

Factors affecting breastfeeding adherence among Chinese mothers

A multicenter study

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Abstract

Breastfeeding is beneficial for both infant and mother, but discontinuation of breastfeeding is very common.

To investigate maternal breastfeeding intention and the rate of breastfeeding based on the theory of reasoned action, and analyze the predominant factors associated with breastfeeding and breastfeeding problems.

This observational study was conducted in 3 hospitals. Three researchers recruited women at 3 time points in the hospitals: initial documentation of pregnancy at the outpatient department, prenatal admission, and postpartum discharge. SPSS version 21 was used for statistical analyses. Significance was set at $P < .05$. In the multivariate analysis, binary logistic regression was used and odds ratios (ORs) with 95% confidence intervals (CI) were calculated.

We recruited 1260 women, with 420 pregnant women at each time point. 55.1% of the infants were exclusively breastfed, 40.6% were mixed fed, and 4.3% were formula fed when discharged from hospital. A total of 53.8% of the mothers declared having breastfeeding problems. The multivariate analysis showed that unsuccessful breastfeeding was associated with neonatal birth length, food intake before breastfeeding, infrequent sucking, the intention of breastfeeding, understanding level of the benefits of breastfeeding and that breastfeeding problems were related with the understanding level of the benefits of breastfeeding, neonatal birth length, normal vaginal delivery, breast size, the experience of breastfeeding, use of pacifier and the needs of family member's support in breastfeeding.

Most mothers who intended to practice exclusive breastfeeding initially chose to add formula and had breastfeeding problems when discharged from hospital. Successful breastfeeding depends on antenatal and postnatal breastfeeding education and on support provided by healthcare professionals.

Abbreviations: AAP = the American Academy of Pediatrics, ACOG = the American College of Obstetricians and Gynecologists, BMI = body mass index, CI = confidence intervals, NEC = necrotizing enterocolitis, ORs = odds ratios, UNICEF = the United Nations Children's Fund, USPSTF = United States Preventive Services Task Force, WHO = World Health Organization.

Keywords: breastfeeding, breastfeeding intention, unsuccessful breastfeeding, theory of reasoned action

1. Introduction

Breastfeeding is significantly beneficial for mother and infant during lactation and is associated with both social and household benefits in the long run. Benefits of breastfeeding for the mother during lactation include accelerated recovery from delivery,^[1]

reduced response to stress,^[2] enhanced weight loss,^[3] and prolongation of anovulation.^[4] Long-term benefits of breastfeeding for the mother include a reduced risk of both ovarian and breast cancer,^[5,6] and a possible reduction in the risk of cardiovascular disease.^[7] Social and household benefits of breastfeeding include economic savings—reducing consumption for health care and formula, for instance—and a reduction in infant mortality.^[8] Meanwhile, the direct clinical benefits of breastfeeding for the infants include improvement in gastrointestinal function and host defense, and a decreased risk of necrotizing enterocolitis (NEC) and other infections.^[9,10] In addition, compared with formula, breastfeeding may also bring long-term benefits to infants, such as a reduced risk of subsequent acute illnesses, chronic diseases and hospitalization,^[11] and improved cognitive development later in childhood and adolescence.^[12] Therefore, exclusive breastfeeding during the first 6 months of life is recommended by the World Health Organization (WHO), the American College of Obstetricians and Gynecologists (ACOG), United States Preventive Services Task Force (USPSTF), and the American Academy of Pediatrics (AAP).^[13–16]

Despite the many benefits of breastfeeding, however, a national survey in the United States in 2014 found that 79% of children had been breastfed, 41% of mothers were exclusively breastfeeding at 3 months, and only 18% were exclusively breastfeeding at 6 months.^[17] In Singapore, only 21% of children were breastfed

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at 6 months in 2001, and less than 5% of children were exclusively breastfed, although the survey indicated that nearly 90% of the mothers understood that breastfeeding was the best nutrition for infants and 95% reported that they attempted to breastfeed.^[18] Therefore, it is very important to study why mothers stop breastfeeding and what are the risk factors related to early termination of breastfeeding. Previous studies indicated that breastfeeding was associated with hospital breastfeeding practices, maternal social-demographic characteristics, biomedical, environmental-support, and psychosocial factors as well as maternal perception. Moreover, the reasons for early termination of breastfeeding include sore nipples, perception of inadequate milk supply, return to work, maternal depression, and lack of confidence in their ability to breastfeed.^[19–24]

Nevertheless, previous researches that studied maternal breastfeeding behavioral intention and investigated why women terminate breastfeeding early either involved relatively small samples or lacked in theoretical support. In this cross-sectional study, we investigated maternal breastfeeding intention and the rate of breastfeeding at discharge based on the theory of reasoned action, and analyzed the predominant factors associated with breastfeeding and breastfeeding problems.

