Breastfeeding, Bed-Sharing, and Infant Sleep

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ABSTRACT: Background: *Expectations for infant sleep development and for the appropriate degree of parental proximity for infant sleep are culturally weighted and historically shifting aspects of parenting behavior, and are known to affect breastfeeding prevalence and duration. This paper examined how new parents managed night-time feeding in the first 4 months, with a particular focus on the relationship between breastfeeding, infant sleep location, and sleep bout duration.* **Methods:** *Sleep logs and semistructured interviews were used with a sample of 253 families in North Tees, United Kingdom, to explore how parents responded to their infant's sleep patterns, how breastfeeding parents managed night-time feeding, and whether bed-sharing was a common strategy.* **Results:** *A clear relationship between breastfeeding and parent-infant bed-sharing was demonstrated. Some evidence indicated that bed-sharing may promote breastfeeding.* **Conclusions:** *An understanding of the role of infant feeding practice on infant sleep and parental caregiving at night is a crucial element in breastfeeding promotion and enhancement of infant health. Health professionals should discuss safe bed-sharing practices with all parents. (BIRTH 30:3 September 2003)*

The tension between parental expectations that their infants' sleep habits should reflect their own as early as possible and the physiological characteristics of the breastfed infant to wake and feed frequently throughout day and night is known to be a barrier to breastfeeding in Western industrialized societies (1–3). Data on what, for decades, were regarded as the "norms" of infant sleep (4) were "established" in the United States and United Kingdom, when breastfeeding rates were at their lowest and solitary sleeping arrangements for infants were the norm. Nonetheless, the data from such studies are still cited in current pediatric texts as the standard against which infant sleep development is measured (5).

In recent decades a range of studies have documented that infants who are fed artificial formula begin to settle (i.e., sleep from 12:00 AM to 5 AM without waking) at a younger age than breastfed infants (6,7), and wake less frequently during the night (8). These differences in sleeping patterns are largely due to the relative indigestibility of cow's milk (9), and do not apply to infants who are breastfed—and particularly to those who are exclusively breastfed for at least 6 months in accordance with current health guidelines (10,11). Elias et al commented that "development of a long unbroken night sleep by the early age of 4 months is surprising when considered from an evolutionary viewpoint, because human infants, like other primates, are physiologically adapted for frequent suckling and close physical contact with their mothers" (12, p 322). Reporting a strong association between prolonged nursing and sleep/wake patterns of infants, Elias et al concluded that the developmental trends described in the literature were artefacts of the early weaning commonly practiced in the United States and western Europe in the previous 30 years.

It is documented that night feeds disappear more slowly in breastfed infants, and that differences occur in the size of milk-feeds across the day for breastfed, but not formula-fed infants (6). Furthermore, infants fed artificial formula experience shorter sleep latency, longer duration of REM (rapid eye movements) sleep, and a larger percentage of REM, whereas

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breastfed infants experience more interruptions during night sleep, are fed more frequently, and have more night feedings (13). Likewise, Quillin, reporting on 45 full-term infants at age 4 weeks, found that breastfed infants awakened more and slept less during the night, although experienced no difference in total hours of sleep diurnally (14). The frequency with which breastfeeding mothers have to wake and get up to feed their infants is a cited reason for giving up breastfeeding: "The mother's need for an uninterrupted night's sleep may be promoting the early cessation of breastfeeding" (2, p 436). Marchand and Morrow discussed barriers to breastfeeding identified by their study participants, and reported that one of these involved: "The need for a satisfied baby that sleeps through the night and does not feed too frequently" (1, p 321). The authors reported that families viewed infants who were gaining weight appropriately and who slept through the night as being well nourished and satisfied, and that this often was accomplished by supplementing the infant's diet with solid food early in life. They further noted that physicians often asked if infants slept through the night during office visits, thus indirectly suggesting to parents that this is what babies are "supposed" to be doing. Greenslade commented "many new mothers are quite unprepared to accept the frequency of breastfeeding which can be seen as often as two hourly because of the easily digestible nature of breastmilk, especially when a bottle of formula may keep the baby quiet for four to five hours. This is particularly significant at night even though giving a baby the breast at night is very easy" (3, p 24).

