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Active Management of the Third Stage of Labor May Reduce Breastfeeding Duration Due to Pain and Physical Complications

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Abstract

Background: Evidence is growing that active management of the third stage of labor using prophylactic uterotonics may be associated with lower breastfeeding rates. The reasons underlying this relationship are incompletely understood. The aim of this article is to examine the experiences of mothers who stopped breastfeeding in relation to administration of parenteral uterotonics for postpartum hemorrhage prophylaxis.
Subjects and Methods: Two hundred eighty-eight mothers with an infant 0–6 months of age who had a vaginal birth completed a self-report questionnaire examining injections of uterotonics during the third stage of labor, breastfeeding at birth, breastfeeding duration, and, where applicable, reasons for breastfeeding cessation, whether physical, social, or psychological.
Results: No significant association was found between infant feeding mode at birth (breast/formula) and injection of uterotonics. However, mothers who had received uterotonics were significantly less likely to be breastfeeding at all at 2 and 6 weeks. Among mothers who had stopped breastfeeding, those who had received parenteral prophylactic uterotonics were significantly more likely to report stopping breastfeeding for physical reasons such as pain or difficulty.
Conclusions: These findings suggest that injection of prophylactic uteronics may reduce breastfeeding duration, but not initiation. This may be attributable to the effects of oxytocin or ergometrine on the physiology of lactation, leading to difficulties with infant latch and milk supply. If breastfeeding rates are to be optimized, this hypothesis needs to be explored in randomized controlled trials of third-stage management. Meanwhile, mothers who receive parenteral uterotonics may need additional support to establish breastfeeding.

Introduction

The benefits of breastfeeding for both infant and maternal health are well known; accordingly, the World Health Organization recommends that infants be exclusively breastfed for the first 6 months postpartum.[1] However, breastfeeding rates in the United Kingdom remain low, despite intentions.[2] Breastfeeding duration and continuation are known to be affected by complex psychosocial factors such as family attitudes, professional support, and maternal confidence. Pain, perceived milk insufficiency, and difficulties with latch are also commonly cited reasons for cessation.[3–5]

Growing evidence suggests that birth experience can affect breastfeeding.[6–9] Uncomplicated unassisted vaginal birth followed by immediate skin-to-skin contact promotes initiation and continuation of breastfeeding.[10,11] However, complications such as emergency[6–8] and elective cesarean[12,13] sections, assisted birth using forceps or ventouse,[14] prolonged second stage of labor,[15] and fetal distress during labor[6] are all associated with a shorter breastfeeding duration. They may lead to delayed breast fullness,[16] delayed recovery from childbirth,[17] and separation of mother and infant,[18] which may contribute to breastfeeding failure.

Attention is focusing on medicines administered during childbirth and how they might affect breastfeeding. Epidural anesthesia/analgesia is associated with lower breastfeeding rates,[19,20] delayed onset of breastfeeding,[16] and perceptions of poor milk supply.[21] Opioids, such as pethidine, meptazinol, or fentanyl, reduce infants' ability to latch and suckle,[8,22] reducing the chances of breastfeeding.[17,23] Complications during childbirth may reduce breastfeeding duration. Mothers who experience postpartum hemorrhage, cesarean section, or fetal distress breastfeed for a shorter duration and are more likely to report pain on feeding plus difficulty with the infant's latch. Medicines associated with these complications may explain this link.[9]

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Table 1. Items and Factor Structure of Questionnaire Examining Reasons for Stopping Breastfeeding