2. Materials and methods

2.1. Materials

This observational study was conducted in West China Second University Hospital of Sichuan University, Sichuan Provincial Hospital for Women and Children and Chengdu Women & Children's Central Hospital. Three researchers recruited women at 3 time points in the 3 hospitals: initial documentation of pregnancy at the outpatient department, prenatal admission, and postpartum discharge. Mothers were eligible if they were aged over 18 and had no complication that would contraindicate breastfeeding. Women with serious illness were excluded. We only included women that signed the informed consent.

2.2. Data collection

We designed the survey questionnaire based on the theory of reasoned action. The social-demographic data of the participating women were collected, including age, education level, income, etc. We investigated the participant's attitudes and intentions of breastfeeding, which included the time of planned breastfeeding, self-efficacy of breastfeeding, the experience of infant feeding, the breastfeeding attitudes of family and friends, and knowledge on the benefits of breastfeeding etc. In addition, we collected information on the breastfeeding rate and breastfeeding problems at hospital discharge.

2.3. Outcome measures

The primary outcomes were breastfeeding intention of pregnant women and their dependents when they had their pregnancy documented at the hospital, prenatal admission, and the breastfeeding rate at hospital discharge. Exclusive breastfeeding is defined as that breast milk only is given to the baby except for vitamins, minerals, and medicines as appropriate. Partial breastfeeding is defined as that breast milk and complementary food—gruel, semisolids, solids, or formula milk, for instance—are given to the baby. No breastfeeding is defined as that only formula milk, complementary food and other liquids are given to the baby.^[25]

2.4. Statistical analysis

To calculate the sample size, we used the formula

$$n = \left(\frac{Z_{\alpha/2}}{\delta} \right)^2 \pi(1 - \pi).$$

The allowable error for the rate of breastfeeding is 5% with an overall rate of 0.65%, which meant that we needed 420 women for each time point.^[25] The survey data were entered into Epidata, and a specialized software was used for managing data. We used SPSS version 21 (SPSS, Inc., Chicago, IL) for statistical analyses. We used Chi-square test or rank sum test to analyze the statistical differences of qualitative data and used analysis of variance to analyze quantitative data for the 3 point times. Significance was set at $P < .05$. In the multivariate analysis, we used binary logistic regression and odds ratios (ORs) with 95% confidence intervals (CI) were calculated. We performed these analyses to explore the relationship between variables and dependent variables. We used the backward elimination procedure to reduce each full model ($P < .05$ for removal).

2.5. Ethical consideration

The study was approved by the Ethics Committee of West China Second University Hospital, Sichuan University. Informed consent was obtained from all participants.

3. Results

We recruited 1260 women from February 2015 to September 2015, with 420 pregnant women at each time point. Among them, 359 (85.4%) were available for interview in the outpatient department when they had their pregnancy documented, 347 (82.6%) at prenatal admission, and 354 (84.3%) at discharge from hospital. Their baseline characteristics were summarized (Table 1). No significant differences in the prevalence of maternal age, education or smoking were found between the prenatal and postpartum cohorts. Nevertheless, the 2 cohorts differed significantly in body mass index, parity, income, the time of receiving health education, and the experience of breastfeeding (Table 1).

3.1. Maternal breastfeeding intention and the attitudes of family members

Approximately 97% of pregnant women intended to breastfeed, but their confidence in breastfeeding differed significantly at 3 time points: about 91.2% of mothers had confidence in breastfeeding at discharge from hospital. Nevertheless, 44.6%, 45.5%, and 13.3% women did not know much about the benefits of breastfeeding, and 68.5%, 75.4%, and 55.7% women did not know much about the harms of nonbreastfeeding at the 3 time points, respectively. Most family members agreed on breastfeeding (Table 2).

