

## Impact of Maternity Support Program on the Stress of Mothers in the First Encounter with the Preterm Infants

### Abstract

**Background:** Mothers of premature infants experience a high level of stress. The current study was conducted aiming at investigating the impact of maternity support program on the stress of mothers in the first encounter with infants. **Methods:** This experimental study began in neonatal intensive care units (NICUs) of two hospitals of Tehran; that is, Mahdieh (intervention) and Shahid Akbar-Abadi (control), from Feb 14, 2016, to May 14, 2016. Both are educational and referral centers including three levels of NICU that were randomly allocated to intervention and control sites. In the span of study period all 75 infants and mothers with inclusion/exclusion criteria in the Mahdieh hospital were included in the intervention group and vis-à-vis all 68 infants and mothers in Shahid-Akbar-Abadi were enrolled in the control group. The designed intervention was conducted based on the support system pattern of mothers with premature infants in the interventional group. In the first stage of intervention, in the intervention group, mothers were provided informational, emotional, and spiritual support before and during the first exposure and were empowered for comfortable interactions. The control group received routine care. After the first exposure, the mothers' stress was measured by the Parental Stressor Scale: Neonatal Intensive Care Unit (PSS: NICU). The data were analyzed by STATA software as well as *t*-test, Chi-square, and average treatment effects (ATEs) were estimated using inverse probability treatment weights (IPTW). **Results:** After adjusting pre-treatment variables by IPTW, the adjusted average difference in the stress score over the NICU environment, infant's behavior and appearance, the special treatments on him/her, and the change in the parental role and total stress were 1.47 (1.19–1.75), 1.06 (0.73–1.14), 1.21 (0.93–1.49), and 1.18 (0.93–1.44), which were lower than the control group ( $P < 0.001$ ). **Conclusions:** The intervention reduced significantly the stress of mothers. The policy-makers are suggested to conduct this method.

**Keywords:** Health planning support, infant, mothers, premature, psychological, stress

### Introduction

Preterm delivery includes many psychosocial complications because it comes with "preterm parental" in which the women's expectation from the "normal" pregnancy and giving birth to a healthy infant are not met. The pregnancy term duration allows one to achieve the emotional adjustment with changes during the pregnancy and to obtain the parenting preparation. Preterm birth followed by hospitalizing the infant in a neonatal intensive care unit (NICU) not only causes such adjustment to occur but also is indicated as a stressful experience.<sup>[1-3]</sup>

It has been documented that preterm birth is usually related to conditions such as posttraumatic stress disorder, parental depression, anxiety, and other stress-related disorders.<sup>[4-6]</sup> These problems later affect

mother-infant bonding and interactions, such as insensitivity during interactions that can affect infant development.<sup>[4]</sup>

In the first encounter with the preterm infant, the technological and unfamiliar environment, infant's appearance, sense of losing the parental role,<sup>[7]</sup> and uncertainty in neonatal prognosis<sup>[8]</sup> affect significantly the formation of maternal stress and accompany contradictory feelings of fear and excitement.<sup>[9]</sup> Hence, the health team is required to provide a welcoming and supportive environment to help the parents to deal with the initial feeling of stress in coming to the NICU.<sup>[3,10]</sup> Addressing the specific causes of stress for mothers in the NICU has resulted in the development of supportive programs aimed at enhancing knowledge, empowerment, and sensitivity, alleviating stress and promoting effective adaptation skills.<sup>[3]</sup>

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Seyedeh S. Mousavi<sup>1</sup>, Afsaneh Keramat<sup>2</sup>, Reza Chaman<sup>3</sup>, Parisa Mohagheghi<sup>4</sup>, Seyed A. Mousavi<sup>5</sup>, Ahmad Khosravi<sup>6</sup>

<sup>1</sup>Nursing Care Research Center (NCRC), Department of Midwifery and Reproductive Health, Iran University of Medical Sciences, Tehran, Iran,

