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ORIGINAL ARTICLE

NEWBORNS CHARACTERIZATION TRANSFUSED IN NEONATAL INTENSIVE CARE UNIT
CARACTERIZAÇÃO DOS RECÉM-NASCIDOS HEMOTRANSFUNDIDOS NA UNIDADE DE TERAPIA INTENSIVA NEONATAL
CARACTERIZACIÓN DE LOS RECIÉN NACIDOS TRANSFUNDIDOS EN LA UNIDAD DE TERAPIA INTENSIVA NEONATAL

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ABSTRACT
Objective: to characterize the newborn blood transfusion profile in hospitals of medium and high risk. *Method:* quantitative, retrospective and documentary study, involving 57 medical records of newborns hospitalized in a public hospital in Fortaleza, Brazil. Data were analyzed from tables and figures. The research project was approved by the Ethics Committee in Research, Protocol number 410/10. *Results:* most of the transfusions (75.44%) were performed in newborns with very low weight, with an average weight at birth of 1344.47 grams. The age of the first transfusion was 10.02 days (± 8.1), between 0.38 and 28 days. The more infused blood component was the concentrated red blood cells (54.97%) and the indications for transfusion: anemia (28.07%), causes associated with anemia (19.3%) and sepsis (8.77%). *Conclusion:* The findings can subsidize nursing care to have evidenced the transfusion records in neonatal. *Descriptors:* Neonatal Intensive Care Units; Blood Component Transfusion; Neonatal Nursing; Health Profile; Nursing Care.

RESUMO
Objetivo: caracterizar o perfil dos recém-nascidos hemotransfundidos em unidades hospitalares de médio e alto risco. *Método:* estudo quantitativo, retrospectivo e documental, realizado com 57 prontuários de recém-nascidos internados em um hospital público de Fortaleza, Brasil. Os dados foram analisados a partir de tabelas e figura. O projeto de pesquisa foi aprovado pelo Comitê de Ética em Pesquisa, Protocolo n° 410/10. *Resultados:* a maioria das transfusões (75,44%) foi realizada em recém-nascidos de muito baixo peso, média de peso ao nascer de 1344,47 gramas. A idade da primeira transfusão 10,02 dias (±8,1), entre 0,38 e 28 dias de vida. O hemocomponente mais infundido foi concentrado de hemácias (54,97%) e as indicações para transfusão: anemia (28,07%), causas associadas à anemia (19,3%) e sepse (8,77%). *Conclusão:* os achados podem subsidiar a assistência de enfermagem por terem evidenciado a história transfusional no período neonatal. *Descritores:* Unidades de Terapia Intensiva Neonatal; Transfusão de Componentes Sanguíneos; Enfermagem Neonatal; Perfil de Saúde; Cuidados de Enfermagem.

RESUMEN
Objetivo: caracterizar el perfil de los recién nacidos transfundidos en unidades hospitalarias de medio y alto riesgo. *Método:* estudio cuantitativo, retrospectivo y documental, realizado con 57 prontuarios de recién nacidos internados en un hospital público de Fortaleza, Brasil. Los datos fueron analizados a partir de tablas y figuras. El proyecto de investigación fue aprobado por el Comité de Ética en Investigación, Protocolo número 410/10. *Resultados:* la mayoría de las transfusiones (75,44%) fueron realizadas en recién nacidos de muy bajo peso, media de peso al nacer de 1344,47 gramos. La edad de la primera transfusión fue de 10,02 días (±8,1), entre 0,38 y 28 días de vida. El hemocomponente más infundido fue concentrado de hematíes (54,97%) y las indicaciones para transfusión: anemia (28,07%), causas asociadas a la anemia (19,3%) y sepsis (8,77%). *Conclusión:* los hallados pueden subsidiar la asistencia de enfermera por haber evidenciado la historia transfusional en el período neonatal. *Descriptores:* Unidades de Terapia Intensiva Neonatal; Transfusión de Componentes Sanguíneos; Enfermería Neonatal; Perfil de Salud; Cuidados de Enfermería.

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INTRODUCTION

To survive outside the womb, the newborn need to successfully pass through the transition period characterized by its adaptation to extra-uterine life.[1] Specifically, when they cannot be born in a satisfactory way, neonates are more predisposed to several interventions needed to keep their survival, including, blood transfusion.

