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PRAXIS

Nursing care management in patients with necrotizing enterocolitis: Case report

Gestión del cuidado de enfermería en pacientes con enterocolitis necrosante: Caso clínico

Gerenciamento de cuidados de enfermagem em pacientes com enterocolite necrosante: Relato de caso

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Abstract

Introduction: The role of nursing is critical to improve the prognosis and ensure the patient's well-being. Necrotizing enterocolitis is a serious complication in preterm infants, which requires specialized nursing care management through accurate assessment and timely care. **Objective:** To implement a nursing care plan in a newborn with necrotizing enterocolitis, focused on improving the patient's prognosis and well-being. **Methodology:** Case study based on the 14 needs of Virginia Henderson, using the taxonomy of the American Association of Nursing Diagnosis-I, Classification of Nursing Interventions and Classification of Nursing Outcomes to develop the care planning for a newborn of 30 weeks with low weight for gestational age and necrotizing enterocolitis in the neonatal intensive care unit. Confidentiality of medical information and patient privacy were protected at all times. **Results:** Impaired gas exchange, risk of pressure injury, risk of unstable blood glucose level, and ineffective gastrointestinal motility were identified as the main diagnosis labels. Specific activities were established, including monitoring of respiratory

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parameters, prevention of pressure injuries, glycemic control and promotion of gastrointestinal motility. **Conclusions:** The taxonomies were effective in stabilizing the hemodynamic status of the critically ill neonate.

Key words: Risk factors; Necrotizing Enterocolitis (NEC); Newborn (NB); Interventions; Nursing (DeCS).

Resumen

Introducción: El rol de enfermería resulta fundamental para mejorar el pronóstico y asegurar el bienestar del paciente. La enterocolitis necrosante es una complicación grave en neonatos prematuros, que exige una gestión de cuidado de enfermería especializada mediante una valoración precisa y cuidados oportunos. **Objetivo:** Implementar un plan de cuidados de enfermería en un recién nacido con enterocolitis necrosante, enfocado en la mejora del pronóstico y el bienestar del paciente. **Metodología:** Estudio de caso basado en las 14 necesidades de Virginia Henderson, utilizando la taxonomía de la Asociación Norteamericana de Diagnósticos de Enfermería-I, Clasificación de Intervenciones de Enfermería y Clasificación de Resultados de Enfermería para desarrollar la planificación del cuidado a recién nacido de 30 semanas con bajo peso para la edad gestacional y enterocolitis necrosante en unidad de cuidados intensivos neonatales. La confidencialidad de la información médica y privacidad de la paciente fueron protegidas en todo momento. **Resultados:** Se identificaron como principales etiquetas diagnósticas, deterioro de intercambio de gases, riesgo de lesión por presión, riesgo de nivel de glucemia inestable, y motilidad gastrointestinal ineficaz. Se establecieron actividades específicas, incluyendo la monitorización de parámetros respiratorios, la prevención de lesiones por presión, el control de la glucemia y la promoción de la motilidad gastrointestinal. **Conclusiones:** Las taxonomías de enfermería resultaron efectivas para estabilizar el estado hemodinámico del neonato en su situación crítica.

Palabras clave: Factores de riesgo; Enterocolitis necrotizante; Recién nacido; Intervenciones; Enfermería (DeCS).

Abstrato

Introdução: O papel da enfermagem é fundamental para melhorar o prognóstico e garantir o bem-estar do paciente. A enterocolite necrosante é uma complicação grave em recém-nascidos pré-termo, que requer uma gestão qualificada dos cuidados de enfermagem, através de uma avaliação precisa e de cuidados atempados. **Objetivo:** Implementar um plano de cuidados de enfermagem num recém-nascido com enterocolite necrosante, centrado na melhoria do prognóstico e bem-estar do doente. **Metodologia:** Estudo de caso baseado nas 14 necessidades declaradas por Virginia Henderson, utilizando a taxonomia da American Association of Nursing Diagnosis-I, Nursing Intervention Classification e Nursing Outcome Classification para desenvolver um plano de cuidados para um recém-nascido de 30 semanas de baixo peso para a idade gestacional com enterocolite necrosante na unidade de cuidados intensivos neonatais. A confidencialidade das informações médicas e a privacidade do paciente foram protegidas em todos os momentos. **Resultados:** As trocas gasosas prejudicadas, o risco de lesão por pressão, o risco de níveis instáveis de glicose no sangue e a motilidade gastrointestinal ineficaz foram identificados como

os principais rótulos de diagnóstico. Foram estabelecidas actividades específicas, incluindo a monitorização dos parâmetros respiratórios, a prevenção da lesão por pressão, o controlo da glicemia e a promoção da motilidade gastrointestinal
Conclusões: As taxonomias de enfermagem foram eficazes na estabilização do estado hemodinâmico do recém-nascido crítico.