Experienced breastfeeding mothers and lactation professionals acknowledge that minimizing the disruption of night-time breastfeeding is important in sustaining the breastfeeding relationship over a period of many months (15). One nocturnal caregiving strategy that accomplishes this is for mother and baby to sleep together, allowing the infant easy access to the mother's breasts, and requiring minimal sleep disturbance for the mother when the infant needs to nurse. That a strong and clear relationship exists between breastfeeding and bed-sharing is supported by several studies (12,16–21).

The current study examined the night-time caregiving practices of 253 families during the first 4 months of their infant's life. It determined parents' responses to their infant's sleep patterns, how breastfeeding parents managed night-time feeding, and whether bed-sharing (defined as an infant sleeping in the parental bed with one or both parents for any portion of the night while parents were asleep, at a frequency of greater than once per week) was a common strategy.

Methods

With ethics committee approval, families were recruited from the postnatal ward of North Tees Hospital (located in the northeastern United Kingdom). From July 1998 to February 2000 researchers visited the ward each week, according to a randomly determined schedule, and attempted to recruit all mothers fitting the study eligibility criteria (healthy infant and mother, delivered at 36+ weeks' gestation). Mothers were approached by a female researcher, who explained the study as an exploration of night-time caregiving practices, and briefly interviewed mothers to ascertain their initial willingness to participate.

The study was presented to parents as an exploration of night-time caregiving, with no mention of an emphasis on sleep location or bed-sharing. Therefore parents were blind to the focus of the study when completing sleep logs and participating in interviews. To minimize potential reporting bias (e.g., parents' failing to describe a sleeping scenario, such as bed-sharing, for fear of criticism or disapproval), a range of possible sleep locations for infants was enumerated on the sleep logs, with boxes for parents to check, and with "parental bed" presented as one location of many.

Those willing to enter the study and sign an informed consent form were asked to provide basic demographic information; to complete a set of 7 sleep logs at home, over a period of 7 consecutive days during their baby's first and third months; and to participate in interviews at the end of the first and third months. Parents completed sleep logs each morning with reference to the previous night, that is, time, location, duration and type of infant feeds; time, location, and position in which infant fell asleep; enumeration of all infant sleep locations during the night; duration and frequency of bouts of infant wakefulness; and descriptions of unusual events (22). Sleep log data were averaged and tabulated for statistical analyses. Ten percent of sleep logs were double entered for reliability testing producing a kappa coefficient of 0.968 ($\kappa = 4.84$, $p < 0.00001$).

When infants were at age 1 and 3 months, trained research staff conducted in-home interviews by using a semistructured format. Interviewers were instructed to remain neutral in all discussions, and to draw out the participant's attitudes and practices (interviewers periodically observed each other's interviews to ensure internal consistency in gathering data). Data were entered into a structured database as soon as possible after the interview. Ten percent of interviews were double entered for reliability testing producing a kappa coefficient of 0.931 ($\kappa = 4.66$, $p < 0.00001$).

Results

Of the 497 mothers who were approached, 421 expressed an initial willingness to participate in the study (initial refusal rate = 15.7%). Sixty percent of the mothers recruited (253/421) completed both the 1-month sleep logs and interview, and 97 percent of these (248/253) completed the full study (3-month sleep logs and interview). The demographic characteristics of mothers who completed the study, and those who dropped out during the first month, are shown in Table 1. The mean infant age was 17 days, and 100 days at the start of each of the sleep-log weeks.

A comparison of the 253 participants in the study with published population demographics for the North Tees region did not reveal any striking differences; thus the sample appeared to be reasonably representative of the local population. Table 2 shows information on feeding practices at the two time periods. These proportions correspond well with the hospital's figure of 50 percent of infants being breastfed on discharge from the postnatal ward.

Night-Time Consequences of Feeding Choice

Breastfed and formula-fed infants exhibited remarkably different sleep-wake patterns, particularly by the third month, as recorded on sleep logs (Table 3). Differences in frequency of waking by feeding type are significant in both months. Differences in duration of infant waking were not significant. Table 3 also shows frequency of feeding at night by feeding type. No significant reduction occurred in the frequency of night feeds between the first and third months for breastfed babies; however, the reduction for formula-fed infants was significant ($p < 0.00001$). To determine whether these differences were caused by breastfeeding and formula-feeding parents considering "night time" to have different parameters, several variables demarcating the beginning and ending of the night were compared (time of "last" feed, time baby fell asleep, time mother went to bed, time mother awoke). No significant differences were found for these variables by feeding type, suggesting parents defined the night-time period in the same way.