Hospitalized newborns (NB) are in a group of patients that proportionally consumes more blood components. This consumption is inversely proportional to its weight and/or gestational age.[2] Blood transfusion in Neonatology has a different approach than adults due to the following characteristics: greater sensitivity to cold than in adults, increased risk of tissue anoxia, metabolic and immunological immaturity, peculiar hematological physiology and specific diseases from NBs.[3]

NB especially premature under intensive care, are exposed to excessive blood collections, respiratory disorders and physiological late anemia. Associated infections cause harm in the synthesis of red blood cells, favoring hemolysis. The sepsis state generates hemostatic disorders and facilitates bleeding, then, anemia and indications for transfusion of red blood cells may have several associated factors.

In neonatal period, anemia should not be based on fixed hemoglobin and hematocrit values, since there is a variation according to neonatal gestational age and weight.[4] Clinical signs present a significant association with anemia, including: respiratory irregularity, tachycardia, lethargy, poor weight gain, low suction and high blood levels of lactate.[5]

The etiology of anemia in NB is related to blood loss from obstetric causes (malformations of the placenta and umbilical cord), bleeding in the neonatal period (intracranial, digestive, umbilical, liver or spleen rupture), excessive spoliation by laboratory exams collection and hemolysis.[6]

Newborns undergo blood transfusion in intensive care units (ICU) every day under different health conditions[7]. However, the nurse still wonders about some questions: what is the newborn blood transfusion profile in these units? How many times the NB needs to be transfused? What type of component is transfused?

Recognizing the magnitude of the transfusion process, the medical professionals and nurses need to know previously the clinical indications for blood therapy and the peculiarities of the neonate's health status as well as health care that may predict risk situations and facilitate the selection and application of interventions for these patients.

Based on the above, this study aims to:

● Characterize the profile of newborns transfused in hospitals of medium and high risk;

● Compare the total number of units transfused with the variables: length of hospitalization, birth weight and gender.

METHOD

Descriptive, retrospective and documentary study in a reference hospital to maternal and child care of Ceará, Brazil, with about 500 births/month, of which 35% are underweight children and 11% of very low birth weight, offering 62 beds in the Neonatology Service, with 21 neonatal ICU and 36 intermediate care (UCI). In these units, the monthly average of blood component consumption is approximately 50 transfusions/month.

The population consisted of all children transfused in the neonatal period, that is, from birth to 28 complete days of life, hospitalized to the Neonatology Service in 2008 and 2009, totaling 420 neonates. The estimated sample size was made from the calculation for finite populations, the prevalence of the phenomenon studied was estimated at P=8.7%, based on monthly reports of Transfusion Agency (AT) site. The confidence level was 95% and the sampling error of 5%, with a sample established in 95 records.

The records were selected randomly by reading the transfusion reports provided by AT and application of established inclusion criteria. After the sample selection, 38 records were excluded for technical and administrative reasons that prevented the researcher access to the contents of these documents, which resulted in a final sample of 57 records.

Secondary data were obtained during May 2010 through a structured instrument with the following variables: newborn identification, transfusion history, neonatal outcome, time and inpatient unit as well as through consultations with medical records and transfusion receiver form into the AT institution. The Excel program was used to organize the data and the Statistical Package for Social Sciences (SPSS) version 18 for analysis. The analysis of quantitative variables was performed through simple and absolute frequency as well as measures of central

tendency and dispersion as mean, median and standard deviation.

For correlation of variables, total blood components units *versus* hospitalization and birth weight x gender of newborns, the non-parametric Kendall's correlation coefficient tau b test was used because the data do not appear normal by the Kolmogorov-smirnov test.

The research project was submitted to the Ethics Committee in Research of the Institution for analysis and was approved by the opinion 410/10.

RESULTS

The investigation of the newborns records transfused until the 28th day of life led to the analysis of gender, twin pregnancy, rating gestational age, birth weight and blood type, which are described in Table 1.

Table 1. Newborn characterization transfused according to identification data, perinatal history, hospitalization unit and medical records. Fortaleza, CE, Brazil, 2010. Source: Medical records.

