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Research Progress on Nasoenteric Tube-Related Complications

Xiangru Li[1*], Fangju Mao[2*], Hong Zhou[1#]

[1]Department of Medicine, Health Science Center, Yangtze University, Jingzhou, China
[2]Neuro-Intensive Care Unit, The First Affiliated Hospital of Yangtze University, Jingzhou, China
Email: [#]1059634547@qq.com

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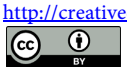

Abstract

As a vital tool for enteral nutrition support, the nasoenteric tube is widely used in clinical practice for patients with severe diseases, strokes, and digestive tract disorders. However, the use of a nasoenteric tube is often accompanied by a variety of complications, which affect the recovery and quality of life of patients. In this paper, we provide a comprehensive summary of studies on nasoenteric tube complications worldwide. We constructed a relatively complete classification framework for complications, including mechanical complications, infectious complications, nutritional complications, respiratory complications, and other complications. Based on this classification framework, this paper discusses the characteristics and mechanisms of various complications and provides a theoretical basis for the prevention and nursing of nasoenteric complications in clinical nursing.

Keywords

Nasoenteric Tube, Complication, Enteral Nutrition, Research Progress

1. Introduction

Enteral nutrition is a common therapeutic modality in clinical practice. For patients at high risk of aspiration due to dysphagia, gastroesophageal reflux, or gastric paralysis, both domestic and international guidelines recommend post-pyloric feeding to ensure safe and effective nutritional delivery [1]-[4]. Nasoenteric tubes, a widely used post-pyloric feeding method, are inserted via the nasal cavity, passing through the pharynx, esophagus, and stomach, and are advanced into the duodenum or jejunum for enteral nutrition infusion [5]. Globally, approximately

*These authors contributed equally to this work.
[#]Corresponding author.

10% of hospitalized patients receive enteral nutrition via nasoenteric tubes annually. However, their use can be associated with various complications, including tube occlusion, displacement, nasal mucosal injury, and other adverse events. These complications not only compromise the patient's nutritional status and treatment efficacy but may also prolong hospitalization, necessitate additional interventions, and potentially increase morbidity and mortality [6] [7]. Nasoenteric tube-related complications refer to adverse reactions caused by mechanical, infectious, metabolic, or improper nursing factors during placement and use, which may result in local tissue damage, aspiration, or nutritional imbalance. Therefore, accurately identifying the types and mechanisms of these complications and implementing effective interventions are crucial for ensuring patient safety. While some studies on related complications have been conducted domestically, they are limited and outdated. This study aims to review the literature on nasoenteric tube complications from both domestic and international sources, with a focus on summarizing the associated adverse events. The goal is to reduce their incidence and improve nursing quality through informed guidance and intervention strategies.

2. Mechanical Complications

2.1. Tube Obstruction

Tube obstruction is one of the most common mechanical complications associated with nasoenteric tube placement and is a significant cause of unplanned extubation [8]. Previous studies indicate that the incidence of tube blockage ranges from 4.0% to 8.0% [9] and 3.0% to 20.9% [10]. Tube occlusion primarily results from physical, chemical, and biological factors, such as the excessive viscosity of nutritional solutions, a narrow lumen diameter, slow infusion rates, or the formation of precipitates due to incompatibility between medications and nutritional fluids, as well as the reflux of gastrointestinal secretions. Additionally, improper nursing practices, such as delayed flushing or insufficient flushing volume, are significant contributing factors [11]. Tube occlusion not only disrupts the continuity of nutritional support but may also necessitate re-insertion of the tube, increasing patient discomfort and healthcare costs. To prevent occlusion, current clinical protocols emphasize standardized flushing procedures, including avoiding concurrent infusion of medications and nutritional solutions through the same line [12], employing pulsatile flushing before and after infusion, utilizing dedicated enteral nutrition preparations, and thoroughly assessing the stability of medications before dissolution and filtration.