Statement	*Body image*	*Embarassment*	*Difficulty*	*Pain*	*Lifestyle*	*Pressure*	*Support*	*Medical*
Breastfeeding was ruining my breasts.	0.65[a]	0.12	0.08	0.12	0.20	0.11	0.11	0.14
I wasn't losing weight.	0.73[a]	0.17	0.18	0.20	0.18	−0.14	0.15	−0.01
My breasts kept leaking.	0.62[a]	0.22	0.12	0.11	0.12	0.05	0.22	0.05
I wanted my body back for me.	0.62[a]	0.32	0.11	0.19	−0.08	0.01	−0.06	−0.22
I didn't like feeding in public.	0.16	0.84[a]	0.20	0.18	0.10	−0.07	−0.04	0.05
I didn't like feeding in front of others.	0.19	0.85[a]	0.29	0.16	0.01	0.05	0.03	0.06
I was stuck in the house breastfeeding.	0.22	0.72[a]	0.03	0.15	0.15	0.06	0.04	0.11
I didn't know anyone else who breastfed.	0.04	0.56[a]	0.32	0.22	0.11	0.22	0.29	0.12
The baby wouldn't latch on properly.	0.22	0.27	0.71[a]	0.20	0.11	0.27	0.22	−0.11
The baby was feeding all the time.	0.21	0.25	0.75[a]	0.21	0.06	0.15	−0.05	0.15
My baby wasn't gaining enough weight.	−0.09	0.07	0.69[a]	0.22	0.02	0.22	0.29	−0.11
I didn't have enough milk.	−0.02	0.01	0.62[a]	0.09	0.14	0.19	0.11	−0.02
Baby didn't want to breastfeed anymore.	−0.04	0.12	0.67[a]	0.23	0.26	0.29	0.16	0.01
It was too painful.	0.04	0.19	0.11	0.78[a]	0.27	0.22	0.09	0.11
My nipples were cracked.	0.01	0.08	0.21	0.62[a]	0.19	0.34	0.22	0.03
I got mastitis, thrush, or another similar problem.	0.03	0.04	0.26	0.68[a]	0.04	0.33	0.12	0.01
It was too difficult.	−0.02	0.15	0.20	0.77[a]	0.21	0.15	0.24	0.03
I never knew when the baby was going to feed.	0.11	0.04	0.10	0.22	0.72[a]	0.23	0.05	0.14
I didn't like being responsible for all the feeds.	0.03	0.24	0.19	0.14	0.67[a]	0.26	0.15	0.22
I couldn't keep track of milk intake.	0.30	0.23	0.12	0.13	0.70[a]	0.20	0.13	0.21
I couldn't leave the baby.	0.02	−0.05	0.14	−0.04	0.61[a]	−0.11	−0.03	−0.05
I couldn't go out and socialize.	0.12	0.16	0.24	0.06	0.68[a]	0.18	0.21	0.06
I wanted a more predictable routine.	−0.02	0.04	0.14	0.12	0.70[a]	0.18	0.19	0.13
My partner wanted me to stop.	0.15	0.35	0.10	0.22	0.10	0.79[a]	0.41	0.03
My mother wanted me to stop.	0.09	0.32	0.17	0.31	0.19	0.82[a]	0.34	0.12
Friends wanted me to stop.	0.13	0.26	0.12	0.16	−0.04	0.76[a]	0.39	0.05
Other people made negative comments.	−0.24	0.17	0.02	0.15	−0.11	0.75[a]	0.25	0.07
Other people felt excluded.	0.14	0.20	0.26	0.10	0.03	0.62[a]	0.35	0.03
I couldn't get any help with problems.	0.17	0.12	0.12	−0.15	0.23	0.12	0.80[a]	0.11
I didn't have enough support.	0.34	0.33	0.12	0.08	0.21	0.12	0.76[a]	0.18
I couldn't get any professional advice.	0.28	0.12	0.24	0.23	0.21	0.19	0.60[a]	0.32
I was exhausted.	0.30	0.18	0.42	0.23	0.05	−0.13	0.58[a]	0.22
I wasn't well.	0.38	0.32	0.36	0.05	0.12	0.12	0.12	0.54[a]

(*continued*)

Table 1. (Continued)

Statement	*Body image*	*Embarassment*	*Difficulty*	*Pain*	*Lifestyle*	*Pressure*	*Support*	*Medical*
The baby wasn't well.	0.22	0.28	0.25	0.17	0.04	0.10	0.08	0.68[a]
I was taking medication.	0.15	0.39	0.14	0.21	0.09	−0.09	0.22	0.66[a]
A health professional advised me to stop.	0.12	0.18	0.11	0.12	0.22	0.02	0.14	0.78[a]
Percentage of variance explained	15.28	10.66	4.79	4.74	4.16	4.02	3.42	3.20
Cronbach's alpha	0.79	0.76	0.70	0.69	0.63	0.78	0.72	0.62

Regression scores are shown for each item and how they load onto each factor produced.
[a]Items that group strongly on each factor.