Table 1. Demographic Characteristics of Participants ($n = 253$) and Dropouts

Variable	*Participants No. (%)*	*Dropouts No. (%)*	*Significance*
Age of mother (yr) (mean)	27.7	26.3	t test, $p = 0.03$
Age of father (yr) (mean)	30.3	29.2	t test = ns
Socioeconomic class			
I	18 (7)	7 (4)	$\chi^2 = 21.4$, $df = 7$, $p = 0.003$
II	61 (24)	17 (10)	
III	81 (32)	57 (34)	
IV	43 (17)	17 (10)	
V	13 (5)	7 (4)	
Unemployed	24 (10)	29 (17)	
Student	5 (2)	3 (2)	
Not stated	8 (3)	31 (18)	
Marital status			
With partner	238 (94)	156 (93)	χ^2 = ns
Lone parent	15 (6)	12 (7)	
Accommodation			
Own	177 (70)	82 (49)	$\chi^2 = 42.76$, $df = 4$, $p = 0.000$
Private rent	15 (6)	2 (1)	
Council rent	33 (13)	62 (37)	
Housing Assoc.	3 (1)	3 (2)	
Parents' housing	25 (10)	12 (7)	
Tenure (yr)	Mean = 3.65	Mean = 3.42	
Mother's education			
< 16 yr	106 (42)	96 (57)	$\chi^2 = 21.11$, $df = 4$, $p = 0.000$
Postsecondary/vocational	96 (38)	59 (35)	
Graduate	35 (14)	3 (2)	
Ongoing	10 (4)	2 (1)	
Not stated	5 (2)	7 (4)	
Household income	Mean = £23,020	Mean = £19,898	t test = ns
Parity	Mean = 1.6	Mean = 1.8	t test = ns

Socioeconomic class: I = professional, II = managerial & technical, III = skilled (manual & nonmanual), IV = semiskilled, V = unskilled.

Interviews with mothers who switched from breastfeeding to formula-feeding between the first and third months confirmed that some were unprepared for the frequency of feeds a breastfed infant requires at night, and were not willing to tolerate the sleep disruption that breastfeeding engendered. For example:

> Baby was too demanding and feeding too often. Breastfeeding didn't allow a good night's sleep and I have a toddler as well. (Mother 118)
>
> Baby was too demanding—waking too frequently. Baby now sleeps solid 12 hours at night (on formula). (Mother 203)
>
> Baby was unsettled on the breast and not sleeping. Now (on formula) baby not fed at night. (Mother 407)
>
> Breastfeeding was too tiring; wanted Dad to help at night. (Mother 412)

Of 40 mothers who initiated breastfeeding but stopped within 5 weeks, 20 percent (8/40) explained their decision to switch to formula in terms similar to those above. When we asked, "Have you had any bad nights with your baby?" 148 (58.5%) mothers described bad nights during their baby's first month, and 17 of these (11.5%) described bad nights in reference to the frequency with which their baby fed (e.g., "woke every couple of hours to feed," and "wasn't full on mum's milk").

In the first month 18 mothers (all formula-feeders) reported that their babies were no longer fed at night. Most babies (62%), however, received their night feeds in their parents' bed, with twice as many breastfed babies being fed in parents' beds than babies who were never breastfed (85% vs 43%). By the 3-month interview, two-thirds of all babies (168/250) were no longer fed at night, most of whom (96%) were fed artificial formula. Only 7 breastfed babies reportedly slept "through the night." Of the 82 babies receiving night-time feeds, 43 were formula-fed, of whom 42 percent were brought into their parents' bed to feed, whereas 39 were breastfed, of whom 97 percent were fed during the night in their parents' bed ($\chi^2 = 27.171$, $df = 1$, $p = 0.000$).