3.2. Early weaning breastfeeding

At the age of 1 week, 55.1% of infants were exclusively breastfed, 40.6% were mix-fed, and 4.3% were formula fed. Among the mothers, 53.8% declared having breastfeeding problems. The top 3 reasons why mother added formula were inadequate breast milk supply (65.9%), worry that breast milk alone was not sufficient (12.3%), and pressure from family members (7.7%) (Table 3).

Table 1**Baseline characterizes of participants.**

Variable	At pregnancy documentations (n=359)	At prenatal admission (n=347)	At discharge (n=354)	P
	Number (%)	Number (%)	Number (%)	
Age, y				
18–34	336 (93.6)	322 (92.8)	323 (91.2)	NS
≥35	23 (6.4)	25 (7.2)	31 (8.8)	
BMI				
<18.5	83 (23.0)	72 (20.8)	7 (2.0)	.00
18.5–24.9	251 (70.0)	219 (63.0)	254 (71.8)	
25.0–29.9	20 (5.6)	49 (14.2)	84 (23.7)	
≥30.0	5 (1.4)	7 (2.0)	9 (2.5)	
Parity				
Primiparous	259 (72.1)	201 (57.9)	274 (77.4)	.00
Multiparous	100 (27.9)	146 (42.1)	80 (22.6)	
Education				
High school or less	26 (7.2)	41 (11.9)	30 (8.5)	NS
Some college	185 (51.6)	189 (54.5)	189 (53.4)	
College graduate	148 (41.2)	117 (33.6)	135 (38.1)	
Income (RMB)				
<2000	15 (4.2)	29 (8.4)	28 (7.9)	.01
2000–4000	123 (34.3)	135 (38.9)	137 (38.7)	
≥4000	221 (61.5)	183 (52.7)	189 (53.4)	
Smoke				
Yes	3 (0.8)	3 (0.9)	353 (99.7)	NS
No	356 (99.2)	344 (99.1)	1 (0.3)	
Gestational weeks/postpartum day (mean ± SD no.)	13.8 ± 4.31	38.7 ± 1.47	3.04 ± 1.3	
The time receiving health education	—	0.88 ± 1.17	1.42 ± 2.19	
Prenatal breastfeeding intention, mo				
<6	27 (7.5)	25 (7.2)	22 (6.2)	.04
6–12	314 (87.5)	311 (89.6)	300 (84.7)	
>12	18 (5.0)	11 (3.2)	32 (9.0)	
The experience of breastfeeding				
Yes	79 (22.0)	103 (29.7)	79 (22.3)	.03
No	280 (78.0)	244 (70.3)	275 (77.7)	

BMI=body mass index, NS=nonsignificant, SD=standard deviation.

3.3. Factors associated with breastfeeding

The following factors were correlated with nonsuccessful breastfeeding: the times of receiving health education, gestational week, neonatal's birth weight and length, food intake before breastfeeding, paternal educational level, confidence in breastfeeding, encouragement in breastfeeding by healthcare provider, frequency of sucking, agreement on breastfeeding, and understanding level of the benefits of breastfeeding. The multivariate analysis showed that the length of infants (OR: 1.48, 95% CI: 1.04–2.11), food intake before breastfeeding (OR: 21.66, 95% CI: 1.55–303.22), infrequent sucking (OR: 2.87, 95% CI: 1.34–6.12), the intention of breastfeeding (OR: 0.69, 95% CI: 0.52–0.93), and understanding level of the benefits of breastfeeding (OR: 0.002, 95% CI: 0.00–0.29) were significant and independent determinants of nonsuccessful breastfeeding (Table 4).

3.4. Factors associated with breastfeeding problems

Binary logistic regression showed that factors related to breastfeeding problems included understanding level of the benefits of breast feeding (OR: 0.37, 95% CI: 0.14–0.98), neonatal's birth length (OR: 1.93, 95% CI: 1.05–3.57), normal vaginal delivery (OR: 0.41, 95% CI: 0.21–0.80), breast size (OR: 0.13, 95% CI: 0.03–0.60), experience in breastfeeding (OR: 0.30, 95% CI: 0.11–0.83), use of pacifier (OR: 4.27, 95% CI: 1.68–10.89), needs of support in breastfeeding (OR: 5.08, 95% CI: 2.58–10.00) (Table 5).

