

# Long-Term Reactions of Women to Electronic Fetal Monitoring During Labor

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The long-term reactions of women to electronic fetal monitoring during labor were studied by mailing a questionnaire to a random sample of 110 women two to five months postpartum. Of the 75 women who responded and in whom the fetal monitor had been used, 74 gave an overall positive response to fetal monitoring. Four important factors underlying the responses of the women were identified. The monitor was remembered as an important provider of information, as an agent of reassurance, and not as an invader of privacy. Most women did not remember the monitor as an uncomfortable or distracting agent, though their responses for this factor were not so strong as for the other factors. No significant associations were found between the four factors and marital status, age, education, parity, specialty of physician, length of monitoring, or amount and adequacy of prenatal information obtained about the monitor. Significant associations were found between three of the factors and race.

Despite the widespread use of electronic fetal monitoring during labor, the efficacy of fetal monitoring was not seriously questioned until recently. Many investigators have attempted to determine the relationship between the use of fetal monitoring and perinatal morbidity and mortality. How-

ever, reports have been published of only three studies concerning the psychologic and emotional reactions of women to fetal monitoring.<sup>1-4</sup>

In 1976, Starkman published two papers on data collected from a total of 35 patients.<sup>1,2</sup> The general reactions of these women to fetal monitoring were sought by interview one to seven days after delivery while the women were still in the hospital. Fifty-six percent of the women gave responses rated as positive toward the fetal monitor, and 44 percent gave responses rated as mixed or negative. The general reactions were divided into the following 11 categories: (1) the monitor as a protector (agent of reassurance), (2) the monitor as an extension of

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the patient (provider of information), (3) the monitor as an aid in communication, (4) the monitor as an extension of the baby, (5) the monitor affecting interactions with husbands, (6) the monitor as a distraction, (7) the monitor as an aid in mastery (of Lamaze breathing), (8) competitive feelings toward the monitor, (9) the monitor as a "mechanical monster," (10) the monitor producing increased anxiety, and (11) the monitor as a danger to the baby.

The next study of maternal reactions to fetal monitoring was reported by Shields in 1978.<sup>3</sup> Thirty patients were interviewed within 48 hours of delivery, and reactions were assessed by a scale developed by the author. Positive responses to fetal monitoring were given by 73 percent and negative responses by 27 percent of the patients.

The most recent study was reported in 1982 by Molfese et al.<sup>4</sup> Two samples of women who volunteered to participate in the research were studied. The samples consisted of 80 women who had given birth at a university hospital and 100 women who had given birth at a community hospital. An interview and a 61-item questionnaire were administered within two days of delivery. The authors found a strongly positive response to fetal monitoring. When the responses of the two samples were combined, 73 percent of the women had given only positive responses to fetal monitoring during the interview, and 11 percent had given only negative responses. Factor analysis of the responses to the statements of the questionnaire resulted in the emergence of 11 important factors for each sample.

In all of the previously reported studies, the responses of women to fetal monitoring were measured while the women were still in the hospital following delivery.<sup>1-4</sup> Most of the data were collected within 48 hours postpartum. The intense emotional response to new motherhood may influence a woman's reactions to fetal monitoring, and reactions to fetal monitoring may alter over time. Long-term responses are important because they represent a woman's persistent attitudes toward fetal monitoring, which may significantly affect her reaction to labor and fetal monitoring in subsequent pregnancies and her reports of her experience with fetal monitoring to friends and relatives. To determine some of these long-lasting attitudes, the responses of women to fetal monitoring two to five months after delivery were investigated.

## Methods

The study population consisted of 517 women who gave birth at the University of Missouri Health Sciences Center (Columbia, Missouri) from April to August 1982 and included private patients of the attending staff, clinic patients, and patients referred from the surrounding area. Almost all patients received continuous fetal monitoring throughout labor, but this was not a requirement. A birthing room was available to women who desired it.

A random sample of 110 patients was selected with the aid of a random numbers table. Women who had delivered prior to 36 weeks' gestation or who had undergone repeat or elective cesarean section were excluded from the sample. A sample size of 110 was chosen to provide enough responses to produce a valid factor analysis.

