

## LACK OF EFFECT OF WALKING ON LABOR AND DELIVERY

STEVEN L. BLOOM, M.D., DONALD D. MCINTIRE, PH.D., MARY ANN KELLY, R.N., HEIDI L. BEIMER, R.N.,  
REBECCA H. BURPO, C.N.M., MARCY A. GARCIA, C.N.M., AND KENNETH J. LEVENO, M.D.

### ABSTRACT

**Background and Methods** Walking during labor may reduce patients' discomfort and improve outcomes. We conducted a randomized trial of walking during active labor to determine whether it altered the duration of labor or other maternal or fetal outcomes. Women with uncomplicated pregnancies between 36 and 41 weeks' gestation and in active labor were randomly assigned either to walking or to no walking (usual care). Pedometers were used to quantify walking, and the time spent walking was recorded.

**Results** Of the 536 women assigned to the walking group, 380 actually walked. Their mean ( $\pm$ SD) walking time was  $56\pm 46$  minutes. There were no significant differences between the women assigned to the walking group and the 531 women assigned to the usual-care group in the duration of the first stage of labor (6.1 hours in both groups,  $P=0.83$ ), the need for labor augmentation with oxytocin (23 percent vs. 26 percent,  $P=0.25$ ), and the use of analgesia (84 percent vs. 86 percent,  $P=0.59$ ). Similarly, the percentages of women requiring delivery by forceps (4 percent vs. 3 percent,  $P=0.35$ ) and cesarean section (4 percent vs. 6 percent,  $P=0.25$ ) were not significantly different. These labor and delivery outcomes were unrelated to walking in both nulliparous and parous women. The infants' outcomes were also similar in the two study groups.

**Conclusions** Walking neither enhanced nor impaired active labor and was not harmful to the mothers or their infants. (N Engl J Med 1998;339:76-9.)

©1998, Massachusetts Medical Society.

IN 1903 J. Whitridge Williams, in the first edition of his textbook of obstetrics,<sup>1</sup> stated, "During the first stage of labour the patient usually prefers to move about her room, and frequently is more comfortable when occupying a sitting position. During this period, therefore, she should not be compelled to take to her bed unless she feels so inclined." Such early observations on the preferred position during labor gave way to the opinion that recumbency during labor should be the norm, and it continues to be required by many of the professionals who provide care during labor.<sup>2</sup> This requirement has sometimes placed them at odds with the woman, who is attempting to discover the most comfortable position possible during labor.

There has been little research to assess the validity of the various strongly held opinions about a woman's position during labor.<sup>2</sup> We therefore undertook this study to assess the effect of walking during the first stage of labor on obstetrical outcomes in women with uncomplicated term pregnancies.

### METHODS

From September 1, 1996, to October 11, 1997, all women presenting to Parkland Memorial Hospital, Dallas, in spontaneous labor with uncomplicated pregnancies between 36 and 41 weeks' gestation were asked by nurse practitioners who assessed them in a labor-evaluation unit to participate in a study of walking during the first stage of labor. Women considered eligible for this study were those who were having regular uterine contractions with cervical dilatation of 3 to 5 cm and fetuses in the cephalic presentation. Fetal membranes could be intact or ruptured. Both nulliparous and parous women were eligible. Women with any known complication of pregnancy, including breech presentations, were excluded. The study protocol was approved by the institutional review board of the University of Texas Southwestern Medical Center, and informed consent was obtained from all the women.

The women enrolled in the study were randomly assigned to be confined to a labor bed (the usual-care group) or to walk as desired during the first stage of labor (the walking group). The women assigned to the usual-care group were permitted to assume their choice of supine, lateral, or sitting positions during labor. The women in the walking group were encouraged to walk but were instructed to return to their beds when they needed intravenous or epidural analgesia or when the second stage of labor began. Electronic fetal monitoring was not used routinely in either study group. Women whose fetuses had heart-rate abnormalities during routine surveillance conducted every 30 minutes with hand-held Doppler devices, women who had meconium in the amniotic fluid, and women in whom labor was augmented by the administration of oxytocin underwent continuous electronic fetal monitoring, which prohibited further walking.