<sup>2</sup>Department of Reproductive Health, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran, <sup>3</sup>Department of Epidemiology, School of Health, Shiraz University of Medical Science, Shiraz, Iran, <sup>4</sup>Hazrate Rasoul Medical Center, Iran University of Medical Sciences, Tehran, Iran, <sup>5</sup>Department of Psychiatry, Psychiatry and Behavioral Sciences Research Center, Addiction Institute, Mazandaran University of Medical Sciences, Sari, Iran, <sup>6</sup>Center for Health Related Social and Behavioral Sciences Research, Shahroud University of Medical Sciences, Shahroud, Iran

<sup>7</sup>Department of Psychiatry, Psychiatry and Behavioral Sciences Research Center, Addiction Institute, Mazandaran University of Medical Sciences, Sari, Iran, <sup>8</sup>Center for Health Related Social and Behavioral Sciences Research, Shahroud University of Medical Sciences, Shahroud, Iran

<sup>9</sup>Department of Psychiatry, Psychiatry and Behavioral Sciences Research Center, Addiction Institute, Mazandaran University of Medical Sciences, Sari, Iran, <sup>10</sup>Center for Health Related Social and Behavioral Sciences Research, Shahroud University of Medical Sciences, Shahroud, Iran

<sup>11</sup>Department of Psychiatry, Psychiatry and Behavioral Sciences Research Center, Addiction Institute, Mazandaran University of Medical Sciences, Sari, Iran, <sup>12</sup>Center for Health Related Social and Behavioral Sciences Research, Shahroud University of Medical Sciences, Shahroud, Iran

<sup>13</sup>Department of Psychiatry, Psychiatry and Behavioral Sciences Research Center, Addiction Institute, Mazandaran University of Medical Sciences, Sari, Iran, <sup>14</sup>Center for Health Related Social and Behavioral Sciences Research, Shahroud University of Medical Sciences, Shahroud, Iran

### Address for correspondence:

Dr. Ahmad Khosravi, Center for Health Related Social and Behavioral Sciences Research, Shahroud University of Medical Sciences, Shahroud, Iran. E-mail: [khosravi2000us@yahoo.com](mailto:khosravi2000us@yahoo.com)

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There are different programs such as creating opportunities for parent empowerment (COPE),<sup>[11]</sup> mother-infant transaction program (MITP),<sup>[12]</sup> neonatal individualized developmental care (NIDCAP),<sup>[13]</sup> kangaroo care,<sup>[14]</sup> NICU tours,<sup>[15]</sup> music therapy,<sup>[16]</sup> buddy system,<sup>[17]</sup> expressive writing,<sup>[4]</sup> joint observation method, and infant massage.<sup>[18]</sup>

COPE is a combination of educational support and psychological conformity with maternal feelings.<sup>[11]</sup> It is conducted within 1 week after admission up to 6 months after discharge.

Just like COPE, other support programs<sup>[4,5,14,19-26]</sup> are planned for the duration of the baby's stay in the NICU, at discharge or beyond when the negative consequences of mental health have changed the mother's perception of infant and inefficient patterns of mother-infant interactions are established.<sup>[6]</sup> In these programs, the first exposure with a preterm infant has been neglected while it is very stressful.<sup>[27]</sup>

It is shown that the highest stress level is attributed to the beginning of infant admission in the NICU that is an emphasis on starting the supportive programs as soon as possible the infant is transferred to the NICU. The failure to pay attention to this critical stage may be one of the reasons that some of the interventions wouldn't help reduce the stress of parental role alteration.<sup>[11,15]</sup>

The current study is designed and conducted aiming at addressing this gap in the literature and determining the influence of early supportive interventions on the stress of mothers in the first encounter with the preterm infants.

Early supportive interventions provided that informational, emotional, and spiritual support before and during the first exposure and nurturing comfortable interactions.

## Methods

This experimental study was conducted in NICUs of two hospitals of Tehran; that is, Mahdih and Shahid Akbar-Abadi, from Feb 14, 2016, to May 14, 2016. Both are educational and referral centers including three levels of NICU. The unit of random allocation was hospitals. Avoiding the contamination between parents is the reason for this type of randomization. In the long run, Mahdih assigned to the intervention site and Shahid Akbar-Abadi assigned as a control site.