4. Discussion

The main findings from this population-based cross-sectional study were that most of pregnant women had intended to breastfeed; but only 55.1% of infants were exclusively breastfed; and 53.8% of mothers had breastfeeding problems.

In the multivariate analysis, we found that prenatal breastfeeding intentions were negatively associated with adverse outcomes. In other words, higher prenatal breastfeeding behavioral intention was related with better breastfeeding outcomes. However, the results of our study indicated that approximately 97% of pregnant women had the intention to breastfeed, but only 55.1% of mothers breastfed exclusively during the birth hospitalization. At the same time, 1 study conducted among mothers who initially intended to breastfeed exclusively reported that 30% of the mothers did not achieve this goal.^[26] Confirmed reasons for not meeting their goals were the lack of skin-to-skin contact in the delivery room and the supplementation of formula in hospital. Another study indicated that in-hospital formula use was associated with the increased risk of weaning within the first 2 months of postpartum.^[27] The study of Merewood et al^[28] showed that facilities and clinical practice policies enhanced the initiation rate of breastfeeding during the birth hospitalization. As a matter of fact, these policies were best summarized by the Ten Steps to Successful Breastfeeding, which had been developed by the WHO and the United Nations Children's Fund (UNICEF) as criteria for a Baby-Friendly Hospital.^[29,30] The study of

Table 2**The attitudes and intentions of participants and family members to breastfeeding.**

Variable	At pregnancy documentations (n = 359)	At prenatal admission (n = 347)	At discharge (n = 354)	P
Understand the benefits of breast feeding				
Yes	199 (55.4)	189 (54.5)	307 (86.7)	.00
A little	151 (42.1)	156 (45.0)	47 (13.3)	
No	9 (2.5)	2 (0.5)	0 (0.0)	
Understand the harms if not breastfeeding				
Yes	113 (31.5)	120 (34.6)	157 (44.3)	.00
A little	187 (52.1)	176 (50.7)	151 (42.7)	
No	59 (16.4)	51 (14.7)	46 (13.0)	
Have the confidence to breastfeed				
Yes	302 (84.2)	308 (88.8)	323 (91.2)	.01
A little	50 (13.9)	37 (10.7)	29 (8.2)	
No	7 (1.9)	2 (0.6)	2 (0.6)	
Agree to breastfeed				
Yes	347 (96.7)	339 (97.7)	348 (98.3)	NS
Neutrality	12 (3.3)	7 (2.0)	6 (1.7)	
No	0 (0.0)	1 (0.3)	0 (0.0)	
Husband agrees on the breastfeed				
Yes	352 (98.1)	343 (98.9)	352 (99.4)	NS
Neutrality	7 (1.9)	4 (1.1)	2 (0.6)	
No	0 (0.0)	0 (0.0)	0 (0.0)	
Agree on the idea of your husband				
Yes	316 (88)	303 (87.3)	311 (87.8)	NS
Neutrality	39 (10.9)	42 (12.1)	37 (10.5)	
No	4 (1.1)	2 (0.6)	6 (1.7)	
Mom agrees on the breastfeeding				
Yes	351 (97.8)	339 (97.7)	354 (100)	.02
Neutrality	8 (2.2)	8 (2.3)	0 (0.0)	
No	0 (0.0)	0 (0.0)	0 (0.0)	
Agree on the idea of your mom				
Yes	314 (87.5)	308 (88.8)	289 (81.6)	NS
Neutrality	42 (11.7)	36 (10.4)	60 (16.9)	
No	3 (0.8)	3 (0.9)	4 (1.1)	
Mom-in-law agrees on the breastfeeding				
Yes	341 (95.0)	332 (95.7)	344 (97.2)	NS
Neutrality	18 (5.0)	15 (4.3)	10 (2.8)	
No	0 (0.0)	0 (0.0)	0 (0.0)	
Agree on the idea of your mom-in-law				
Yes	293 (81.3)	293 (84.4)	281 (79.4)	NS
Neutrality	61 (17.0)	46 (13.3)	67 (18.9)	
No	6 (1.7)	8 (2.3)	6 (1.7)	

NS = nonsignificant.