Staffing of the labor unit included 24-hour supervision by obstetrical faculty members from the Department of Obstetrics and Gynecology at the University of Texas Southwestern Medical School. Other staff members included three or four certified nurse-midwives per shift, directly supervised by one on-site second-year house officer in obstetrics and gynecology who reported to one on-site fourth-year house officer.

A written manual of labor-management procedures was used that stipulated that pelvic examinations were to be performed approximately every two hours to evaluate the progress of labor. Ineffective labor was suspected if the cervix did not dilate progressively during the first two hours after admission. If the fetal membranes were intact, amniotomy was then to be performed and the progress of labor evaluated at the next two-hour pelvic examination. In the women in whom labor did not progress, an internal pressure catheter was placed to evaluate uterine function. If a woman had hypotonic uterine contractions and no further cervical dilatation after an additional two to three hours, labor was augmented by the intravenous administration of oxytocin.<sup>3</sup> The initial dose was 6 mU per minute, and it was increased every 40 minutes by 6 mU per minute to a maximum of 42 mU per minute. Dystocia was diagnosed if labor had not progressed in

---

From the Department of Obstetrics and Gynecology, University of Texas Southwestern Medical Center, Dallas. Address reprint requests to Dr. Bloom at the University of Texas Southwestern Medical Center, Department of Obstetrics and Gynecology, 5323 Harry Hines Blvd., Dallas, TX 75235-9032.

two to four hours.<sup>4</sup> In both study groups, the positions permitted during delivery included the lateral (Sims') position and the dorsal-lithotomy position, with or without obstetrical stirrups.

Walking was quantified by the use of two measures. Nurses attended each walking woman and recorded the number of minutes spent walking. In addition, the women in both groups wore pedometers (Comp-U-Step II, Precise International, Orangeburg, N.Y.) that recorded the number of steps walked during the first stage of labor. The pedometers were programmed to a default setting that assumed that the average stride was 0.8 m (2.6 ft). The majority of the walking women, however, probably had shorter strides. We estimate that 100 steps corresponded to approximately 61 m (200 ft) of walking. The pedometers allowed us to assess compliance with confinement to bed in the usual-care group. The women randomly assigned to walking were interviewed in the immediate postpartum period and asked whether, given the choice, they would want to walk during a future labor.

Labor outcomes were documented by certified nurse-midwives attending each woman. Delivery outcomes were recorded by the attending nurse, and the data sheets were later checked for accuracy by research nurses. The infants' outcomes were abstracted from newborn-discharge records.

Student's t-test and analysis of covariance were used to compare continuous variables. Chi-square tests and logistic-regression analysis were used for analysis of categorical data. All data were analyzed with SAS statistical software (SAS Institute, Cary, N.C.). All statistical tests were two-sided.

## RESULTS

Between September 1, 1996, and October 11, 1997, we enrolled 1067 women in this study; 536 were assigned to walking and 531 to labor in bed (usual care) during the first stage of labor. Among the women in the walking group, 30 had incomplete walking records, 8 had advanced cervical dilatation at the time of randomization, and 2 had a fetus with unrecognized breech presentation. Among the women in the usual-care group, 12 walked, 10 had advanced cervical dilatation, and 3 had a fetus with unrecognized breech presentation. The results were analyzed on an intention-to-treat basis. Among the women in the walking group, 116 (22 percent) did not walk. These women were not significantly different from those who did walk with respect to race ( $P=0.79$ ), parity ( $P=0.97$ ), and degree of cervical dilatation on admission ( $P=0.57$ ). However, the length of the first stage of labor was significantly shorter in the women who were randomly assigned to walking but who did not walk than in those who actually did walk (mean [ $\pm$ SD],  $5.5 \pm 3.6$  vs.  $6.2 \pm 3.5$  hours;  $P=0.05$ ). The mean walking time of those who actually walked during the first stage of labor was  $56 \pm 46$  minutes. The number of pedometer-recorded steps in the walking group, for the women who actually walked, was  $553 \pm 801$ , as compared with  $30 \pm 42$  steps in the usual-care group. Most of the latter group's walking was a result of trips to the toilet.