The study population of this study was the parents of premature newborns. All premature newborns and their parents with inclusion/exclusion criteria were recruited in the study during 3 months period.<sup>[17]</sup> The inclusion criteria were having a newborn with the age of fewer than 37 weeks, birth weight under 2500 g, high possibility of survival, expressing the satisfaction to take part in the study, Iranian nationality, and the ability to establish verbal communication. Exclusion criteria were as follows newborns with any abnormality or any serious disabling

conditions like intraventricular hemorrhage (IVH) grade 3 or 4.

In the intervention group, 75 infants and mothers were included and 68 infants and mothers were included in the control group during the study period.

## Intervention

The designed intervention was conducted based on the support system pattern of mothers with premature infants in the experimental group. In this pattern, parents and babies are at the center of the supportive model that need to be supported at critical transitional periods and consisted of preconception, prenatal, neonatal unit, the transition to home, and at home.

Different interventions in support of mothers in the NICU were planned for the program, which was gradually implemented within 3 months of the intervention. The present study focuses on the first phase, preparing for the first encounter with the infant, which was designed based on the pattern of the support system of mothers with preterm infants.<sup>[28]</sup>

After welcoming and introducing the researcher and explaining the research and obtaining a written informed consent from the mother to participate in the research and filling out the maternal Trait anxiety inventory, the first encounter of the mother with the infant was established based on the mother's placement, intervention, or control group.

In the intervention group, two albums were shown to the mother. One of the albums, filled with the photos of a premature baby was included from birth to the age of about 2 years, and in the other album the images of previous premature infants and the healthy present kids, all born in different weight and age, were born prematurely, was included. By showing these photos, we prepared mothers to see their baby with the characteristics of premature infant (informational support). During the presentation of the photographs to her, it was tried besides the recognition of the mother's values, was emphasized about trust in God, supplication, recourse to Ma'sumun (The 14 Infallibles), and surrendered to divine fate appreciation (spiritual support). The mother was trained how to express breast milk, work with a breast pump, store, and transport the breast milk, also we tried with creating hope around breastfeeding, gave emotional support. was given, too. At this point, the mother was advised to enter the neonatal intensive care unit, she was taken to the infant's bedside and was encouraged and empowered to have a comfortable interaction with the infant through the exchange of smell (encouraging the mother to put the milk pad under the infant's head and removing the previous pad to make the infant closer to her while milking and when the infant is away), continuous gentle touch, whispering in the infant's ear and eye contacts, and KMC as soon as possible.

In addition to the baby, the conditions and characteristics of premature infants and equipment around the baby were explained simply and were answered to any more questions the mother had about the baby, the environment, and the unit routine.

In the end, DVD and pictorial training booklets on infant's characteristics, premature infant, and infant massage were given to the mother, and the researcher's telephone number was given to the mother to ask any possible question, considering no time limitation then Parent Stressor Scale: Neonatal Intensive Care Unit (PSS: NICU) questionnaire was filled.

In the control group, once the state-trait anxiety inventory (STAI) was filled by mother, the mother's first encounter with the infant occurred in accordance with routines in the unit, and the nurse responded to any question, then after filling the PSS: NICU questionnaire, DVD, and pictorial training booklets on infant's characteristics, premature infant, and infant massage were given to the mother and the researcher's telephone number was given to mother to ask any possible question.

### Measurements

The STAI was designed by Spielberg in 1970 and revised in 1983. The concurrent validity of this scale with other anxiety inventories was assessed using the correlation coefficient ( $r = 0.73$  to  $0.85$ ), and the reliability was substantial using Cronbach's alpha coefficient equal to  $0.97$ . The validity of the Persian version was approved in 2007.<sup>[29]</sup>

The stress on the entrance of mothers was measured by the PSS-NICU after the mother's first encounter with an infant. Parental stress sources were evaluated in three fields of the NICU environment, infant's appearance, behavior, and special treatment made on him/her, parents' communication with infant and parental roles.