Oxytocin administered during induction of labor has been associated with reduced breastfeeding,[15] attributed to desensitization of oxytocin receptors and the transfer of oxytocin across the immature fetal blood–brain barrier.[24] Also, induction and augmentation of labor increase pain,[25,26] leading to epidural administration.[15] However, analysis of a large cohort found no association between prenatal oxytocin and infant feeding ($n = 48{,}366$).[13]

Management of the third stage of labor may influence breastfeeding. To deliver the placenta, women choose either active management, which always includes injection of a uterotonic as prophylaxis against postpartum hemorrhage, or physiological management, which is unmedicated and allows the placenta to deliver spontaneously.[27] Because of reduction in mean postpartum blood loss in women receiving active management,[28] the World Health Organization in 2006 recommended active management, particularly in developing countries where up to 25% of maternal deaths are due to hemorrhage.[27] The 2007 United Kingdom guidelines (from the National Collaborating Centre for Women's and Children's Health) recommend active management of the third stage but indicate that physiological management may be supported in low-risk women, providing risk factors, including prenatal oxytocin use, prolonged first, second, or third stage, precipitate labor, and operative birth, are absent.[13] Women usually receive an intramuscular injection either of oxytocin or of oxytocin plus ergometrine (Syntometrine®; Alliance Pharmaceuticals, Chippenham, United Kingdom) during the third stage,[29,30] but practice varies.[31,32]

One potential adverse effect of medicated third stage is the impact on breastfeeding. Analysis of a large birth cohort ($n = 48{,}366$) indicated that intramuscular injection of oxytocin, with or without ergometrine, in the third stage of labor reduced breastfeeding rates at 48 hours by 6–8% (adjusted odds ratio [OR] = 0.75, 95% confidence interval [CI] = 0.61–0.91; adjusted OR = 0.77, 95% CI = 0.65–0.91), consistent with other observational studies.[20] A randomized controlled trial ($n = 132$) of active management of the third stage with intravenous ergometrine indicated an increase in supplementation and cessation of breastfeeding by 1 and 4 weeks postpartum, mainly because lactation was inadequate for the infants' needs.[33]

Understanding of the mechanisms underlying this reduction in breastfeeding is incomplete. It is possible that disruption of neuroendocrine/paracrine pathways may lead to suboptimal latching, nipple trauma, pain, and feeding difficulty. The aims of this article are (1) to examine associations between breastfeeding duration and intramuscular uterotonics and (2) to explore physiological, social, and psychological reasons for breastfeeding cessation in relation to third-stage management.

Subjects and Methods

Ethics statement

All aspects of this study have been performed in accordance with the 1964 Declaration of Helsinki. The Swansea University Department of Psychology Research Ethics Committee approved this study. All participants gave informed consent via tick box after reading the information sheet for the study. For online participants, if consent was not given, the remainder of the questionnaire would not upload.

Participants

Three hundred and ninety mothers with an infant up to 6 months of age and who had given birth vaginally were recruited through local mother and baby groups based in the City and County of Swansea, United Kingdom and by advertisement on United Kingdom online parenting forums between July 2011 and January 2012. Groups were located in areas with varying degrees of social deprivation as measured by the 2008 Welsh Index of Multiple Deprivation.[34] For participation via established online forums, study advertisements were placed on online message boards (e.g., www.mumsnet.com and www.bounty.com).

We excluded dyads affected by cesarean delivery, multiple birth, low birth weight (< 2,500 g), or premature birth (< 37 weeks).

Measures

The self-report questionnaire consisted of questions examining maternal demographic background (age, education, parity, and occupation [coded using the 2005 National Statistics Socioeconomic Classification]), infant details (age, gender, and birth weight), use of pain relief, method of delivery, and details regarding breastfeeding initiation, duration, and exclusivity.

Within the questions examining birth mode, participants were given a description of active versus physiological management of the third stage of labor. They were asked to indicate whether they experienced active management and received an injection soon after the birth or physiological management (no injection) or whether they were unsure. Women who received active management would not have known whether they received oxytocin alone or oxytocin plus

ergometrine. However, the impact of these on breastfeeding is almost identical.[20]

Participants indicated whether they breastfed or formula-fed at birth and, if they had stopped, duration of breastfeeding (full or partial). Mothers who had stopped breastfeeding completely also completed a 41-item questionnaire examining the reasons why they stopped (Table 1). Questions were based on qualitative interviews conducted with mothers exploring reasons for not breastfeeding or stopping breastfeeding before 6 months[5,35] and themes in the literature for breastfeeding cessation.[3,4] Items were initially piloted ($n=20$) before first being used.[9] Responses were based on 5-point Likert scales (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree).