A questionnaire consisting of two sections was mailed to the women. The first section was used to collect demographic data and information about the woman's pregnancy, labor, and delivery. The second section contained 24 statements about fetal monitoring to which the women were to respond. These statements were derived from each of the 11 categories of responses to fetal monitoring described by Starkman in 1979.<sup>1,2</sup> The women were asked to indicate their degree of agreement or disagreement with each statement by circling the appropriate number on a five-point scale ranging from "strongly disagree" to "strongly agree." Twelve of the statements were worded in a positive manner with respect to fetal monitoring, and 12 were worded in a negative manner. The statements were listed in random order. If a woman had not responded to the questionnaire within two weeks, a second questionnaire was mailed.

Numerical values corresponded to responses to the statements in the questionnaire, with 1 representing "strongly disagree," 2 representing "disagree," 3 representing "neutral," 4 representing "agree," and 5 representing "strongly agree." A mean score for each statement was computed, and Z tests were used to determine whether these mean scores were statistically different from 3, the midpoint of the range.

To determine important underlying dimensions of the patients' responses, factor analysis was performed on the 24 items in the questionnaire. Factors with eigenvalues greater than 1 were con-

sidered significant. Items with factor loadings greater than 0.4 for a factor were included as part of that factor. Each significant factor was assigned a label (A through D), and factor scores were computed for each woman by adding the numerical values for each item in the questionnaire making up that factor. For example, factor A, which deals with women's responses to the monitor as a provider of information, is made up of six items from the questionnaire. In this case, the factor score could range from 6 to 30.

The factor scores were used to dichotomize each factor, using the midpoint of the factor score range as the point of division. Scores of 6 to 18 for factor A would then correspond to those women who were less likely to feel that the fetal monitor provided useful information, and scores of 19 to 30 would correspond to women who were more likely to feel that the monitor provided useful information. Factors B, C, and D were dichotomized in a similar fashion.

## Results

Questionnaires were mailed to 110 women. Six women had moved and left no forwarding address. A total of 79 responded, for a response rate of 72 percent. Fetal monitoring was used during the labors of 75 of these women.

The mean age of the respondents to the questionnaire was 23 years. Twenty-seven percent of the women were aged less than 20 years, and 11 percent were aged more than 30 years. The mean gravidity was 2.0; the parity, 1.6. Sixty percent of the women were married and living with their husbands at the time of delivery, 29 percent had never married, and 11 percent were divorced or separated. Eighty-seven percent of the women were white, and 13 percent black. Thirty-nine percent had not completed high school, and 15 percent had a college degree. Twelve percent of the women were patients of family physicians and 88 percent were patients of obstetricians. Labor and delivery characteristics of the respondents are summarized in Table 1.

The current and previous pregnancies and deliveries of these women were relatively uncomplicated. Only 8 percent of the women had had any of

**Table 1. Characteristics of Labor of Survey Respondents**

Characteristic	Median	Percentage
Fetal monitor used		95
Duration of labor	8.1 h	
Duration of monitoring		
Less than 30 minutes		12
30 minutes to 2 hours		23
2 hours to 5 hours		32
More than 5 hours		33
Place of delivery		
Delivery room		78
Birthing room		9
Labor room		5
Operating room (cesarean section)		8

the following complications: hypertension, pre-eclampsia, diabetes, premature labor, maternal or infant infection, admission of the infant to an intensive care unit, or fetal or neonatal death.

The group of women who responded to the questionnaire ( $n = 79$ ) were similar to the group of women from whom no response was obtained ( $n = 31$ ) with respect to several important characteristics. There was no statistically significant difference between these groups in age, length of labor, race, residence (urban vs rural), specialty of physician, or Apgar scores of their infants at one and at five minutes. The women who did not respond were of significantly higher gravidity ( $P < .01$ ) and parity ( $P < .01$ ) than those who did respond.

Of the women responding to the questionnaire, 70 percent felt they had received adequate information about the monitor prior to labor. The sources of prenatal information about fetal monitoring are summarized in Table 2.