Table 2. Feeding Practices at Time of 1-Month ($n = 253$) and 3-Month ($n = 248$) Sleep Logs

Feeding Type	*1-Month Logs*	*3-Month Logs*
Mean age	17 days	100 days
Breastfed	112 (44.1%)	56 (22.6%)
Formula-fed	128 (50.4%)	183 (73.8%)
Mixed feeding	13 (5.1%)	9 (3.6%)

Sleeping Location

In these analyses, bed-sharing was restricted to night-time sleeping in an adult bed for any portion of the night. An infant who slept in the same bed as an adult, while the adult was asleep, was considered to have bed-shared. Almost one-half of all babies bed-shared in the neonatal period: 47 percent (120/253) sleeping with an adult at least once, for all or part of the night, in the 1-month sleep-log week. This was a conservative estimate of bed-sharing prevalence, since we underrecorded occasional bed-sharing occurring less than once a week. Twenty-nine percent (73/248) of babies bed-shared at least once, for all or part of the night, on the 3-month sleep logs. Fifteen (21%) of these babies had not bed-shared on the 1-month sleep logs, and overall 54 percent of babies bed-shared on at least one sleep-log night in the first month, third month, or both. With the inclusion of parental reporting of "ever bed-sharing" at interviews, 70 percent (176/253) of the sample had bed-shared by the time their baby was at least 3 months of age.

Subcategories of bed-sharing were defined as habitual bed-sharing (infant sleeps in parents' bed all night every night); combination bed-sharing (infant sleeps in more than one place, but sleeps in parents' bed for at least part of night on at least 2 nights per week); occasional bed-sharing (infant sleeps in parents' bed once a week or less) (19). Non-bed-sharing families claimed that their infant never slept with parent(s) in an adult bed. Proportions of families in each subcategory are shown in Fig. 1.

Feeding Type and Sleeping Location

Babies who were brought into their parents' beds to feed often remained there to sleep for the rest of the night. Sleep logs showed that 65 percent of infants who had "ever breastfed" slept in their parents' bed (at least occasionally), whereas 33 percent of formula-fed infants did so. For infants who were breastfed for

Table 3. Night-time Events for Breastfed and Formula-Fed Infants First and Third Months

	Breast		*Formula*	
Events	*1st Month*	*3rd Month*	*1st Month*	*3rd Month*
Mean frequency of infant waking	2.41	1.63	1.82	0.80
Mean duration of infant waking	1:44	0:42	1:26	0:33
Mean frequency of feeding at night	2.15	1.44	1.44	0.36

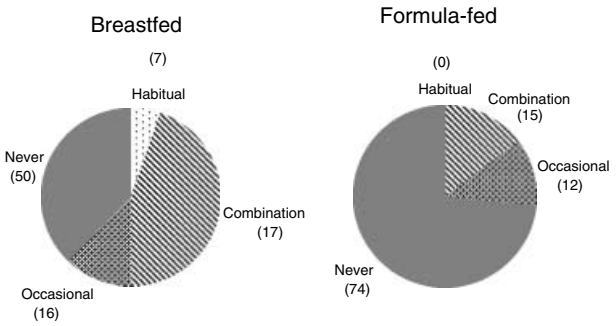

Fig. 1. Proportion of families practicing bed-sharing by infant feeding type.

a month or more, the association with bed-sharing was even greater (Table 4): 72 percent of these infants were bed-sharers compared with 38 percent of formula-fed infants ($\chi^2 = 29.03$, $df = 1$, $p = 0.0000$).

The data also suggest that bed-sharing helps prolong the total duration of breastfeeding, particularly for those mothers most likely to give up. Figure 2 depicts the overall decline in breastfeeding in this sample from birth to 16 weeks, illustrating the relative proportions of bed-sharers and non-bed-sharers. The proportion of mothers breastfeeding declined less steeply for bed-sharers than for non-bed-sharers, with 27 percent (16/60) of non-bed-sharers versus 46 percent (41/90) of bed-sharers continuing to breastfeed to at least 16 weeks. The association between bed-sharing at 1 month and breastfeeding to at least 16 weeks was significant ($\chi^2 = 5.45$, $df = 1$, $p = 0.02$). Figure 3 contrasts breastfeeding duration for bed-sharers and non-bed-sharers by occupational category. Women in occupational class V, and unemployed (U) in the United Kingdom generally have very low rates of breastfeeding, and if initiated, very short breastfeeding duration (23). We observed a significantly longer duration of breastfeeding among mothers in these occupational classes who were bed-sharers, compared with those who were not (t test, $p = 0.032$).