To examine non-normally distributed data, such as breastfeeding duration, natural logarithmic transformations were computed to correct for the skewed distribution. Back-transformation was then used to compute interpretable mean scores.

Data collection

The questionnaire was completed either via a paper copy distributed through local mother and baby groups or via an online survey link whereby data were collected through an online questionnaire hosted by Survey Monkey. Participants from the face-to-face groups were also given an online link to complete the questionnaire if required, and likewise online participants could request a paper copy. Both paper and online versions of the questionnaire contained information and consent sections, debrief information, and details of how to contact the researcher for further information.

For face-to-face groups, permission was initially sought from the group leader. The group leader/manager distributed questionnaires to mothers who returned them to the group in sealed envelopes. For the online questionnaire, permission was sought from the hosts of online parenting groups (e.g., www.mumsnet.com or www.bounty.com). Details of the questionnaire were posted online with a link to the online version.

Data analysis

For the items examining reasons for breastfeeding cessation, principal components analysis using varimax rotation was carried out using IBM SPSS version 20 software (IBM SPSS UK Ltd., Portsmouth, United Kingdom). Factors with eigenvalues over 1 were retained. A threshold of 0.5 was used to determine which variables should be retained.[36] The computed factor scores were saved as regression scores and used for the data analysis as recommended by Tabachnick and Fidell.[37] Participants were therefore scored along a continuum from −1 to +1 for each factor. Higher factor scores represented stronger agreement with the specified reasons for stopping breastfeeding. Cronbach's alpha was computed for each factor to examine internal consistency.

Associations between breastfeeding at birth and at 2 and 6 weeks were explored in unadjusted (chi-squared with Yates's correction for 2×2 tables) and adjusted analyses. Multivariate analysis of covariance (MANCOVA) was used to explore differences in breastfeeding duration and reasons for stopping breastfeeding according to third-stage management (active versus physiological). The adjusted analysis controlled for factors associated with breastfeeding in unadjusted analyses: maternal age and education, birth mode, and analgesia administered.

Results

The questionnaire was completed by 310 mothers (256 online, 54 by paper copy). Twenty-two were excluded from the analyses for not knowing whether they had active or physiological management. Two hundred thirty-eight of the 288 participants had active management (82.6%), and 50 received physiological management (17.4%).

The mean age of the 288 participants at childbirth was 29.2 (SD = 5.35, range 18–42) years, and the mean number of years of education was 13.2 (SD = 2.05, range 12–20); 53.6% were primiparous. Demographics are further described in Table 2. The age of the infant at the time of response ranged from 1 to 26 weeks (mean, 15.76 weeks; SD = 7.11). No significant difference was seen in mean age,

Table 2. Sample Distribution by Demographic Factors and Birth Mode ($N=288$)

	Active third stage		*Physiological third stage*	
Indicator, group	*Number*	*%*	*Number*	*%*
Age (years)				
≤19	8	3.4	0	0
20–24	35	14.7	10	20.0
25–29	66	27.7	13	26.0
30–34	89	37.4	18	36.0
≥35	40	16.8	9	18.0
Total	238	100	50	100
Education				
School	63	26.4	12	24.0
College	46	19.3	11	22.0
Higher	81	34.0	11	22.0
Postgraduate	48	20.0	16	32.0
Total	238	100	50	100
Marital status				
Married	155	65.1	32	72.0
Cohabiting	69	29.0	12	24.0
Partner	10	4.2	2	4.0
Single	4	1.7	0	0.0
Total	238	100	50	100
Maternal occupation				
Professional and managerial	83	34.8	20	40.0
Skilled	44	18.5	9	18.0
Unskilled	28	11.7	6	12.0
Stay-at-home mother	83	34.8	15	10.4
Total	238	100	50	100
Birth mode				
Unassisted	166	69.7	43	86.0
Assisted	72	30.3	7	14.0
Total	238	100	20	100
Analgesia				
Pethidine	63	26.5	8	16.0
No pethidine	175	73.5	42	84.0
Total	238	100	50	100

years in education, or breastfeeding duration between mothers who completed a paper or the online version of the questionnaire.