Once the blockage occurs, the commonly used clinical methods include flushing with the injection of warm water, using enzyme preparations such as trypsin, and physical and chemical methods such as sodium bicarbonate solution or sodium citrate to relieve the blockage [10]. Recent research has focused on understanding the mechanisms of tube blockage and optimizing preventive strategies, such as designing nasal-enteric tube occlusion prevention protocols [13], and establishing standardized flushing procedures and training systems [14]. In addi-

tion, some studies have proposed the use of positive pressure tube flushing technology or a continuous micro-flushing system to maintain lumen patency, and artificial intelligence-assisted infusion monitoring systems have also been proposed to identify the risk of tube blockage in real time. With the advancement of technology, electromagnetic guidance [15] and visualization technology [16] have also been used in the process of nasoenteric tube placement, which can avoid blockage caused by displacement or folding through real-time monitoring of the tube status and accurate positioning. Qualitative interview research further confirmed that the incidence of serious misplacement (such as pneumothorax and misplacement into the airway) by trained nurses was significantly lower than that of traditional blind insertion when using electromagnetic or visual guidance at the bedside. Moreover, research pointed out that continuous training and a standardized verification process were the key to ensuring the long-term safety of operation [17]. In conclusion, although nasoenteric tube blockage is a common problem, its incidence is expected to be further reduced through standardized management and technical innovation, so as to provide patients with safer and more effective enteral nutrition support.

2.2. Displacement

Displacement or malposition of nasoenteric tubes is a common complication in clinical enteral nutrition support therapy, with an incidence rate of 14.7% during tube placement, of which 2.1% result in severe complications or even mortality [18]. During the indwelling period, the displacement or dislodgement rate can reach up to 33%, and the incidence of tube occlusion increases with prolonged use [19]. Such events may lead to interruption of nutritional delivery, aspiration, gastrointestinal perforation, or infection, potentially endangering patient life [20]. Currently, high-risk populations for tube displacement or malposition primarily include critically ill patients, those with impaired consciousness, mechanically ventilated patients, and individuals with abnormal gastrointestinal anatomy [21]. Manifestations of displacement or malposition are diverse, including coiling within the stomach, migration into the esophagus or reflux into the oropharynx, or malposition into non-target areas such as the bronchi, thoracic cavity, or abdominal cavity, with gastric dislodgement being the most common. Entry into the airway or thoracic cavity can cause severe complications. The main causes of nasoenteric tube displacement include voluntary or unconscious removal by the patient, vigorous coughing, vomiting, frequent positional changes, inadequate fixation, and prolonged indwelling time. Additionally, some patients exhibit agitation or scratching behaviors due to discomfort, which can also lead to displacement. After successful placement, fixation is typically achieved with adhesive tape; however, factors such as facial hair, sweat secretion, and oily skin can reduce adhesive efficacy, resulting in tube displacement or unplanned removal, thereby hindering enteral nutrition delivery [22]. Yang Qian reported that the improved fixation method using 3M+ fine adhesive tubes can enhance patient comfort, and reduce the rates of tube displace-

ment, dislodgement, facial injuries, and associated complications [23].

3. Infectious Complications

Nasal Mucosal Pressure Injury

Nasal mucosal pressure injury (NMPI) refers to tissue damage caused by sustained compression or traction from medical devices such as nasoenteric feeding tubes on the nasal mucosa [24]. Patients in intensive care units are at high risk due to critical illness, limited mobility, and extensive use of nasal medical devices [25]. Studies indicate that the incidence of NMPI ranges from 10% to 35.47% [24] [26]. Owing to the delicate structure, rich blood supply, and unique histological characteristics of the nasal mucosa, it has low pressure tolerance. Damage can rapidly progress to ulcers or chronic wounds and may lead to severe complications such as nasal adhesions, septal perforation, or bacteremia [27]. These outcomes not only exacerbate patient suffering and prolong hospitalization but also increase healthcare costs and may result in legal disputes [28].

The occurrence of this type of mucosal injury is influenced by multiple factors. Studies indicate that prolonged nasotracheal tube placement increases the risk of nasal mucosal pressure injury, with approximately two-thirds of such injuries occurring within four days post-insertion [29]. Additionally, improper fixation methods, such as excessive adhesive tension or the use of rigid, inelastic, oversized, and difficult-to-adjust airway devices that hinder ventilation, can significantly exacerbate local nasal cavity compression, serving as critical etiological factors [30]. Patients with comorbidities such as diabetes mellitus, malnutrition, hypoalbuminemia, or those receiving vasopressor therapy are more susceptible to tissue ischemia-induced damage [31]. Furthermore, inadequate knowledge and non-standardized assessment of mucosal injuries among healthcare providers constitute important contributory factors [32]. Currently, clinical preventive strategies primarily rely on nursing expertise, lacking targeted risk assessment tools. Research recommends selecting flexible, conformable tube materials and employing appropriate fixation methods to minimize localized pressure, along with regular evaluation of the nasal mucosa. Additionally, enhancing specialized training for ICU nursing staff to improve their ability to identify and manage mucosal injuries is essential for preventing such complications.