The response to fetal monitoring by this sample of women was strongly positive. For 11 of 12 statements in the questionnaire that were worded positively with respect to fetal monitoring, the mean score was significantly greater than 3. For all 12 statements that were worded negatively with respect to fetal monitoring, the mean score was

**Table 2. Prenatal Information About Fetal Monitoring Received by Respondents**

Characteristic	Percentage
Attended childbirth classes	49
Sources of prenatal information about fetal monitoring	
Used in previous labor	38
Explained in childbirth classes	40
Explained by physician	38
Explained on hospital tour	15
Had prenatal test with monitor	27
Received no prenatal information about fetal monitoring from any source	15
Explanation of fetal monitoring given during labor	87

significantly less than 3. These results indicate a positive response to fetal monitoring for 23 of the 24 items. Mean scores for most items are found in Table 3. Of 75 women who were monitored, 74 (99 percent) gave more positive responses than negative responses to the fetal monitor. Fourteen women (19 percent) gave positive responses to all 24 items. No woman responded in a negative way to all items.

When factor analysis was performed on the items, four factors emerged as important. These four factors accounted for 60 percent of the variance of the sample. The items of which each factor is composed are listed in Table 3. Two of the items of the questionnaire were not included in any of the four significant factors. None of the items had significant factor loadings for more than one of the factors.

After examining the groups of items that make up each factor, the following labels were assigned to each factor: factor A, information provided by the monitor; factor B, comfort and distraction of the monitor; factor C, invasion of privacy by the monitor; and factor D, reassurance provided by the monitor. The distribution of responses to the items making up each factor showed that the women remembered the fetal monitor as a provider of information and agent of reassurance and did not remember the monitor as an invader of

privacy. In general, they did not remember the monitor as particularly uncomfortable or distracting. It should be noted, however, that even though the women in general did not feel that the monitor produced physical discomfort, 15 of 75 (20 percent) agreed that the monitor caused physical discomfort and 18 of 75 (24 percent) agreed that the monitor restricted their activity more than they would have liked.

Associations were sought between the four factors and the following variables: age, marital status, race, education, parity, specialty of physician, attendance of childbirth classes, amount of information obtained about fetal monitoring prior to labor, and length of monitoring. Chi-square tests and Fisher's exact tests were used to test for statistical significance. Surprisingly, significant associations were not found between any of the four factors and the amount or adequacy of information obtained about fetal monitoring prior to labor. Women who perceived that they had not received adequate information about the monitor were not more likely to give negative responses than women who perceived that they had received adequate information. Two other subsets of women were compared: those receiving information about fetal monitoring from at least two of the sources listed in Table 2, and those who had received no information about fetal monitoring prior to labor. No significant association was found between the factors and responses of these two groups. No significant associations were found between the factors and marital status, age, education, parity, specialty of physician, attendance of childbirth classes, and length of monitoring.

Significant associations were found between race and three of the factors. Black women felt the monitor produced more discomfort and distraction ( $P < .05$ ) and was more of an invader of privacy ( $P = .01$ ). These women were not as likely as white women to remember the monitor as an agent of reassurance ( $P < .001$ ). Only nine black women responded to the questionnaire.

## Discussion

In each of the previous studies concerning the emotional and psychological effects of fetal monitor-