Palavras-chave: Factores de risco; Enterocolite necrosante; Recém-nascido; Intervenções; Enfermagem (DeCS).

Introduction

The term necrotizing enterocolitis (NEC) was first coined in 1950, and despite advances in diagnosis and medical treatment, it continues to be one of the most common gastrointestinal emergencies in newborns [(1)]. NEC is a disorder characterized by necrosis of the mucosa and submucosa of the small intestine or colon, as a consequence of an isolated or concurrent ischemic process. These lesions may be reversible in their initial stage or evolve into necrosis and perforation. This can trigger serious complications such as intestinal perforation, systemic inflammatory response, multi-organ dysfunction and ultimately put the patient's life at risk [(2)].

Currently, NEC is one of the main causes of morbidity and mortality in patients in the Neonatal Intensive Care Unit (NICU), predominantly affecting premature infants due to the immaturity of their digestive system [(1)]. Mortality reaches 50 % in some cases, and among survivors, neurodevelopment is severely affected [(3)]. The specific cause of necrotizing enterocolitis is still not fully understood; it is considered a condition of multifactorial origin in which prematurity is the main risk factor. This vulnerability is largely due to the immaturity of the gastrointestinal system, characterized by reduced motility that increases the permeability of the intestinal mucosa, which facilitates the entry of bacteria through this barrier [(4)]. Severity can be classified using Bell’s stratification system, (Table 1).

Table 1. Modified Bell's stratification criteria for NEC in newborns

Stagging	NEC Classification	Clinical signs
IA	Initial suspicions	Systemic signs: Thermal instability, episodes of apnea, decreased heart rate, lethargy. Abdominal signs: gastric retention, increased abdominal volume, vomiting, blood in stool.
IB	Advanced suspicions	Systemic signs: Same as stage IA.
IIA	Slight confirmation	Abdominal signs: Bloody stools.
IIB	Moderate confirmation	Systemic signs: Same as stage IIA, with presence of mild metabolic acidosis and thrombocytopenia. Abdominal signs: Same as stage IIA, with localized pain, possible signs of cellulitis in the abdominal area or formation of a mass in the right lower quadrant.
IIIA	Equal to IIB plus hypotension, bradycardia, severe apnea, combined respiratory and metabolic acidosis.	Same as above plus signs of peritonitis, marked tenderness and abdominal distention.
IIIB	Equal to IIIA	Equal to IIIA

Source: Own depelopment

The main areas affected by this pathology include the terminal ileum and the proximal colon; in more complicated cases it can include the entire gastrointestinal tract. Macroscopically, the bowel is dilated with areas of necrosis, hemorrhage and intestinal pneumatosis dissecting the wall and areas of perforation. Histologically, coagulative necrosis, congestion, hemorrhage, acute inflammatory processes, bacterial infiltration, gaseous collections, tender transmural necrosis, ulceration, capillary micro thrombi and bacterial infiltration are observed [(5)].

The incidence worldwide varies among different countries and neonatal units, with reported figures ranging from 7 % to 13 %, showing an increasing trend. Ninety percent of cases of NEC occur in very low birth weight preterm infants (VLBW), while less than 10 % affect term or near term newborns, especially those with congenital heart disease [(6)]. The importance of implementing prevention strategies and specific clinical protocols to improve the management of NEC and reduce its complications in this vulnerable population has been highlighted [(7)]. Approximately 2-5% of NICU admissions globally are attributed to NEC. Approximately 2 % to 5 % of NICU admissions globally are attributed to NEC. The vast majority of cases, about 85% to 90%, occur in NBW of less than 1,500 grams and/or less than 32 weeks' gestation. The incidence of NEC is between 1 and 3 cases per 1,000 live newborns (LNB), showing an inverse relationship with gestational age [(8)].