Margaret inventory (2002) is a self-reporting tool with 34 items which evaluates the parental stress sources in three fields of NICU environment (six items), infant's appearance, behavior and special treatment made on him/her (17 items), parents' communication with infant and parental roles (11 items). Mothers were demanded to specify the stress intensity of the aforementioned sources by choosing one option among these: "Never, A little, Medium, High, extremely stressful, No experience." In the end, there is an open-ended question in the field of other stressful issues from the mother's point of view. The scores' interval is between 0 and 170 where the high scores indicate the high stress of parents, and the validity and reliability of the Persian version of inventory are already determined.<sup>[30-32]</sup>

### Statistical analysis

The obtained data were analyzed by Stata 13 (StataCorp, College Station, Texas). T-test used for comparison of

means between the two groups and Chi-square test was used to assess the independence between two categorical variables. For control of the pre-treatment variable due to cluster randomization (not random allocation at the individual level), we used inverse probability treatment weights (IPTW) to compute weighted averages of the outcomes for each intervention level.<sup>[33]</sup>

The IPTW method was utilized to control the heterogeneity in basic variables between the two groups. In this regard, variable entitled disease intensity was initially generated based on the infant's requirements and a lack of need for invasive and noninvasive ventilation. Then, the treatment variable was modeled by logistic regression on basic variables of infant's disease intensity, age, birth weight, the reception-time status of anxiety, and reception-time personality anxiety which is known as the propensity score (PS). The weights are  $1/PS$  for the intervention group participants and  $1/(1-PS)$  for the control participants.<sup>[25]</sup> The average treatment effect (ATE) is an adjusted estimate of difference scores between two groups using weights.

### Results

The baseline characteristics of intervention and control groups were presented in Table 1. Since the patients were not divided randomly rather the hospitals were randomly allocated to intervention and control group, both the control and experiment groups were significantly different in terms of some demographic (education, occupation, insurance status, and mother ethnicity) and clinical factors (birth age, birth weight, and a number of noninvasive ventilation days) [Table 1].

Adjusted mean differences (95% confidence interval) of outcomes between the two groups are depicted in Table 2. Results of this study showed that the all stress scores including 1- total  $1.18$  (95% CI  $0.93-1.44$ ), 2- stress over the NICU environment  $1.47$  (95% CI  $1.19-1.75$ ), 3- stress over the infant's appearance, behavior, and special treatments on him/her  $1.06$  (95% CI  $0.73-1.14$ ), and 4- stress over the change in parental role  $1.21$  (95% CI  $0.93-1.49$ ), in the experimental group were significantly lower than the stress scores of the control group. It is significant because the confidence interval not including the zero.

### Discussion

The present study focuses on determining the influence of implementation of designed interventions based on the supportive program of parents of preterm infants<sup>[28]</sup> on the stress of mothers in the first encounter with the preterm infants.

Its implementation declined significantly the total stress and stress in three areas of the NICU environment, infant's appearance and behavior, and parental role alteration significantly.

**Table 1: A comparison of demographic information and clinical data between the two intervention and control groups**

Variables	Control (%) n=68	Intervention (%) n=75	P
Mother's education			
Under diploma	24 (35.3)	15 (20.0)	0.01
Diploma	35 (51.5)	36 (48.0)	
Academic	9 (13.2)	24 (32.0)	
Mother's employment			
Household	65 (95.6)	64 (85.3)	0.05
Employed	3 (4.4)	11 (14.7)	
Status of insurance			
Social insurance or treatment services	39 (57.4)	33 (44)	0.03
Rural or health insurance	25 (36.8)	26 (34.7)	
Complementary insurance	4 (5.9)	16 (21.3)	
Mother's ethnicity			
Persian	8 (11.8)	36 (48.0)	<0.001
Non-Persian	60 (88.2)	39 (52.0)	
Family income (\$)	341.5±138.7	400/2±312/2	0.08
Mother's age	28.3±5.8	28.5±5.4	0.84
Parity			
1	35 (51.5)	51 (68.0)	0.13
2	24 (35.3)	20 (26.7)	
3	5 (7.4)	4 (5.3)	
4	3 (4.4)	0 (0.0)	
5	1 (1.5)	0 (0.0)	
Abortion			
0	53 (77.9)	59 (78.7)	0.72
1	11 (16.0)	9 (12.0)	
2	3 (4.0)	4 (5.3)	
3	1 (1.5)	3 (4.0)	
Alive children			
1	21 (30.9)	26 (34.7)	0.15
2	31 (45.0)	39 (52.0)	
3	12 (17.6)	10 (13.3)	
4	4 (5.9)	0 (0.0)	
Pregnancy status in terms of multiple births			
Single	42 (61.8)	40 (53.3)	0.053
Twin	26 (38.2)	29 (38.7)	
Triplet	0 (0.0)	6 (8.0)	
Type of delivery			
Natural	13 (19.1)	10 (13.3)	0.26
Cesarean	55 (80.9)	65 (86.70)	
Sex of infant			
Male	34 (50.0)	35 (46.7)	0.69
Female	34 (50.0)	40 (53.3)	
Birth age	32.3±2.1	30.9±2.6	<0.001
Birth weight (kg)	1.7±0.4	1.5±0.48	<0.001
Number of invasive ventilation days	0.7±3.1	2.4±10.4	0.09
Number of noninvasive ventilation days	0.8±3.5	2.4±3.8	0.01