Infant feeding

Participants indicated how they fed their infant at birth and at 2 and 6 weeks: 236 (81.9%) breastfed at birth, whereas 52 (18.1%) formula-fed. Mothers who breastfed at birth were significantly older ($t_{322} = 4.04$, $p < 0.001$) (mean difference, 3.20 years; 95% CI = 1.64–4.76) and more educated ($t_{322} = 6.58$, $p < 0.001$) (mean difference, 2.80 years; 95% CI = 1.95–3.63) than those who gave formula. Therefore maternal age and education were controlled for throughout analyses. No significant association was found between occupation or marital status and infant feeding at birth.

Birth experience

Birth mode (vaginal unassisted vs. vaginal assisted) and pain relief during childbirth (epidural or intramuscular pethidine meptazinol) were examined. Two hundred and nine mothers had an unassisted vaginal delivery (72.6%), with 79 having an assisted delivery with forceps or ventouse (27.4%). Seventy-one mothers used pethidine/meptazolin during labor (24.7%), whereas 44 from the active management group had an epidural (15.3%). The remaining mothers reported no pharmacological analgesia other than nitrous oxide in oxygen.

Mothers who had pethidine in labor were significantly more likely to formula feed at birth (OR = 0.24, 95% CI = 0.13–0.44), 2 weeks (OR = 0.53, 95% CI = 0.30–0.93), and 6 weeks (OR = 0.51, 95% CI = 0.29–0.88).

No significant association was seen between an assisted delivery and formula use at birth. However, mothers who had an assisted delivery were significantly more likely to be formula feeding at 2 (OR = 2.23, 95% CI = 1.28–3.90) and 6 (OR = 3.22, 95% CI = 1.56–6.62) weeks.

The association between third-stage management and birth experience was also explored. A significant association was seen between assisted birth and active management (OR = 0.38, 95% CI = 0.16–0.87), although no significant association was seen with use of pethidine and assisted delivery (OR = 1.27; 95% CI = 0.68–2.36).

Assisted birth and pethidine use were therefore controlled for where appropriate throughout analyses.

Infant feeding and uterotonic injection in the third stage of labor

When association between infant feeding mode and third-stage management was examined, no significant association was seen between third-stage management and infant feeding mode (breast/formula) at birth. Any breastfeeding (full or partial) at 2 and 6 weeks was then examined. For 2 weeks, the sample was reduced to those with an infant 2 weeks of age or older ($n = 263$), and for 6 weeks, it was reduced to those with an infant 6 weeks of age or older ($n = 228$). Significant associations were found between feeding mode and third-stage management. At both 2 and 6 weeks mothers who had received active management were significantly less likely to be breastfeeding compared with those who had a physiological third stage (Table 3).

Reasons for stopping breastfeeding and third-stage management

Mothers who had ceased breastfeeding at the time of the questionnaire reported reasons for stopping breastfeeding. Of the 113 who had ceased breastfeeding, 95 had received active management (84.1%), and 18 had received physiological management (15.9%). Those who received active management were significantly more likely to have stopped breastfeeding at the time of the questionnaire compared with those who had physiological management [$\chi^2(1, 228) = 9.81$, $p = 0.01$; OR = 3.43, 95% CI = 0.17–0.68].

Thirty-six of the 41 items loaded onto eight factors. The rotated component matrix explained 50.30% of the variance (Table 1). Internal validity for each factor was good, with Cronbach's alpha ranging from 0.62 to 0.79. Factors included were body image concerns (worries about appearance and leaking milk), embarrassment (not wanting to feed in front of others or in public), difficulty (problems with latch and positioning), pain (from cracked nipples or mastitis), impact on lifestyle (lack of routine and difficulties socializing), pressure from others to stop (from friends, family, and partner), lack of support (difficulties getting advice or support with problems), and medical reasons (taking medication or advised to stop by a professional).