Variables (n=57)	n (%)
Gender	
Male	30 (52,63)
Female	27 (47,37)
Multiple birth	
Yes	5 (8,77)
No	52 (91,23)
Gestational age and birth weight (classification)	
PIG	17 (29,82)
AIG	37 (64,91)
Without data	3 (5,27)
Blood Type	
A positive	14 (24,56)
A negative	2 (3,51)
B negative	6 (10,53)
AB positive	3 (5,26)
O positive	29 (50,88)
O negative	3 (5,26)
Hospitalization unit	
Medium risk nursery	6 (10,53)
Neonatal ICU	51 (89,47)
Medical diagnosis (classification)	
Clinical	53 (92,98)
Clinical and sirurgical	4 (7,02)
Neonate evolution	
Discharge	35 (61,40)
Death	17 (29,82)
Transference	5 (8,78)

In this study, there was a predominance of males (52.63%). The occurrence of multiple births was absent in 91.23% of newborns studied. Regarding the classification by gestational age and birth weight, there are the newborns classified as appropriate for gestational age (AIG), with 64.91%. As for the frequency of blood type of the neonates, two most predominant groups can be highlighted: A positive and O positive, with 24.56% and 50.88%, respectively.

Most neonates (89.47%) were hospitalized in neonatal ICU, so the sample was considered as high risk. There was a predominance of clinical diagnosis (92.98%), highlighting the most common: prematurity, respiratory distress syndrome, risk of neonatal infection, congenital infection, congenital malformations, Edwards syndrome and congenital heart disease.

NB with merely surgical medical diagnosis was not found, since the characteristic of the studied hospital does not perform surgical procedures, except for those for correction of neural tube malformations.

The occurrence of clinical and surgical medical diagnosis was in 7.02% of neonates studied. In surgical diagnosis we can highlight the neural tube malformations (meningocele and myelomeningocele) and esophageal atresia with distal fistula.

Regarding the neonate's destination, 61.4% were discharged; none of them remained in the inpatient unit, since it was a retrospective study, and when the researcher entered in the hospital, all the participants had had an outcome and there were 29.82% of deaths. It was observed that 8.78% of newborns were transferred to other hospital units that addressed strategies for resolving health problems.

Out of the NB who died, 94.12% had the pathologies of clinical basis as prematurity, neonatal infection, respiratory distress

syndrome and congenital malformations incompatible with life as Edwards syndrome and the others (5.88%) had the combination of clinical and surgical diagnosis such as neural

tube malformations and esophageal atresia. The following Table 2 presents the characteristics of transfused newborns.

Table 2. Newborn characterization transfused according to neonatal variables. Fortaleza, CE, Brazil, 2010.

Variables	Minimum	Maximum	Average	Median	Standard Deviation
Gestational age	23	41,29	30,56	31,5	12,02
Birth weight	525	3460	1344,47	1595	1315,21
Apgar 1st minute	1	9	5,13	7	-
Apgar 5th minute	4	9	7,47	8	1,41
Age at 1st transfusion	0,38	28	10,02	8	8,10
Length of hospitalized	2	168	58,55	58	16,26

In gestational age, transfused newborns had an average of 30.56 weeks (standard deviation of 12.02 weeks), and 75.44% were premature, that is, those with a gestational age less than 37 completed weeks.

The average birth weight was 1344.47 grams (± 1315.21 grams) predominantly transfused newborns of low birth weight (84.21%). In the subcategory, newborns with very low birth weight, that is, with birth weight <1500 g, were 75.44% of the study participants.

The Apgar score (AS) was lower than seven, fetal hypoxia condition was diagnosed. The study had this index in 36 newborns (67.92%) and the average AS at the 1st minute was 5.13. It is noteworthy that the gestational age and AS variables at 1st and 5t^{h} minutes do not correspond to the all the sample of this study, because some records did not reveal this information.