Pérez-Escamilla R showed that the breastfeeding policy has a positive impact on short-term, medium-term, and long-term breastfeeding outcomes, and improved early breastfeeding initiation, exclusive breastfeeding at hospital discharge.^[31] Therefore, clinical staffs should endeavor to publicize the Ten Steps to Successful Breastfeeding in hospital to encourage and facilitate breastfeeding. The limitations of this study are not reflected sources of potential bias or imprecision.

In our study, we found that the top 3 reasons why mothers added formula were inadequate breast milk supply (65.9%), worry that breast milk was not sufficient (12.3%), and pressure from family members (7.7%). Inadequate milk intake or the perception of inadequate milk production was the most common reason for early adding of formula.^[23,24] Causes of inadequate milk intake were insufficient milk production and poor milk extraction. The reasons cited/devoted for inadequate milk production are the following: insufficient breast development during pregnancy, previous breast surgery of the mother,^[32] and poor milk extraction. Poor feeding routines in the early period of postpartum were the most common cause of insufficient milk intake. They included infrequent feeding,

inadequate latch-on, maternal–infant separation, and formula addition.^[33] Therefore, initial management should focus on determining and addressing the cause of inadequate milk supply or transfer, involving increasing the effectiveness and frequency of breastfeeding. The use of breast pumps or manual hand expression especially after feeding increases stimulation and emptying of the breast, thereby enhancing milk production.

In the study of Parkinson, Russell-Bennett and Previte, personal social support was a significant factor that affected maternal breastfeeding self-sufficiency and breastfeeding behavior.^[34] In another study, the mothers who received more emotional and physical support from the infant's father and from their own immediate family members had significantly higher self-esteem.^[35] In our study, the maternal needs for breastfeeding that were supported by family members, were positively related to breastfeeding problems. As a result, clinical staffs need to make efforts to provide health education to the mother's family members on breastfeeding.

Binary logistic regression showed that the factors associated with breastfeeding problems were normal vaginal delivery

Table 3
The status of breastfeeding at hospital discharge.

Variable	Number (n = 354)	%
Mode of delivery		
Normal vaginal	193	54.5
Vacuum (ventouse)	17	4.8
Caesarean section	144	40.7
Intake of food before breastfeeding		
Yes	51	14.4
No	303	85.6
First lactation, h		
≤6	312	88.2
6–12	21	5.9
>12	21	5.9
Breastfeeding in hospital		
Exclusive breastfeeding	195	55.1
Partial breast feeding	144	40.6
No breast feeding	15	4.3
The way of lactation		
Breastfeeding on time	90	25.4
Breastfeeding on demand	264	74.6
There are difficulties in lactation period		
Yes	187	53.8
No	167	47.2
The reasons of adding formula		
I did not have enough milk	145	65.9
Breast milk alone did not satisfy my baby	27	12.3
Family members demanded	17	7.7
Encouraged to breastfeed by healthcare provider		
Yes	342	96.6
No	12	3.4

(OR: 0.41, 95% CI: 0.21–0.80) and breast size (OR: 0.13, 95% CI: 0.03–0.60). Evidence shows that the initiation rates of breastfeeding are lower in infants delivered by cesarean than those born vaginally.^[36] In a meta-analysis, the rate of initiating breastfeeding was also lower after cesarean versus vaginal delivery (OR: 0.57, 95% CI: 0.50–0.64).^[36] Similar results were noted in an Italian multicenter study, which reported that the rates of exclusive formula use were 19%, 8%, and 7% in infants born by elective cesarean delivery, emergency cesarean, and vaginal, respectively.^[37] Although some types of anesthesia may interfere with the initiation of breastfeeding and decrease

Table 4
Multivariate analysis of factors associated with nonsuccessful breastfeeding at discharge from hospital.

	P	OR	95% CI	
			Lower	Upper
The time receiving health education	NS	0.92	0.40	2.09
Gestational weeks	NS	0.91	0.25	3.33
Neonatal birth weight	NS	1.32	0.05	38.22
Neonatal birth length	.03	1.48	1.04	2.11
Intake of food before breastfeeding	.02	21.66	1.55	303.22
Education of husband	NS	4.66	0.57	38.12
No confidence to breastfeeding	NS	105.41	0.04	267580.50
Encouraged to breastfeed by healthcare provider	NS	0.06	0.00	1634.26
Infrequent sucking	.01	2.87	1.34	6.12
Agree to breastfeed	.01	0.69	0.52	0.93
Understand the benefits of breast feeding	.02	0.002	0.00	0.29

CI=confidence intervals, NS=nonsignificant, OR=odds ratio.