Discussion and Conclusions

Norms of infant sleep in the United Kingdom and United States were established when breastfeeding rates were at their lowest (4), leading parents and medical personnel to expect young infants to sleep through the night from an early age, but this is only characteristic of formula-fed infants. The composition of breastmilk supports the conclusion that humans are a low solute, frequent suckling species (24), and like other primates, humans are physiologically adapted for close mother-infant contact day and night, which is necessary both for the infant's optimum development (25) and the maintenance of the mother's milk supply (26). In addition, breastfeeding releases oxytocin, inducing sleep in both mother and baby (27). All these factors combine to indicate that sleep contact is an adaptive part of mother-infant nocturnal feeding behavior.

Our study confirmed that the frequency of both waking and feeding at night is significantly greater during the initial months of life for breastfed babies than for babies fed artificial formula. At age 3 months breastfed infants were fed at night with the same frequency as at 1 month (averaging 2–3 times per night), whereas formula-fed babies were, on average, receiving less than one feed per night.

We were disappointed to lose a large proportion of the sample (40%) between initial contact and the end of the first month; however, it was not completely unexpected that among the dropouts were more unemployed families, families living in housing rented from the local council, and a smaller proportion of mothers with graduate education. These mothers were particularly difficult to recontact, despite repeated efforts and personal visits. Thus the sample probably contains a slightly greater proportion of breastfeeders than one might find in a random sample of new mothers in North Tees. However, the night-feeding patterns of babies in North Tees reflect the findings of others (6,13,14) that breastfed infants experience more frequent night feedings than formula-fed infants at both 1 and 3 months.

When mothers are not prepared to get up periodically in the night and breastfeed, they generally pursue one of three options: (1) feed the baby formula (or formula plus some "heavy" indigestible substance, such as cereal or baby rice) so that he or she does not require frequent (or any) night

Table 4. Association Between Breastfeeding and Bed-Sharing

Feeding Type	*Bed-Shared No. (%)*	*Did Not Bed-Share No. (%)*	*Total*	*Significance*
Ever breastfed	80 (65%)	44 (35%)	124	$\chi^2 = 24.37$, $df = 1$, $p < 0.000001$
Never breastfed	43 (33%)	86 (67%)	129	
Breastfed (4+ wk)	81 (72%)	31 (28%)	112	$\chi^2 = 29.03$, $df = 1$, $p < 0.000001$
Formula-fed (4+ wk)	54 (38%)	87 (62%)	141	

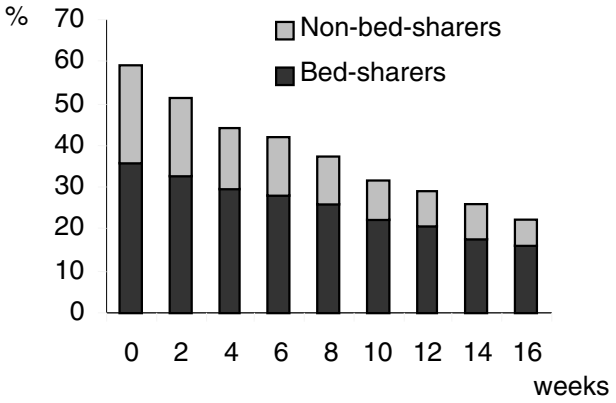

Fig. 2. Proportion of breastfeeding infants who did and did not bed-share from first month.

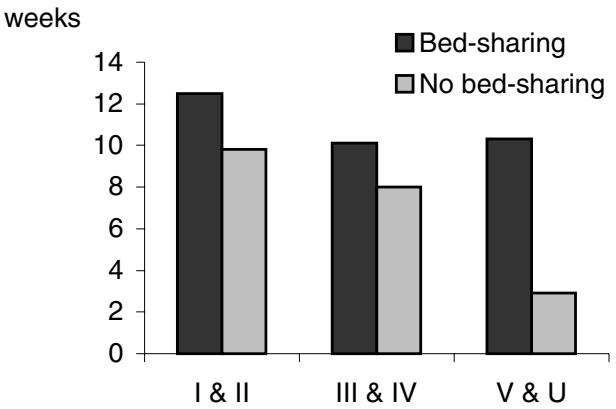

Fig. 3. Breastfeeding duration (weeks) for bed-sharers and non-bed-sharers by socioeconomic group.

feeding; (2) undertake an "infant-training" program involving feeding breastfed babies water in darkened rooms over lengthening intervals to encourage them to lengthen their sleep bouts until they "sleep through the night" (midnight to 5:00 AM); or (3) sleep next to the baby, allowing easy access to breasts, and eliminating the need for either mother or baby to wake fully for breastfeeds.