The study of Beheshti *et al.* is consistent with the findings of this study.<sup>[34]</sup> Beheshti *et al.* investigated the effect of the training program in four areas of general conditions of infant, NICU equipment and setting, partner support, and problem-solving strategies, on the reduction of parents' stress.

Another program that showed a consistently positive impact on maternal stress was MITP.<sup>[12]</sup> MITP empowers mothers to recognize their infant's special characteristics, temperament patterns, and developmental potential, gradually sensitizing parents to infant physiological and social cues, thereby, stress-sensitive care-taking, and



**Table 2: The average score of stress between the two intervention and control groups**

Stress	Control	Intervention	Average treatment effect*	95% CI for difference**
Total stress	2.74±0.79	1.71±0.79	1.18	0.93-1.44
Stress over the NICU environment	3.2±0.95	1.77±0.85	1.47	1.19-1.75
Stress over the appearance, behavior, and treatment of infant	2.41±0.92	1.47±0.97	1.06	0.73-1.14
Stress over parental role alteration	3.01±0.91	2.05±0.93	1.21	0.93-1.49

\*Average treatment effect is adjusted for infant's disease intensity, birth age, birth weight, reception status anxiety, and reception trait anxiety using the inverse probability treatment weight method. \*\*It is significant if the confidence interval not including the zero

improving the mutual interaction between the mothers and the infants.

NIDCAP program showed an inconsistent impact on stress alleviation and had no significant effect on parental stress.<sup>[13]</sup> The NIDCAP program is based on the individuality of families and premature infants in which the infant's behavior as the expression of brain function is observed along with four subsystems: attention and interaction, state, autonomic, and motor. Observations are discussed with mothers and other caregivers as a caregiving plan and for synchronizing the infant's environment. The NIDCAP program might result in increased engagement of mothers compared to a basic form of care leading to more stress levels of mothers.

COPE also showed a positive impact on maternal stress.<sup>[11]</sup> In this program, Melnyk succeeded to alleviate the maternal stress related to the physical environment by combining the training support and psychological conformity. The training intervention was regarding premature infant's appearance and behavior, how parents participate in infant care, and how to interact positively with the infant. It is conducted within 1 week after admission and despite literature emphasizing,<sup>[35]</sup> the stress of the first encounter was not taken into account. Maybe that's it, one reason that COPE wouldn't help reduce the stress of parental role alteration.

Mianaei implemented the COPE intervention in Iran and contrast to Melnyk, COPE designer, could alleviate the stress in areas of change in a parental role.<sup>[36]</sup> It seems such differences related to cultural and economic differences. As such, the training and welfare facilities and higher psychological support create a more inflexible and demanding character in which the stress cannot be decreased easily.

In the present study, an intervention plan was designed based on the evidence.<sup>[28]</sup> Part of our multifaceted intervention was designing peer support and their introduction to mothers. Since the nurses probably don't have sufficient time to meet the parents' emotional needs, applying the members of volunteer supportive teams can be suitable.<sup>[37,38]</sup>

Sharing the experience and feeling with similar mothers helps to cope with the stress of premature birth and accepting infant clinical status. Furthermore, the health team can extend their support range by referring the

parents to other parents with the same experience. The unique empirical knowledge offered by the experienced parents in groups provides an opportunity for two-way sharing, creating a support system in which the extension for parents is continued until the post-discharge period. In such an environment, the mother receives confirmation, justification, and empathy from others in terms of thoughts and feelings and becomes aware of how other mothers cope with the stress of encountering current conditions.<sup>[39,40]</sup>