Scores on each of the eight factors for stopping breastfeeding were compared for third-stage management groups controlling for birth mode, pain relief, and maternal age and education. MANCOVA found that mothers who had an

Table 3. Mode of Feeding and Third Stage Management (Unadjusted Analysis)

	Management [n (%)]				
Time, feeding type	*Active*	*Physiological*	*Chi-squared significance*	*Odds ratio*	*95% confidence interval*
Birth ($n = 288$)			$\chi^2(1, 288) = 1.50$, $p = 0.15$	0.57	0.23–1.42
Breast ($n = 236$)	192 (81.4)	44 (18.6)			
Formula ($n = 52$)	46 (88.5)	6 (11.5)			
2 weeks ($n = 263$)			$\chi^2(1, 263) = 8.04$, $p = 0.005$	0.35	0.18–0.71
Breast ($n = 131$)	100 (76.3)	31 (23.7)			
Formula ($n = 132$)	119 (90.2)	13 (9.8)			
6 weeks ($n = 228$)			$\chi^2(1, 228) = 6.36$, $p = 0.01$	0.38	0.19–0.78
Breast ($n = 79$)	59 (74.7)	20 (25.3)			
Formula ($n = 143$)	132 (88.6)	17 (11.4)			

active third stage were significantly more likely to agree they stopped breastfeeding for reasons of pain ($F_{1,99}=7.12$, $p=0.01$), difficulty ($F_{1,99}=10.17$, $p=0.002$), and embarrassment ($F_{1,99}=9.39$, $p=0.003$) compared with mothers who had physiological management. No difference appeared between the two groups for reasons of medical need, lack of support from others, pressure from others to stop, perceived inconvenience, embarrassment, or body image.

Prenatal versus postnatal oxytocin

To account for the possible impact of oxytocin administered before birth (through induction), we removed from the analysis all women likely to have received intravenous oxytocin. Women who are induced are likely to have an epidural; thus we removed all women who reported having an epidural ($n=44$). Likewise, induction is most common in full-term birth after 41 weeks of pregnancy. Therefore we further removed those women who gave birth at >41 weeks of gestation from the sample ($n=16$).

We reran all analyses with this smaller sample ($n=228$). All findings remained significant. At birth no significant difference was found between those who had an injection or not [$\chi^2(1, 228)=2.12$, $p=0.11$], but those who had the injection were significantly less likely to be breastfeeding at 2 [$\chi^2(1, 212)=18.39$, $p=0.00$] and 6 [$\chi^2(1, 189)=13.94$, $p=0.00$] weeks.

For the reasons for stopping breastfeeding, a MANCOVA still found that mothers who had an active third stage were significantly more likely to agree they stopped breastfeeding for reasons of pain ($F_{1, 78}=9.95$, $p=0.002$), difficulty ($F_{1, 78}=6.28$, $p=0.015$), and embarrassment ($F_{1,78}=6.81$, $p=0.011$) compared with mothers who had physiological management. No difference appeared between the two groups for reasons of medical need, lack of support from others, pressure from others to stop, perceived inconvenience, embarrassment, or body image.

Discussion

This study reports the association between intramuscular uterotonics in the third stage of labor, breastfeeding initiation and duration, and reasons for breastfeeding cessation among mothers of infants up to 6 months of age who had a vaginal birth. Mothers who received an injection of a uterotonic (oxytocin or oxytocin combined with ergometrine) during the third stage were less likely to be currently breastfeeding and reported shorter breastfeeding duration. They were significantly more likely to stop breastfeeding due to pain and difficulty than those who received physiological management.

Third-stage management did not affect infant feeding at birth. This is logical: women develop intentions to breastfeed or formula feed before or during pregnancy, and breastfeeding intention predicts breastfeeding initiation.[3,23] There is no reason why parenteral uterotonics should prevent an initial first breastfeed, as this is usually dictated by the woman's choice. This is often considered successful, even if the mother's attempts to latch the infant onto the breast are not wholly effective. Even if a mother has received medication that might interfere with ability to breastfeed, it would be unlikely to affect her willingness or ability to place her infant to the breast at birth unless childbirth had been unusually complicated.[9,10] All mothers in this sample had normal births (cesarean deliveries, infants needing neonatal intensive care units, and premature births were excluded), and any influence of assisted delivery on the relationship between third-stage management and breastfeeding was controlled for in the analysis.