Table 5
Multivariate analysis of factors associated with breastfeeding problems at discharge hospital.

	P	OR	95% CI	
			Lower	Upper
Perceived poor weight gain	NS	2.75	0.55	13.70
Food intake before breastfeeding	NS	2.09	0.79	5.50
No confidence to breastfeed	NS	1.52	0.63	3.70
Understand the benefits of breast feeding	.05	0.37	0.14	0.98
Weight	NS	0.50	0.22	1.11
Length	.04	1.93	1.05	3.57
Gravida	NS	1.27	0.84	1.91
Postpartum day	NS	1.13	0.84	1.50
Education	NS	1.05	0.61	1.81
Normal vaginal delivery	.01	0.41	0.21	0.80
Neonatal weight	NS	0.33	0.06	1.87
Education of mom-in-law	NS	1.10	0.86	1.40
Breast size	.01	0.13	0.03	0.60
Nipples type	NS	0.58	0.33	1.04
Experience of breastfeeding	.02	0.30	0.11	0.83
Making use of pacifier	.00	4.27	1.68	10.89
Agree on the benefits of breastfeeding to yourself	NS	0.58	0.24	1.41
Agree on the benefits of breastfeeding to infant	NS	0.50	0.16	1.57
Understand the harms if not breastfeeding	NS	0.69	0.42	1.12
Need support in breastfeeding	.00	5.08	2.58	10.00

CI=confidence intervals, NS=nonsignificant, OR=odds ratio.

alertness of the infant, the problem is relatively insignificant because regional anesthesia was still the most common for cesarean deliveries. Therefore, infants delivered by cesarean delivery should be taken to the mother as soon as possible for skin-to-skin contact, even in the operation room. Meanwhile, clinical staffs should provide additional guide to mothers who have undergone cesarean delivery by helping them feel comfortable and teaching them techniques necessary for breastfeeding. ACOG declared that hypo-plastic breast tissue, nipple abnormalities, and previous breast surgery may interfere with successful breastfeeding.^[38] For one thing, insufficient glandular tissues cannot support breastfeeding as they should have, and so women without sufficient glandular tissues may have no breast enlargement during pregnancy and will produce little or no milk. Therefore, it is advisable to perform prenatal breast assessment to identify and address breastfeeding problems at the earliest stage possible. For another, nipple abnormalities and breast surgery, for example, augmentation or reduction procedures, could interfere with milk production.^[39] In our study, however, nipple abnormalities and breast surgery were not obviously associated with either breastfeeding or breastfeeding problems.

The multivariate analysis showed that the understanding level of the benefits of breastfeeding (OR: 0.002, 95% CI: 0.00–0.29) was significant and independent determinants of nonsuccessful breastfeeding. Binary logistic regression showed that breastfeeding problems were associated with the understanding level of the benefits of breastfeeding (OR: 0.37, 95% CI: 0.1340.98) and the needs of breastfeeding support (OR: 5.08, 95% CI: 2.58–10.00). This means that clinical staffs should make more efforts to provide health education on breastfeeding to mothers and their family members. Systematic reviews have shown that antenatal education and postnatal support programs improved rates and maintenance of exclusive breastfeeding.^[40,41] This was best illustrated in a meta-analysis of 38 randomized controlled trials (36 were conducted in developed countries) performed for the United States Preventive Task Force.^[40] Interventions for

promoting breastfeeding include structured educational sessions for mothers and other members of the family, professional and lay support for breastfeeding mothers, motivational interviews, skin-to-skin contact, delay or discouragement in pacifier use, and a combination of all these interventions.

5. Conclusion

Our findings highlight that most mothers had breastfeeding problems at hospital discharge, and many mothers chose to add formula, although they intended to practice exclusive breastfeeding before delivery. It is essential to ensure that the healthcare system provides efficient antenatal and postnatal breastfeeding education and support. In particular, clinical staffs should contribute more to promoting the Ten Steps to Successful Breastfeeding in hospital for a higher breastfeeding rate.

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