Next, Figure 1 shows the clinical indications determined transfusion of blood components.
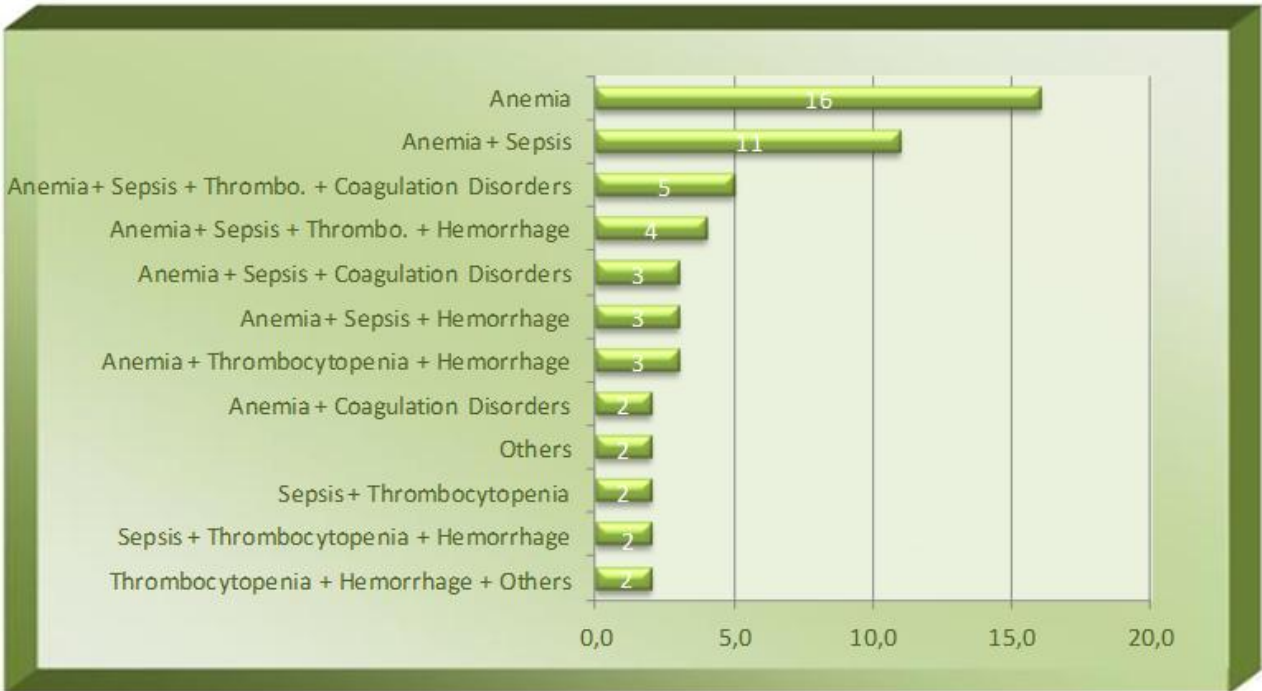

Figure 1. Clinical indications for blood component transfusion in newborns. Fortaleza, CE, 2010. Source: Medical records.

The most frequent clinical indications evidenced was anemia found in sixteen records, corresponding to 28.07% added to other indications and sepsis to 19.30% and 8.77%, respectively. Clinical indications referred as "others" were: apnea, heart disease, hypovolemic shock, oxygen dependency, bronchopulmonary dysplasia, pulmonary hypertension, congenital infection by the human immunodeficiency virus, neonatal infection, prematurity, mechanical ventilation and ventriculitis.

Among the other indications, there are the junctions with anemia, sepsis, thrombocytopenia, coagulation disorders, hemorrhage and "others", as well as the junctions between sepsis and thrombocytopenia; sepsis and hemorrhage; sepsis, thrombocytopenia, hemorrhage and others; thrombocytopenia; thrombocytopenia, hemorrhage and "others", corresponding to 1.75%. Table 3 shows the distribution of transfusion history of newborns in the Neonatal Unit.

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Table 3. Distribution of blood componentes administered in hospitalized newborns in neonatal intensive care units. Fortaleza, CE, Brazil,2010. Source: Medical records.

Blood components	n (%)
Concentrated red blood cells	105 (54,97)
Concentrated platelets	35 (18,33)
Fresh Frozen Plasma	5 (26,7)
Total	191 (100)

As observed here, 191 blood components were infused, especially the red blood cells (CH), responsible for 54.97% of transfused blood therapeutic products, being administered in an average of 1.84 CH unit per newborn. The second most transfused blood component was the Fresh Frozen Plasma (PFC), corresponding to 26.70% and infused on average 0.89 unit per NB, followed by Concentrated Platelet (CP), with 18.33%, and administered 0.61 unit per patient. It is noteworthy that, during the study period, there was no transfusion of cryoprecipitate.