Shortened breastfeeding duration due to pain or other physical difficulties was associated with injection of uterotonics during the third stage of labor. By as early as 2 weeks postpartum, women were significantly less likely to be breastfeeding if they had received intramuscular uterotonics. This finding might be interpreted in terms of the physiology of lactation. Successful breastfeeding requires increased secretion of prolactin and oxytocin at birth. Like all dopamine agonists, ergometrine inhibits prolactin secretion regardless of route of administration,[38] and intravenous ergometrine interferes with the ability to continue breastfeeding.[33] Administration of intramuscular oxytocin in the third stage of labor reduces endogenous prolactin secretion in response to suckling at 2 days postpartum[39] and interrupts oxytocin feedback mechanisms,[40] disrupting the hormonal balance needed for optimum mother–infant bonding.[39,40] Higher doses of oxytocin are associated with impaired infant breastfeeding behaviors, suggesting a dose–response relationship.[41] Also, the reduction of plasma cortisol level following intramuscular oxytocin may impair the catabolism needed for milk production.[42]

The proposition that oxytocin, with or without ergometrine, disrupts the finely balanced physiology of lactation is supported by the novel findings reported here. Among women who had stopped breastfeeding, those who had received active management were significantly more likely to do so for reasons of pain and difficulty compared with those who had physiological management, although no differences occurred between the two groups for issues such as social support, negative attitudes, or maternal health difficulties. Specifically, mothers who received active management were experiencing greater difficulty with infant latch and perceived milk insufficiency, indicating physiological issues and biological causes. Oxytocin secretion during birth and lactation depends on remodeling and on an abrupt switch in activity in the oxytocin-secreting cells of the magnocellular nuclei of the hypothalamus.[43,44] The effects of interventions and medicines at delivery on this complex regulation of oxytocin within the central nervous system have been shown to persist for at least 2 weeks postpartum[45]; our participants reported persisting with breastfeeding for days, hoping that problems would subside, before being overwhelmed by physical difficulties. Infants whose mothers have received oxytocin may experience greater difficulty latching onto the breast, or the mother–infant dyad may fail to feed responsively and build up the milk supply.

Poor latching is associated with pain on breastfeeding, and correct positioning and latch are critical for increasing milk supply and intake.[46] If infant feeding behavior is disturbed, poor latching and weak suckling will neither empty the breast nor stimulate adequate release of prolactin and oxytocin,[38] reducing milk production. This may lead to delayed lactogenesis and/or reports of inadequate milk supply and feeding difficulties; for example, low breastfeeding frequency at Day 2 is associated with low milk volume at Day 5.[17] Poor suckling and latching are associated with infant weight loss and, consequently, the belief that milk supply is poor or the

infant needs more than breastmilk,[3] resulting in shorter breastfeeding duration.[47,48]

Mothers who had received intramuscular uterotonics were also more likely to report stopping breastfeeding because they felt embarrassed at feeding in front of others or in public. Although this may not appear to be linked to a biological reaction to medication received, it is likely that mothers who have difficulty getting their infant to latch find feeding in public or in front of other people more problematic. In turn, greater embarrassment is linked to shorter breastfeeding duration.[5]

Currently, a high proportion of mothers receive active management of the third stage to reduce the risk of excessive blood loss.[28] Overall, active management shortens the third stage of labor and reduces the risk of postpartum hemorrhage, blood loss greater than both 500 mL and 1 L and overall mean blood loss by 79 mL, and the incidence of anemia (hemoglobin, <10 g/dL) postpartum.[49,50]

However, active management is also associated with an increase in nausea, vomiting, and hypertension (diastolic blood pressure, >100 mm Hg) and, in low-risk women, manual removal of the placenta (relative risk = 2.05, 95% CI = 1.20–3.51).[49] Moreover, the Cochrane Review of management of third-stage labor concluded that, for women at low risk of hemorrhage, active management may not reduce the risk of severe hemorrhage (>1 L) or low hemoglobin concentration (<9 g/dL) at 24–72 hours postpartum.[24] Serious blood loss may be due to damage to nonuterine tissues refractory to uterotonics.[31] Some observation studies suggest that, for low-risk women, severe hemorrhage (> 1 L), blood transfusion, and surgery for postpartum hemorrhage may be more likely when the third stage is actively managed.[25,26]

Practice varies, but most women continue to receive active management in the United Kingdom, although those under the care of midwives are more likely to receive physiological management.[29,30] Because systematic review suggests that, for low-risk women in developed countries, active management does not affect the incidence of severe hemorrhage or low hemoglobin concentration postpartum,[31] the impact of intramuscular uterotonics on breastfeeding duration merits consideration. These findings indicate that women who receive active management require greater support in relation to latch, pain, and building milk supply in the early days postpartum to articulate and overcome breastfeeding difficulties.