The characteristics of the women in the two groups were similar (Table 1). The groups were also similar with respect to the degree of cervical dilatation at the time of study entry ( $4.0 \pm 0.9$  cm in the walking group vs.  $4.0 \pm 0.8$  cm in the usual-care

**TABLE 1.** CHARACTERISTICS OF THE WOMEN IN THE WALKING AND USUAL-CARE GROUPS.\*

CHARACTERISTIC	WALKING GROUP (N=536)	USUAL-CARE GROUP (N=531)
Race or ethnic group — no. (%)		
Hispanic	440 (82)	425 (80)
Black	67 (12)	74 (14)
White	24 (4)	26 (5)
Other	5 (1)	6 (1)
Age — yr	$22.4 \pm 5$	$22.5 \pm 5$
Nulliparity — no. (%)	272 (51)	272 (51)
Cervical dilatation at base line — cm	$4.0 \pm 0.9$	$4.0 \pm 0.8$
Duration of labor — hr		
First stage	$6.1 \pm 3.6$	$6.1 \pm 3.5$
Second stage	$0.6 \pm 0.8$	$0.6 \pm 0.7$
Labor augmentation — no. (%)†	122 (23)	137 (26)
Chorioamnionitis — no. (%)‡	43 (8)	42 (8)
Analgesia — no. (%)		
None	84 (16)	76 (14)
Intravenous only	285 (53)	271 (51)
Epidural only	29 (5)	31 (6)
Both	138 (26)	153 (29)
Dose of analgesic — mg		
Meperidine	$64 \pm 29$	$68 \pm 29$
Butorphanol	$2.2 \pm 1.2$	$2.3 \pm 0.8$

\*Plus-minus values are means  $\pm$ SD. There were no significant differences between the groups. Because of rounding, not all percentages total 100.

†Labor augmentation was defined as stimulation of labor with oxytocin because of inadequate uterine contractions.

‡Chorioamnionitis was defined as a maternal temperature of  $38^{\circ}\text{C}$  or higher and either uterine tenderness or malodorous amniotic fluid at delivery.

group,  $P=0.74$ ). There were no significant differences between groups in any characteristics of labor, including the length of the first and second stages of labor, the need for oxytocin, the development of chorioamnionitis, and the use of analgesia. Similarly, walking had no effect on the length of the first stage of labor after adjustment for the degree of cervical dilatation on admission ( $P=0.65$  by analysis of covariance). Unexpected events occurred during labor in two of the women assigned to the usual-care group. One woman had a presumed amniotic-fluid embolism during the second stage of labor and was successfully resuscitated. Another woman had a convulsion attributed to bupivacaine toxicity during the administration of epidural analgesia.

There were no significant differences in the frequency of episiotomy, use of forceps, and cesarean delivery between the two groups (Table 2). Similarly, there were no significant differences between the nulliparous women in the two groups or between the parous women in the two groups (Table 3). Logistic-regression analysis, performed to adjust for parity in the cohort, also revealed no significant dif-

**TABLE 2.** DELIVERY OUTCOMES IN THE WALKING AND USUAL-CARE GROUPS.

OUTCOME	WALKING GROUP	USUAL-CARE GROUP	P VALUE
	(N=536)	(N=531)	
	no. (%)		
Episiotomy	122 (23)	124 (23)	0.86
Spontaneous delivery	490 (91)	483 (91)	0.39
Forceps delivery	23 (4)	17 (3)	0.35
Shoulder dystocia	1 (0.2)	2 (0.4)	0.56
Cesarean delivery			
Dystocia	17 (3)	17 (3)	0.98
Fetal distress*	5 (1)	12 (2)	0.08
Breech presentation	1 (0.2)	1 (0.2)	0.99
Prolapsed cord	0	1 (0.2)	0.32
Total	23 (4)	31 (6)	0.25

\*Fetal distress was defined as the presence of a nonreassuring fetal heart rate.

ferences in labor and delivery outcomes between the two groups.