Research on NEC is critical to improving neonatal care by identifying early signs and patterns of the disease, facilitating timely diagnosis. Nursing care is essential in the implementation of evidence-based interventions that optimize clinical outcomes and reduce morbidity.

Methodology

Clinical case study, observational, descriptive and longitudinal. Nursing care was structured according to the five stages of the Nursing Process (NP). The assessment of the NB was carried out using the Virginia Henderson Theory and its 14 needs [(9)], an essential tool for detecting and quantifying the health problems that affect this group. In this way, care was oriented to health maintenance [(10)]. The Current State Outcome Analysis (CSOA, in spanish AREA) model was implemented as part of the diagnosis reasoning process. This approach allowed the identification of diagnosis labels using the North American Nurses' Diagnostic Association-I (NANDA-I) taxonomy [(11)]. Subsequently, the objectives were established using the Nursing Outcome Classification (NOC) [(12)], and the nursing interventions were defined using the Nursing Intervention Classification (NIC) [(13)]. This allowed the outcomes derived from the interventions to be systematically evaluated.

Informed consent was requested from the patient's mother, thus guaranteeing the privacy and confidentiality of the newborn. Protection of information and respect for patient autonomy are fundamental aspects of research ethics.

Presentation of the case

In the assessment of the female newborn, with initials H.C.L., hospitalized in the NICU of a hospital in Chihuahua City, Mexico, a gestational age of 30 weeks was determined using the Ballard scale, which evaluates physical and neurological characteristics by cumulative scoring. The patient presented low birth weight, with a birth weight of 1.587 kg. During the evaluation of the

lung fields, bilateral rales and wheezing were observed, accompanied by polypnea, nasal flaring and costal and xiphoid retractions.

Laboratory tests revealed a blood biometry with leukocytes 22.5 K/uL, neutrophils 16.7 K/uL, monocytes 1.1 K/uL, lymphocytes 13 % and erythrocytes 3.1 M/uL, with hemoglobin 8.9 g/dL. On blood chemistry, glucose was reported at 65 mg/dl. Vital signs showed a heart rate of 173 beats per minute, respiratory rate of 75 breaths per minute and blood pressure of 79/38 mmHg, with an oxygen saturation of 87 %. Arterial blood gases showed a pH of 7.1, PCO2 of 47 mmHg, PO2 of 73.3 mmHg and HCO3 of 14.1. In addition, hematocrit was found to be 25 % and hemoglobin 8.4 g/dL, with prothrombin times of 17 seconds.

According to the assessment of the 14 Needs of Henderson, problems related to the need for breathing and circulation were identified, reflected in the presence of rales and wheezing, as well as in the signs of polypnea, nasal flaring, and costal and xiphoid retractions. Given these signs, it was decided to initiate noninvasive ventilation using nasal continuous positive airway pressure (CPAP), with an inspired oxygen fraction of 40 % and end-expiratory pressure (PEEP) of 6.

In addition to respiratory problems, the patient exhibited gastrointestinal symptoms, including vomiting and regurgitation after ingestion of formula, as well as abdominal distention with a perimeter of 49 cm in diameter. Skin color changes were observed and blood was identified in the stool. To address these symptoms, orogastric tube no. 5 was placed for feeding and gastric drainage. A radiological study of the abdomen was performed and revealed distension of intestinal loops and apparent intestinal pneumatosis, categorized as NEC grade 2A according to clinical and radiographic findings. In view of these signs and symptoms, it was decided to start management with antibiotics, specifically piperacillin 106 mg every 8 hours, vancomycin 5.3 mg every 8 hours and amikacin 12 mg every 12 hours.

Nasal CPAP was adjusted to optimize ventilation over a four-day period. Face protection was implemented to prevent pressure injuries, and continuous monitoring of ventilatory parameters was performed.

Need for nutrition and hydration: Vomiting and regurgitation were observed after formula administration, as well as abdominal distension with a perimeter of 49 cm, which led to the decision to keep the patient fasting. An orogastric tube no. 5 was used for feeding and drainage of biliary origin.