Blood components consumption in premature newborn is higher when compared to newborns at term and corresponds to 73.37%. It is noteworthy that the total number of units transfused evaluated did not represent the totality (191), since in three records there was no gestational age of the newborn.

About 71.93% of newborns were transfused with only one type of blood component, that is, Concentrated Red Blood Cells or Concentrated Platelets or Fresh Frozen Plasma and the rest (28.07%) with more than one blood therapeutic product.

Each newborn received 3.35 units of blood components. The average age at first transfusion was 10.02 ($\pm$ 8.1) days and was between 0.38 and 28 days of the neonate.

When correlated the total number of units transfused with the variables: length of hospitalization, birth weight and gender, p values were 0.226, 0.245 and 0.151 respectively.

DISCUSSION

The male gender was the one that requires more blood transfusion during hospitalization[8]. However, it is known that the female children have 1.25 times higher chances of low birth weight than male.[9] In this study, when all the blood transfused units variables were correlated with newborn gender, there was no statistically significant data since p <0.05 (p=0.151).

The blood type of newborns was predominantly A Positive and O Positive. A research conducted in São Paulo identified 34.44% of mothers and newborns as A Positive and 47.88% with O Positive.[10] Generally, it is observed that the phenotypes of the most common ABO system between the different segments of Brazilian population are blood groups A and O, with O as the most representative.[11]

In inpatient units, most of the newborns were hospitalized in neonatal ICU and another small portion in UCI. These findings are explained by the fact that blood transfusion is a prescribed therapy to critically ill patients.[2]

Concerning gestational age, transfused newborns were especially premature, that is those with gestational age less than 37 completed weeks. The duration of pregnancy is a risk factor for neonatal morbidity and mortality, with premature most exposed to risks.[9,12] The blood components consumption before 30 days of life can be up to four times the average needed by children in other age groups, premature being those with greater need for transfusion.[7]

When comparing groups of term and preterm newborns, one research claimed to be the preterm group the one with the highest consumption of blood components, with an average of gestational age of 31.95 weeks (SD$\pm$3.05).[2] Gestational age less than 33 weeks is considered statistically significant risk factor for blood transfusion in neonatalperiod.[13]

In this study, the transfused newborns were in the category of very low birth weight, that is below 1500 g. This corroborates with authors who claim that the very low birth weight neonate for transfusion therapy in neonatal intensive care units is at risk.[13] Similarly, children with birth weight less than 1000g need more transfusions than those with 1000g or more.[14] In this study, the correlation between birth weight and the total number of units transfused was not statistically significant (p=0.246). However, the average weight of NB investigated was 1344,47g .

The Apgar score in the fifth minute is the newborn oxygenation state during the ante and intra-partum. It is considered an important predictor of the evaluation of the well-being and initial prognosis of the newborn, showing a good state of them from values above 7.[4]

Reaffirming data of this study, the main reasons found for transfusion in the literature

were anemia and hemorrhagies.[15] Studies report that approximately 25% of all blood transfusions to critical patients happen to those who have hemorrhagies.[16] The main transfusion indications in children hospitalized in a Brazilian pediatric ICU were anemia (71.4%), active bleeding (25.7%) and refractory hypoxemia in administration of oxygen (1.9%).[9]

The most commonly type of blood component used in neonatal units analyzed was the CH. This has a similar result performed in a research with transfused newborns at term and premature, in which CH was the most transfused blood component, an average of 2.38 units per term NB and 5.22 units in prematures.[2] When studying children in pediatric ICU, authors showed that 30% of these children, received transfusions of red blood cells and the average transfusion was 1.6 units per child.[9,17]

The second most transfused blood component in NB and registered in the records was CP. It is ver important, besides induced anemia by bleeding, thrombocytopenia is the most common hematological changes in the Neonatal Unit. About a quarter of these inpatients and half of premature develop thrombocytopenia.[18]

The literature shows that the consumption of blood components in premature is about 60% higher than by in NB at term, because preterm are subject to more infectious and respiratory complications when comparing with at term NB.[2]

In this article, the consumption of blood components for premature NB was higher when compared to newborns at term with 73.37%. It is noteworthy that the total number of units transfused evaluated did not represent the totality (191), since in three records there was no gestational age of the newborn.