The results in the 380 women assigned to walking who actually walked and in the women in the usual-care group were also similar (Table 4). Among the women who actually walked, 278 (73 percent) were asked if they would choose to walk again during a future labor, and 274 (99 percent) said yes.

There were no significant differences in the infants' outcomes, both in the delivery room and in the nursery, between the two groups (Table 5). The mean birth weights were similar, and there was the same proportion of large infants, defined as those weighing 4000 g or more, in the two groups. There were no perinatal deaths, and the condition of the

newborns at birth was unrelated to the mothers' group assignment.

**DISCUSSION**

We found that walking during labor had no appreciable effect on any outcome of labor or delivery. Approximately 22 percent of the women randomly assigned to the walking group did not, in fact, walk during labor. We believe that these women had significantly faster labors, which may have precluded their walking.

Reviews of the possible benefits of walking on the first stage of labor have been inconclusive,<sup>5</sup> although there is agreement that many women desire mobility during labor and there is no evidence that such activity is harmful to the fetus. Although there are published reports on the effects of walking on labor, there have been very few randomized trials.<sup>6-9</sup> In each of the four randomized trials that have been conducted, 14 to 630 women were studied. In two trials involving a total of 82 women, the duration of labor was shorter in the walking group. The shorter duration was attributed to improved uterine contractility in the upright position,<sup>6,7</sup> the decreased need for augmentation of labor with oxytocin,<sup>6</sup> the decreased need for analgesia,<sup>6</sup> and the lower frequency of instrumental vaginal delivery.<sup>6</sup> In the other two randomized trials, involving a total of 670 women, the duration of labor in the walking and usual-care groups was similar.<sup>8,9</sup>

We do not interpret our finding that walking does not shorten the first stage of labor as either an indictment or an endorsement of current birthing practices. There has been interest in the maternal position during the first stage of labor throughout the 20th century, but until relatively recently little re-

**TABLE 3.** COMPARISON OF THE EFFECT OF WALKING ON SELECTED LABOR AND DELIVERY OUTCOMES IN NULLIPAROUS AND PAROUS WOMEN.\*

OUTCOME	NULLIPAROUS WOMEN			PAROUS WOMEN		
	WALKING GROUP	USUAL-CARE GROUP	P VALUE	WALKING GROUP	USUAL-CARE GROUP	P VALUE
	(N=272)	(N=272)		(N=264)	(N=259)	
Labor — hr						
First stage	7.6±3.9	7.3±3.9	0.47	4.6±2.4	4.7±2.4	0.60
Second stage	1.0±0.9	0.9±0.8	0.46	0.2±0.3	0.2±0.3	0.42
Labor augmentation — no. (%)†	95 (35)	99 (36)	0.72	27 (10)	38 (15)	0.12
Forceps delivery — no. (%)	21 (8)	15 (6)	0.30	2 (1)	2 (1)	0.99
Cesarean birth — no. (%)	19 (7)	21 (8)	0.74	4 (2)	10 (4)	0.10

\*Plus-minus values are means ±SD.

†Labor augmentation was defined as stimulation of labor with oxytocin because of inadequate uterine contractions.