This latter strategy, which represents most breastfeeding-driven bed-sharing, is what we have termed "combination bed-sharing" (19). It is a strategy involving the baby starting the night in his or her own cot or crib, being brought into the parents' bed to feed (1:00 to 4:00 AM), and remaining in the parents' bed to sleep for the rest of the night and feed on demand.

Mothers in this study who were initially motivated to breastfeed, but who attempted to do so in the absence of bed-sharing, managed the nocturnal disruption of breastfeeding for up to 6 weeks (some considerably shorter), and then sought alternative strategies. Many mothers switched to artificial formula feeding to encourage their infants to sleep for longer periods at night, whereas others chose bed-sharing as a means to continue breastfeeding while reducing sleep disturbance for both parents and infant. Almost all mothers who continued to breastfeed for more than 8 weeks incorporated bed-sharing into their nocturnal feeding and sleeping routine early on. We found a significant relationship between bed-sharing and breastfeeding persistence, in contrast to early termination of breastfeeding in the absence of bed-sharing. This finding appears to support the hypothesis that bed-sharing promotes breastfeeding, although it is possible that these data reflect a propensity for women who are most likely to practice prolonged breastfeeding to also prefer bed-sharing. This issue will hopefully be resolved by means of a randomized controlled trial of breastfeeding and bed-sharing, the preliminary work for which is underway. Although Byard (28) cautions against the rare possibility of accidental asphyxia associated with breastfeeding related bed-sharing, breastfeeding mothers commonly bed-share as a means to ameliorate the sleep disruption of nocturnal breastfeeding (19), and we should expect that breastfeeding mothers and infants will predominate in any population of bed-sharers.

We have previously discussed (19,22) the benefits of bed-sharing for breastfeeding mothers who are separated from their infants during the day (e.g., at the end of maternity leave, which typically lasts for 3 months in the United Kingdom, although this may be extended by the employer). In addition to the opportunity that bed-sharing provides for mothers and infants to spend prolonged periods in close physical contact (described as a benefit of bed-sharing by many working mothers), the frequent suckling that bed-sharing facilitates helps to maintain the milk supply of mothers who are unable to nurse frequently during the day.

McKenna demonstrated that bed-sharing also promoted breastfeeding by halving the average interval between breastfeeds and doubling or tripling the total nightly duration of breastfeeding in comparison with separate room sleeping (29, p 22). If mothers breastfeed more frequently during bed-sharing nights than on separate sleep nights, breastmilk production will be enhanced, and mothers will be less likely to perceive the insufficiency in their milk supply that causes so many Western mothers to give up breastfeeding (30,31). Providing information about the practical aspects of breastfeeding, such as ease of night feeding, to prospective parents might aid in breastfeeding promotion (32).

Because the profile of breastfeeding in many Western countries involves a sharp decline in the proportion of infants breastfed between birth and 6 months (23,33), younger infants will be more likely to bed-share than older infants. The relationship between infant age and bed-sharing clearly demonstrated in the data from the current study is corroborated by Rigda et al (21), who found a significantly greater proportion of younger infants (2–12 wk) than older infants (13–24 wk) bed-sharing in an Australian cohort. Esmail et al (34) failed to observe a marked difference in bed-sharing prevalence by infant age; however, their comparative age groups (1 < 70 days vs 70–365 days) were possibly too broad for useful analyses.

Several implications of the current study and other studies of breastfeeding and bed-sharing can be noted. First, bed-sharing promotes breastfeeding in various ways (e.g., makes breastfeeding less "hard work," appears to prolong overall duration of breastfeeding, encourages more frequent night-time suckling). Second, as increasing numbers of mothers are encouraged to breastfeed, the proportion of babies who bed-share will be expected to increase. Third, blanket recommendations against parent-infant bed-sharing will work antithetically to breastfeeding promotion programs and undermine Baby-Friendly initiatives. Parents currently receive mixed messages with respect to bed-sharing; however, most do it, primarily to minimize the night-time disruption of breastfeeding. We suggest that health professionals should explicitly discuss bed-sharing with parents, particularly if they are encouraging those parents to breastfeed, and help them to think about how to bed-share safely, allowing them informed choices.

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