Elimination requirement: Blood was identified in the patient's stool, he had a 5 Fr. bladder catheter installed, which allowed an adequate urine output, recorded at 2 mL/kg/hour, which equals approximately 3.17 mL/hour or about 76 mL in a 24-hour period.

Need for movement: Newborn patient at rest to avoid any additional discomfort or pain.

Need for sleep and rest: Fragmented sleep patterns were identified, with frequent movements and signs of discomfort indicating possible pain or irritability, affecting the adequate rest of the premature newborn.

Clothing requirements: Diapers and soft, easily removable garments were used, designed to minimize stress during medical procedures and facilitate the handling of the premature newborn, considering his delicate health condition.

Body temperature requirement: The neonate's body temperature was maintained at 37.4 °C by constant monitoring inside an open incubator, with temperature checks performed hourly to ensure adequate thermal stability in his premature condition.

Need for body hygiene: Newborn with frequent diaper changes and gentle cleansing of their skin to prevent skin irritation and infection.

Need to avoid environmental hazards: Newborn dependent on healthcare personnel, exposed to environmental risks that were strictly minimized by the nursing team to avoid infections and any additional complications.

Need for communication: For Newborns, communication is limited to crying and other nonverbal cues. This patient did not yet have the ability to communicate effectively, so the nursing team interpreted the signals to meet his needs.

Need to act or react in accordance with one's beliefs: The patient's mother was of the Catholic religion, so a Catholic image was placed in the open incubator for the family's peace of mind.

Due to the Newborn early cognitive developmental stage and critical NEC condition, needs related to sense of accomplishment, participation in recreational activities or play, and satisfaction of personal curiosity are not applicable at this stage.

Results

In the assessment performed, the nursing diagnoses that showed a greater relationship included: a) Impaired gas exchange, b) Risk of unstable blood glucose level, c) Ineffective gastrointestinal motility and d) Risk of pressure injury in children, according to the application of the AREA model, (Table 1).

Table 1. Application of the AREA Model to the newborn with necrotizing enterocolitis 2023

Nursing diagnosis
00030 Deterioration of gas exchange
00179 Risk of unstable blood glucose levels
00196 Ineffective gastrointestinal motility
00286 Risk of pressure injury in children

Source: Own development

To identify the most common nursing diagnoses with the greatest impact on the health of the NB with NEC. During the premature new born (PNB) assessment, several NANDA-I labels were identified to guide nursing intervention, including (00030) impaired gas exchange, (00286) risk of

pressure injury in infants, (00179) risk of unstable blood glucose level, and (00196) ineffective gastrointestinal motility.

To address (00030) impairment of gas exchange, the NOC outcome Respiratory Status: Gas exchange was implemented, along with the corresponding NIC to prevent impairment of gas exchange, specifically the intervention Elimination and Exchange (3302). Para abordar (00030) la alteración del intercambio gaseoso, se implementó el resultado NOC, Estado respiratorio: intercambio gaseoso, junto con la correspondiente NIC para evitar la alteración del intercambio gaseoso, concretamente la intervención Eliminación e intercambio (3302). In addition, preventive measures, such as facial protection, were implemented to prevent pressure injuries to the skin, considering the skin fragility of premature neonates. Continuous monitoring of ventilator alarms and routine assessment of symptoms indicative of increased work of breathing were critical to detect and manage any respiratory complications in a timely manner. This proactive approach made it possible to optimize patient comfort and respiratory stability, minimizing the risk of additional complications associated with impaired gas exchange, (Table 2).

Table 2. Individualized care plan for newborns with necrotizing enterocolitis, 2023

Domain 3 Elimination and Exchange Class: 4 Function		
Nursing diagnosis	Result (NOC)	Intervention (NIC)
(00030) Impairment of gas exchange Related factors: Inefficient breathing pattern Defining characteristics (signs and symptoms): nasal flaring and tachypnea Associated conditions: Changes in the alveolar-capillary membrane	Breathing status: Gas exchange. Domain: II Physiologic health Class: Cardiopulmonary (0415) Indicator: 041528 Nasal flaring 041510 Use of accessory muscles 041522 Adventitious breathing sounds Diana punctuation: 1. Severe deviation from normal range 2. Deviation substantial from normal range 3. Deviation substantial from normal range 4. Slight deviation from normal range 5. No deviation from normal range Measurement scale: For indicators. Keep at: 4 Increase to: 5	Elimination and Exchange (3302) ▪ Apply the non-invasive device ensuring proper fit and avoiding large air leaks. ▪ Facial protection is applied to prevent pressure damage to the skin if necessary. ▪ Ensure ventilator alarms are turned on ▪ Routine monitoring of ventilator parameters ▪ Control symptoms that indicate increased work of breathing ▪ Providing care to alleviate patient discomfort