It is very important what kind of perception parents have of the NICU environment and it should be guided to alleviate the shock of first encounter and parents' reassurance that their children will be handed over to reliable hands.<sup>[9]</sup> Therefore, one element of our intervention is to introduce the unit, personnel, facilities, equipment, and unit routine affecting the stress reduction. As in various studies, various preparation methods like displaying the premature infant image,<sup>[41]</sup> running to NICU tour for mothers exposed to the preterm delivery were utilized and it was found that these interventions decrease the parents' fear and inspires the hope for infant future and reassures the cares offered in NICU.<sup>[42]</sup> Showing two image albums where in one album, pictures of a preterm infant since birth to 2 years old and in another, pictures of born preterm infants in different ages of 1–14, was another part of our intervention which prepared the mothers for the first encounter with the preterm infant with special premature characteristics<sup>[9]</sup> and was promising for the infant future.

NICU tour, teaching the characteristics of the premature infant and NICU environment for mothers exposed to the preterm delivery or mothers with premature infants lead to stress reduction in areas of NICU environment and infant appearance which is fully consistent with the present study.<sup>[1,11,15,43]</sup>

Chourasia *et al.* conducted a 30–45-min informational session to test the impact of counseling among mothers of preterm infants about the structure, settings, procedures of NICU and giving feedback to mothers on infant clinical progress. 48 h after the intervention, stress reduction was significant in the intervention group.<sup>[44]</sup>

In the current study, arranging the NICU tour after the preterm delivery and during the first encounter with an infant had the same effect in the reduction of mothers' stress.

Due to preterm birth, the parents feel frustrated due to the lack of their expected caring role as a parent<sup>[5,37]</sup> and the stress reduction resulting from the change in a parental role cannot be realized by a mere training intervention,<sup>[26]</sup> as such impact was not observed in studies by Melnyk,<sup>[11]</sup> Morey,<sup>[15]</sup> Giuseppe<sup>[5]</sup> Annie,<sup>[45]</sup> Glazebrook.<sup>[46]</sup>

In another intervention study, Voos *et al.* compared the impact of traditional rounds versus family-centered rounds in which parents actively participated in rounds, and found no effect of this intervention on parental stress,<sup>[47]</sup> which emphasizes that simply receiving information is not enough to relieve stress.

Franck *et al.* evaluated teaching families about signs and relief techniques of pain through written information. This intervention increased maternal satisfaction but showed no significant difference in parental stress,<sup>[48]</sup> While in the present study, the use of combined interventions and encouraging mother/infant interaction, as soon as possible, could be effective in reducing maternal stress.

Another component of the designed intervention is how to express breast milk, work with breast pumps, and store and transport the milk. In addition to positive impacts on the future breastfeeding success, it was conducted initially aiming at decreasing the deprivation of unique feelings of maternity.<sup>[15]</sup>

The most effective interventions appear to be those are not limited to education. Abd-e Yazdan with the implementation of a family support program including two informational and emotional supports could decrease the stress level among the parents significantly, but his intervention started 2–4 days after the admission of the infant in the NICU and made no support from the parents in the acute phase of admission.<sup>[49]</sup> Whereas in the present study, the use of various interventions in the first encounter of the mother with preterm infants, including early mother/infant interaction, could reduce maternal stress regarding the NICU environment, infant's appearance and behavior, and parental role alteration significantly.

### Limitation

As already mentioned in the results, concerning the mothers' encouragement to attend the hospital as much as possible, pollution was a limitation leading to sampling in two hospitals.

Despite this disadvantage, the intervention was highly effective in reducing mother stress. Moreover, for each outcome, the results remained mainly unchanged after adjustment for baseline differences between groups.

### Conclusion

In view of the successful implementation of intervention, which was designed based on the evidence and facilities,

it is proposed to conduct such program to promote the quality of offering the care to preterm infant parents and transforming the infant services into the welcoming, supportive and family-based models and it is suggested that another similar study is conducted on the fathers.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the mothers have given their consent for their clinical information to be reported in the journal. The mothers understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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