Most newborns were transfused with only one type of blood component in few days of life. Similarly, professionals have found that the date of the first transfusion performed in 48 NB occurred between the 1st and 51st days of life, with an average of 13 days.[2]

Transfused patients are more likely to extend their hospitalization compared with those who did not undergo such procedure[9], enhancing the susceptibility of newborns in the study, since the length of hospitalization presented a range of 2 to 168 days and on average each newborn was hospitalized in the Neonatal Unit for almost two months (average=58.55). However, in this study, the length of hospitalization when associated with the total number of transfused units was not statistically significant (p=0.226).

It is worth mentioning the importance of blood transfusion in premature babies, considering that the hemodynamic impact of anemia and red blood cell transfusion has a complex relationship with the maturation of the cardiovascular system. A recent pilot study identified through echocardiographic functional indexes, that the first cardiac adaptations induced by anemia seem to appear before the establishment of their own structural changes.[18]

The clinical medical diagnosis was prevalent among transfused neonates. A research identified the clinical hospitalization with 85.57% of transfusion requests, followed by the ICU with 81.4% and surgery with 71.42%.[17]

The occurrence of clinical and surgical medical diagnosis was present in only 7.02% of the studied neonates. Among surgical diagnosis, there are the neural tube malformations (meningocele and myelomeningocele) and esophageal atresia with distal fistula. In newborns under surgical treatment, the most frequent pathologies were: the digestive tract (esophageal atresia, jejunum and ileum, necrotizing enteritis and volvulus) and urinary tract (posterior urethral valve and bladder exstrophy), and inguinoescrotal and umbilical hernia.

Strategies must be taken to prevent blood loss and to increase production of red blood cells in surgical patients.[19] Blood transfusions may also trigger the immune response of the receiving system, increased risk of infection, early malignancy recurrence and increased mortality.[9]

Regarding the newborn's destiny, more than half had discharged. None of them remained in the inpatient unit, since this was a retrospective study, and 29.82% of newborns died. There were well-equipped neonatal units, using technology combined with a well-trained multidisciplinary team to assist these particular patients. In this setting, the nursing staff should be highlighted on the quality of care provided, because in neonatal ICU care delivery has been significantly modified, above all, by the use of new technologies that have contributed to the increased survival of many newborn premature and low birth weight.[6]

A study emphasizes such behavior, observing the complexity of care for this patients. The use of technologies in nursing care to premature newborn is necessary, since they require specialized care and require sensitive and intensive technical and scientific

actions. With all this, the Neonatal Intensive Care Unit should concentrate qualified human and material resources to provide uninterrupted support for the vital functions of premature newborns.[20]

CONCLUSION

Among the 57 records analyzed, there was a slight predominance of male gender, non-twin babies, appropriate for gestational age, with a predominant blood group of "O" Positive, followed by "A" Positive.

The transfused newborns had an average of 30.56 weeks, and 75.44% were premature. The average birth weight was 1344.47 grams, with more transfused newborns with low weight at birth (84.21%). In the subcategory, newborns with very low birth weight were 75.44% of the study participants. The research found Apgar score less than 7 in 67.92% of newborns. According to the indication of blood transfusion, the most frequently found was anemia in 28.07% of the records, followed by association with other indications and sepsis.

CH was the most transfused blood component as an average of 1.84 unit per NB. Consumption of blood components in premature is higher as compared to NB at term and corresponding to 73.37%. On average, the age of the first transfusion was 10.02 (±8.1) days and occurred within 28 days of newborn life, with length of hospitalization average of 58.55 (±16.26) days. It was observed that 61.40% of the newborns were discharged and those who died, 94.12% had clinical based pathologies. There was no significant relationship between the correlated variables (total infused units between birth weight, length of hospitalization and gender), as all p were > 0.05.

Limitations of this study are related to the exclusion of non-available records or incomplete records, reducing the sample. Finally, it is believed that the information presented here may be a complement to existing literature in an attempt to increase the scientific literature on the blood transfusion in the neonatal period and assist doctors and nurses in neonatal health care.

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