The uncertainty generated by this and previous work[13] will not be resolved without a large, multisite, randomized controlled trial for third-stage management. This analysis controlled for birth experience (mode and pain relief) and maternal demographic background, which may affect infant feeding. However, as in all observational studies, we cannot exclude residual confounding; it is possible that women who choose a physiological third stage are in some way different from those who choose active management. Research linking breastfeeding with management of the third stage may not be routinely discussed with women antenatally, and women who do not express a preference may be advised to receive active management.[29] In many United Kingdom centers, active management is often the automatic choice. Mothers who decide to have a physiological third stage may have read widely on birth and breastfeeding before making this decision and, consequently, are better informed on breastfeeding and overcoming difficulties. Alternatively, mothers who choose to go against the norm, and sometimes professional advice, regarding third-stage management may have greater confidence and self-efficacy, which in turn affects breastfeeding duration and ability to overcome difficulties.[3–5] Psychological traits, such as anxiety, may affect breastfeeding success[51]; whether this association is secondary to increased willingness to accept pharmacological interventions requires investigation. However, this aside, the data showed no differences in stopping breastfeeding for psychosocial issues between the two groups; differences would be expected here if women were significantly different in terms of psychological traits or determination to breastfeed.

This Internet survey has some limitations. First, the sample was self-selected with an unknown response rate, which might have led to only the most motivated women participating.[52] However, breastfeeding initiation and continuation rates of the sample are largely similar to those of the United Kingdom Infant Feeding Survey.[3] Although participants came from a wide range of demographic backgrounds, the sample favored older, more educated women, as is common elsewhere in health services research (e.g., Jordan and Morgan[53] and Alcade[54]). This may have been due to use of Internet forums for recruitment. However, the Internet is an increasingly popular strategy for contacting women from all demographic backgrounds and across widespread geographical areas, because of the popularity of such forums among young women.[55] Generalizability of the findings must be based on logical, rather than statistical, inferences.

Data are based on self-report and retrospective recall of birth mode, infant feeding at birth, and, for some, duration of breastfeeding. It is possible that mothers misreported whether they had an active of physiological third stage, but they were given the option of ''not sure'' and subsequent exclusion from the analysis. However, it is unlikely that mothers would forget third-stage management decisions, especially as, at least for physiological management, it is often an active choice written into birth plans.[56] Data regarding epidural use, assisted delivery, or how the infant was fed at birth are unlikely to be forgotten, especially in a sample for whom birth was relatively recent. Breastfeeding recall is often retrospective to allow for duration over a period to be measured (e.g., 6, 8, or 16 weeks).

Finally, data on induction and augmentation of labor were not collected, and it remains possible that prenatal oxytocin may influence our findings. However, sensitivity analyses excluding women likely to have received prenatal oxytocin indicate that our findings are robust and unlikely to be confounded by prenatal oxytocin administration. Data on other factors that might affect breastfeeding such as skin-to-skin contact[3] were not collected.

In conclusion, this article augments the growing body of evidence that active management of the third stage of labor using prophylactic uterotonics may decrease breastfeeding rates at 2 and 6 weeks. These data support the argument that active management may interfere with the physiology of lactation, increasing risk of difficulties with latch and milk supply. However, until an adequately powered multisite randomized controlled trial has been conducted, residual confounding cannot be discounted. The health benefits of breastfeeding indicate that this investment in maternal and child health is warranted.

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A.B. conceptualized and designed the study, coordinated data collection, carried out the analyses, drafted the initial manuscript, and approved the final manuscript as submitted. S.J. conceptualized and designed the study, carried out the analyses, drafted the initial manuscript, and approved the final manuscript as submitted.

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