**TABLE 4.** SELECTED OUTCOMES IN THE WOMEN IN THE WALKING GROUP WHO ACTUALLY WALKED AND IN THE USUAL-CARE GROUP.\*

OUTCOME	WOMEN WHO ACTUALLY WALKED (N=380)	USUAL-CARE GROUP (N=531)	P VALUE
Labor augmentation — no. (%)†	85 (22)	137 (26)	0.23
Analgesia — no. (%)			0.76
None	61 (16)	76 (14)	
Intravenous only	199 (52)	271 (51)	
Epidural only	21 (6)	31 (6)	
Both	99 (26)	153 (29)	
Dose of analgesic — mg			
Meperidine	63±27	68±29	0.06
Butorphanol	2.2±1.2	2.3±0.8	0.61
Length of first stage of labor — hr	6.2±3.5	6.1±3.5	0.36

\*Plus-minus values are means ±SD.

†Labor augmentation was defined as stimulation of labor with oxytocin because of inadequate uterine contractions.

**TABLE 5.** OUTCOMES OF THE INFANTS BORN TO THE WOMEN IN THE WALKING AND USUAL-CARE GROUPS.

OUTCOME	WALKING GROUP (N=536)	USUAL-CARE GROUP (N=531)	P VALUE
Birth weight			
Mean (±SD) — g	3381±406	3393±387	0.61
≥4000 g — no. (%)	34 (6)	31 (6)	0.73
Condition at birth — no. (%)			
5-min Apgar score ≤3	0	0	—
Umbilical-artery pH ≤7.0	0	2 (0.4)	0.16
Intubation in delivery room	3 (0.6)	3 (0.6)	0.99
Seizures in first 24 hr of life — no. (%)	0	1 (0.2)	0.32
Stillbirth	0	0	—
Neonatal death	0	0	—

search was done to assess the validity of various strongly advocated opinions. The limitations of our experimental protocol include the inability to mask the tested intervention (walking), the inability to extrapolate our results to women with pregnancy complications or those with higher rates of cesarean delivery or epidural analgesia, and the lack of objective methods to gauge maternal satisfaction with either walking or lying down during labor.

Approximately 22 percent of the women in the walking group did not walk. Most of those who did walk indicated that they would do so again in a future labor. Since our results provide no objective evidence for or against walking during labor, it seems reasonable to let women elect either alternative. Thus, it appears that we have come full circle during this century to the conclusion that during labor a woman “should not be compelled to take to her bed unless she feels so inclined.”<sup>1</sup>

## REFERENCES

1. Williams JW. *Obstetrics: a text-book for the use of students and practitioners.* New York: D. Appleton, 1903:282.
2. Roberts J. Maternal position during the first stage of labour. In: Chalmers I, Enkin M, Keirse MJNC, eds. *Effective care in pregnancy and childbirth.* Vol. 2. *Childbirth.* Oxford, England: Oxford University Press, 1991: 883-92.
3. Satin AJ, Leveno KJ, Sherman ML, Brewster DS, Cunningham FG. High- versus low-dose oxytocin for labor stimulation. *Obstet Gynecol* 1992;80:111-6.
4. Hauth JC, Hankins GDV, Gilstrap LC III. Uterine contraction pressures achieved in parturients with active phase arrest. *Obstet Gynecol* 1991; 78:344-7.
5. Lupe PJ, Gross TL. Maternal upright posture and mobility in labor — a review. *Obstet Gynecol* 1986;67:727-34.
6. Flynn AM, Kelly J, Hollins G, Lynch PF. Ambulation in labour. *BMJ* 1978;2:591-3.
7. Read JA, Miller FC, Paul RH. Randomized trial of ambulation versus oxytocin for labor enhancement: a preliminary report. *Am J Obstet Gynecol* 1981;139:669-72.
8. Hemminki E, Saarikoski S. Ambulation and delayed amniotomy in the first stage of labor. *Eur J Obstet Gynecol Reprod Biol* 1983;15:129-39.
9. McManus TJ, Calder AA. Upright posture and the efficiency of labour. *Lancet* 1978;1:72-4.