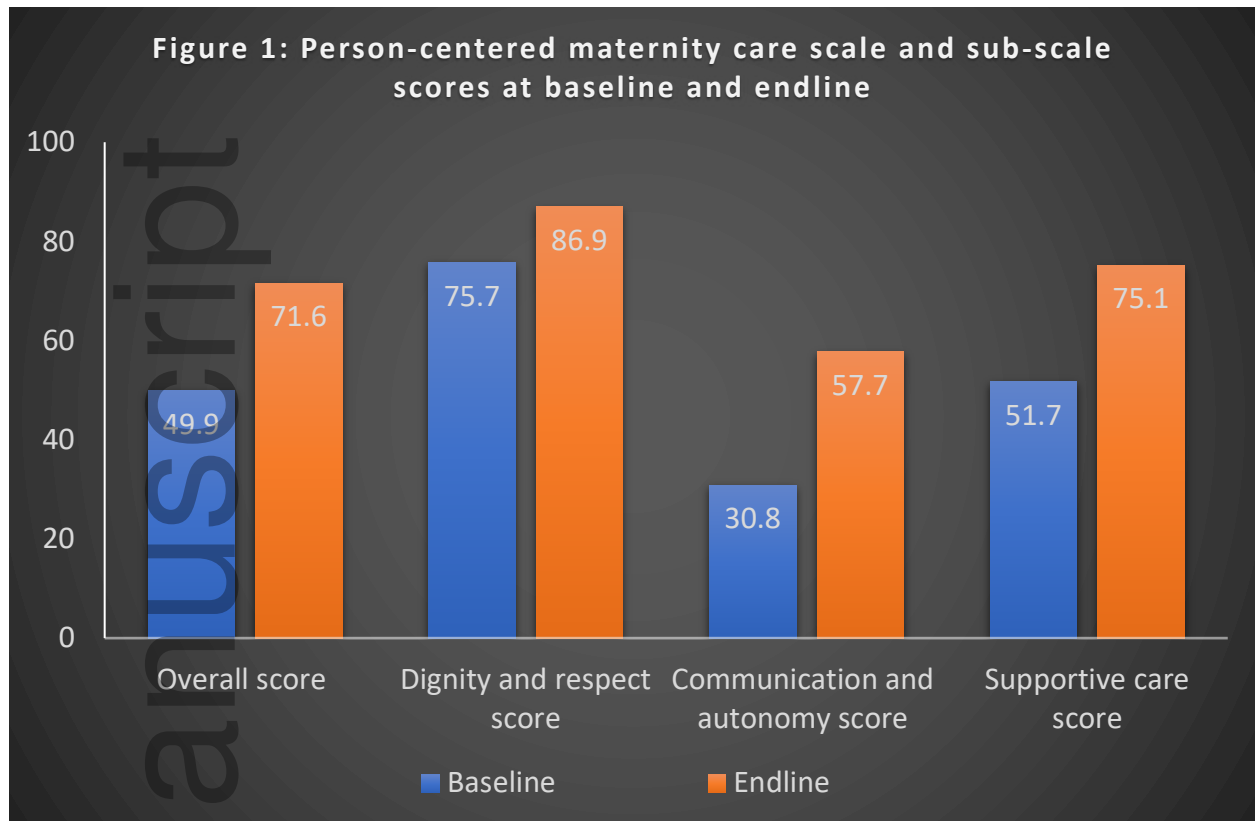
Notes: All differences between baseline and endline scores are significant at  $p < 0.001$  or  $< 0.01$

**Table 4: Multivariate regression of person-centered maternity care scale and subscale scores, East Mamprusi district, Ghana, 2017 (N=499)**

	Overall score	Dignity and respect score	Communication and autonomy score	Supportive Care score
	Beta Coefficient (95% CI)	Beta Coefficient (95% CI)	Beta Coefficient (95% CI)	Beta Coefficient (95% CI)
Data collection period				
Baseline	Reference	Reference	Reference	Reference
Endline	17.6*** (15.6 - 19.6)	2.4*** (1.8 - 3.0)	7.8*** (6.8 - 8.8)	7.4*** (6.6 - 8.3)
Constant	24.2*** (13.6 - 34.8)	9.8*** (6.7 - 13.0)	6.9* (1.6 - 12.3)	7.4** (2.9 - 12.0)

Notes: \* p<0.05 \*\* p<0.01 \*\*\* p<0.001

Model controls for facility, age, parity, marital status, literacy, household wealth, occupation, partner's education and occupation, insurance status, complications, prior facility delivery, timing and frequency of antenatal care, position and sex of delivery provider, religion, tribe, and timing of interviews



Notes: These are the rescaled scores, so the range for each is from 0 to 100.  
The differences are statistically significant ( $p < 0.001$ )