Table 3. Factors Associated With Women's Responses to Fetal Monitoring

	Mean Score
Factor A: Information provided by the monitor	
<i>Items</i>	
1. The fetal monitor made labor a more enjoyable experience	3.50
2. The fetal monitor helped my husband (or other person) to work with me more closely during labor	3.73
3. The monitor helped me report the progress of my labor to my physician and nurses	3.47
4. I felt reassured by the presence of the monitor	3.91
5. The fetal monitor provided useful information to me during labor	4.03
6. The fetal monitor provided valuable information to my physician and nurses	4.35
Factor B: Comfort and distraction of the monitor	
<i>Items</i>	
1. The fetal monitor restricted my activity more than I would have liked	2.41
2. The presence of the monitor did not allow my husband to be as close to me as I would have liked	1.87
3. I was worried that the fetal monitor would do some damage to my baby	2.09
4. The noises made by the monitor distracted me	2.03
5. I was concerned that the monitor was not working properly during my labor	2.06
6. The straps and wires of the monitor caused me physical discomfort	2.22
Factor C: Invasion of privacy by the monitor	
<i>Items</i>	
1. The nurses did not spend enough time with me because of the monitor	1.81
2. The monitor provided no extra useful information for my physician and nurses	1.66
3. My privacy was invaded by the monitor	1.75
4. The physician paid too much attention to the monitor and not enough to me	1.84
5. My husband paid too much attention to the monitor and not enough to me	1.73
6. I felt the monitor was in some way harmful to me	1.75
Factor D: Reassurance provided by the monitor	
<i>Items</i>	
1. The noises made by the monitor reassured me that the baby was doing well	4.14
2. The monitor helped me pass the time during labor	3.49
3. The monitor did not interfere with the natural process of childbirth	3.95
4. Overall, the fetal monitor was beneficial to me and my baby	4.36
(Note: All mean scores in this table are significantly different from 3.00 at $P < .01$ using a two-tailed Z test.)	

ing during labor, maternal reactions to monitoring were investigated in the immediate postpartum period. In this study, long-term responses were investigated by administering the questionnaire two to five months after delivery. A strongly positive response to fetal monitoring was found. Though different measures were used to determine the response to fetal monitoring, the positive response rate of 99 percent found in this study appears to be somewhat higher than that found by

the earlier investigators. As has been suggested previously, the increasingly positive response in recent years may result from women being more likely now to view fetal monitoring during labor as part of the hospital routine and therefore tending to have fewer negative attitudes about it.<sup>4</sup> It is also possible that the long-term responses of women to fetal monitors are more positive than their immediate responses.

As it is unlikely that reactions to fetal monitor-

ing could be described adequately by a single unidimensional scale, factor analysis was used to seek underlying dimensions with which a subset of reactions would correlate highly. Four factors listed earlier emerged as important, many fewer than found immediately after delivery by Molfese et al,<sup>4</sup> who reported 11 important factors. There are three possible explanations for the large difference in the number of important factors in the two studies:

1. There may actually be fewer important underlying factors in women's responses to fetal monitoring when the women are questioned two to five months after delivery.

2. In the previous study, a 61-item questionnaire was administered to samples of 80 and 100 subjects, and factor analysis was done for each sample. Such a large number of items and such relatively small samples may not have allowed the true factors to emerge. In this study, there were three times as many subjects as there were items in the questionnaire, which probably would result in a more valid factor analysis.

3. The smaller number of items in this questionnaire (24) may have caused the emergence of fewer factors.

The women who responded to the questionnaire gave responses indicating that they strongly felt the fetal monitor was an important provider of information and agent of reassurance, not an invader of privacy. Though most women did not feel that the monitor was particularly uncomfortable or distracting, about 20 percent agreed that the monitor was uncomfortable or distracting. Physical discomfort caused by the monitor appears to be an important reaction of a number of women, and it

should not be neglected in prenatal discussions concerning the monitor.

Previous investigators have suggested that women receiving more prenatal information about fetal monitoring will more likely have a positive reaction to it.<sup>3</sup> Surprisingly, this positive association was found not to be the case for the women in this study. Even when the responses of a group who had received relatively large amounts of prenatal information about fetal monitoring were compared with the responses of a group who had received no prenatal information, no statistically significant differences in response were found. It is also interesting that there were no differences in the responses of women who attended childbirth classes and of those who did not.

The significant differences found in responses among black and white women have not been previously reported. It should be noted that only nine black women responded to the questionnaire, and although the results are statistically significant, no conclusion can be drawn with such a small sample size. Further investigation will be needed.

Since 28 percent of the women to whom questionnaires were mailed did not respond, selection bias is a possible problem in this study. The group of women who responded to the questionnaire did not differ significantly with respect to several important characteristics from the group of women who did not respond, which makes the possibility of selection bias less likely.

Finally, in this study and previous ones, small samples of patients from the same hospitals were studied. It would be worthwhile to study more heterogeneous groups over larger geographic areas.

### References

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