Source: Own development, supported by NANDA-I, NIC, NOC Taxonomy

In order to intervene the (00286) risk of pressure injury in the NB, the NOC outcome was implemented.

Tissue integrity: Skin and mucous membranes, together with the NIC intervention.

Skin surveillance (3590). Meticulous documentation of changes in the skin and mucous membranes was performed, allowing continuous monitoring of the patient's condition. Each comment included identification of areas of discoloration, bruising and loss of skin integrity. Regular inspections were also performed to detect signs of redness, extreme heat or drainage, which could indicate infection or edema. The nursing team's prompt intervention in the face of these signs contributed to maintaining the integrity of the PNB's skin, minimizing the risk of developing pressure ulcers due to the continuous use of medical devices, (Table 3).

Table 3. Individualized care plan for newborns with necrotizing enterocolitis, 2023

Domain 11 Safety / Protection Class: 2 Physical injury.		
Nursing diagnosis (00286) Risk of pressure injury Related factors: Altered microclimate between the skin and the bearing surface. Defining characteristics (signs and symptoms): Pressure on bony prominences. Associated conditions: Medical devices.	Result (NOC) Tissue integrity: skin and mucous membranes Domain: II Physiological health Class: Tissue integrity (1101) Indicator: 110113 Skin integrity. 110111 Tissue perfusion. 110101 Skin color. 1. Severely compromised 2. Substantially compromised 3. Somewhat compromised 4. Slightly compromised 5. Non-committed Measurement scale: For indicators. Keep at: 4 Increase to: 5	Intervention (NIC) Prevention of pressure ulcers (3540) ▪ Documenting skin and mucosal changes. ▪ Observe for areas of discoloration, bruising, loss of skin integrity. ▪ Observe for redness, extreme heat, edema or drainage of the skin and mucous membranes.

Source: Own-development, supported by NANDA-I, NIC, NOC taxonomy

In order to manage the (00179) risk of unstable blood glucose level in the patient, the resulting NOC blood glucose level was implemented, along with the corresponding NIC to prevent glycemic fluctuations, specifically the intervention Management of Hypoglycemia (2130), continuous monitoring of signs and symptoms of hypoglycemia was performed, paying special attention to changes in mental status, diaphoresis and tachycardia. In addition, frequent monitoring of glucose levels was performed using accurate measurement methods, adjusting the care plan according to the results obtained. In situations where indicated, intravenous glucose was administered in a timely manner to correct low blood glucose levels, thus ensuring effective management and prevention of complications resulting from glycemic imbalances, (Table 4).

Table 4. Individualized care plan for newborns with necrotizing enterocolitis, 2023

Domain 2 Nutrition Class: 4 Metabolism.		
Nursing diagnosis (00179) Risk of unstable blood glucose levels. Related factors: Inadequate dietary intake. Associated conditions: severe infections or sepsis.	Result (NOC) Blood glucose level Domain: II Physiological health Class: Therapeutic response (2300) Indicator: 230001 Blood glucose concentration. Diana Score: 1. Severe deviation 2. Substantial deviation 3. Moderate deviation 4. Slight deviation 5. No-deviation Measurement scale: For Indicators. Keep at: 4 Increase to: 5	Intervention (NIC) Hypoglycemia management (2130) ▪ Identify signs and symptoms of hypoglycemia. ▪ Monitor blood glucose if indicated. ▪ Administer intravenous glucose, if indicated. ▪ Maintain an intravenous line, as appropriate.

Source: Own development, supported by NANDA-I, NIC, NOC taxonomy

In order to manage (00196) ineffective gastrointestinal motility in PNB with NEC, the outcome NOC Gastrointestinal function was implemented, along with the corresponding NIC to improve such gastrointestinal function, specifically the intervention Fluid Management (4120). Daily weight monitoring was carried out and a meticulous record was kept of patient check-in and check-out in order to evaluate the patient's evolution. Hydration status surveillance and hemodynamic status monitoring were essential to prevent associated complications. In addition, fluids were administered according to the patient's needs, ensuring adequate management to facilitate recovery. These actions contributed significantly in the improvement of the NB's gastrointestinal health, contributing to the reduction of symptoms such as regurgitation and vomiting, (Table 5).

Table 5. Individualized care plan for newborns with necrotizing enterocolitis, 2023

Domain 3 Elimination and Exchange Class: 2 Gastrointestinal function		
Nursing diagnosis (00196)	Result (NOC)	Intervention (NIC)
Dysfunctional gastrointestinal motility Related factors: Malnutrition Defining characteristics (signs and symptoms): regurgitation and vomiting Associated conditions: Food intolerance	Gastrointestinal function. Domain: II Physiological health Class: Elimination (0501) Indicator: 050108 Blood in feces 050109 Mucus in feces 050128 Pain on passage of feces Diana score: 1. Severely compromised 2. Substantially compromised 3. Moderately committed 4. Slightly committed 5. Non-committed Measurement scale: For indicators. Keep at: 4 Increase to: 5	Liquid management (3302) ▪ Daily weighing and evolution control ▪ Accurate recording of incoming and outgoing liquids ▪ Check hydration status ▪ Monitor hemodynamic status ▪ Control symptoms that indicate increased breathing work ▪ Administer fluids as required

Source: Own-development, supported by NANDA-I, NIC, NOC taxonomy

Discussion

The purpose of this case study was to design and evaluate the nursing care plan in a PNB with NEC, with a focus on clinical stabilization and reduction of complications through a comprehensive and multidisciplinary approach. Initially, a thorough patient assessment was performed, identifying risk factors and applying a care plan based on NANDA-I, NIC and NOC taxonomies. This approach allowed for personalized care that specifically addressed critical patient needs such as respiratory monitoring and skin integrity. This is consistent with studies that highlight the effectiveness of nursing interventions in reducing risk and stabilizing the condition of PNB with NEC [7,17].

In this case, multidisciplinary intervention and the use of advanced monitoring techniques were essential to maintain patient stability. Recent studies have highlighted the importance of a multifaceted approach to the management of NEC, noting that disease severity and comorbidities, such as delayed first enteral feeding, significantly affect recovery times and the risk of

complications [17]. In agreement, authors [15] reported that early detection and management can improve clinical outcomes in neonatal patients with NEC.

Finally, the comprehensive nursing care approach included continuous interventions for skin surveillance and monitoring of vital parameters, which was instrumental in stabilization and prevention of further complications. This care plan, aligned with scientific evidence, prioritized patient safety and quality of life in a critical context [16]. Despite obtaining positive results, the study may be limited by factors such as the sample size as it was a single case that allowed a care proposal to be made and the lack of long-term follow-up, which restricts the generalization of the findings [14].

Conclusion

Through the application of NANDA, NOC and NIC taxonomies, a care plan tailored to the specific needs of the patient was designed and implemented. Early detection and early intervention were crucial to mitigate risks and improve clinical outcomes. Despite the efforts of the interdisciplinary team, unfortunately, the patient's condition did not show significant improvement, requiring palliative care and specialized assistance.

The role of the nursing personnel is essential at every stage of NEC management, as preterm infants require constant and specialized surveillance. Nursing care is especially important in high-risk situations, such as infection prevention, invasive device management, protection of skin integrity, and early identification of signs of complications such as bowel perforation or multi-organ dysfunction. The nursing personnel not only offers technical care, but also provides indispensable emotional support for the families, helping them to cope with the difficult process involved in a critical neonatal illness such as NEC.

This case underscores the need to continue to develop and apply advanced clinical knowledge in the management of complex neonatal conditions such as necrotizing enterocolitis, thereby

optimizing comprehensive care and improving the quality of life of vulnerable neonatal patients. Nurses, with their holistic approach and ability to adapt care to the changing needs of the patient, play an indispensable role in the interdisciplinary team and in the well-being of newborns in critical situations.

Conflicts of interest

The authors stated that there is no conflict of interest.

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