Although nasoenteric tube use may cause other infectious complications, such as maxillary sinusitis and bacteremia, because the incidence of these complications is low, most of them are related to factors such as the patient's immune status and nursing practices. NMPI is the most common complication associated with a nasoenteric tube because of the high sensitivity of the nasal mucosa to continuous compression. Therefore, this study mainly focused on nasal mucosal pressure injury.

4. Nutritional Complications

Refeeding Syndrome

Refeeding syndrome is a critical metabolic complication that warrants heightened

vigilance during enteral nutrition therapy, particularly in patients with prolonged fasting or severe malnutrition. Initiating enteral feeding rapidly in these populations significantly elevates the risk of developing this syndrome [33]. Clinical manifestations include electrolyte disturbances, arrhythmias, heart failure, and neurological dysfunction. Failure to promptly identify and intervene can lead to a severe prognosis or life-threatening conditions [34]. Research indicates that nasoenteric tube feeding is a key precipitating factor for refeeding syndrome, which is associated with the incretin effect, whereby nutrients directly entering the gastrointestinal tract stimulate excessive insulin secretion, thereby accelerating cellular uptake of phosphate, potassium, magnesium, and thiamine, resulting in metabolic derangements [35]. Therefore, during the initiation phase of nutritional support, a gradual feeding strategy should be implemented, with initial caloric intake recommended at 10 - 20 kcal/kg/day, progressively increased based on the patient's tolerance. Prophylactic supplementation of phosphorus, potassium, magnesium, and vitamin B1 should be administered before feeding. Throughout the feeding process, close monitoring of electrolyte levels, electrocardiogram, and cardiopulmonary function is essential to ensure the safety and efficacy of the nutritional intervention.

5. Respiratory Complications

5.1. Aspiration

Compared with a nasogastric tube, a nasoenteric tube has certain advantages in reducing the incidence of aspiration in general patients. However, for the special group of patients with mechanical ventilation, a meta-analysis of 8 RCTs (a total of 676 cases) showed that there was no statistically significant difference in the incidence of aspiration between nasoenteric tube feeding and gastric tube feeding [36], which may be related to factors such as decreased airway protection ability and inhibition of gastrointestinal motility in patients with mechanical ventilation. However, this study also confirmed that a nasoenteric tube can significantly reduce the incidence of ventilator-associated pneumonia (VAP, RR = 0.69) and gastric retention (RR = 0.11), suggesting that a nasoenteric tube still has higher safety in patients with mechanical ventilation. It is important to note that nasal bowel loops do not completely avoid the risk of aspiration: patients with delayed gastric emptying and intestinal obstruction or gastric paralysis may still experience gastric reflux to the throat [37]; the risk of aspiration is also increased if the patient has impaired consciousness, an impaired cough reflex, or is lying flat while feeding.

Clinical manifestations typically include sudden choking, dyspnea, and cyanosis; if aspiration pneumonia develops, symptoms may include fever, purulent sputum, and auscultation revealing moist rales or wheezing, with imaging showing pulmonary infiltrates [38]. In the event of aspiration, immediate cessation of feeding, prompt airway suctioning, and, if necessary, bronchoscopic lavage are required; if pneumonia is present, targeted antibiotic therapy should be guided by sputum culture results. Preventive measures include elevating the head of the bed

by 30˚ to 45˚, maintaining the position for at least 30 minutes post-feeding, regularly verifying the position of the nasoenteric tube to prevent displacement, and monitoring gastric residual volume—pausing feeding if residual exceeds 500 ml—and administering prokinetic agents as needed [39]. Furthermore, for such patients, clinical practice may involve placing an additional nasogastric tube in the contralateral nostril for gastric decompression or directly inserting a triple-lumen gastrointestinal tube [40].

5.2. Airway Obstruction

Airway obstruction is a serious complication that can occur during nasoenteric tube placement, often resulting from catheter compression of the larynx or trachea, particularly when using larger-diameter tubes or in patients with limited neck mobility [20]. In patients with prolonged bed rest and pulmonary infections, accumulation of secretions or sputum can also precipitate airway blockage. Clinical manifestations typically include sudden onset dyspnea, stridor, tracheal tug, and rapid decline in oxygen saturation, with severe cases leading to asphyxia [41]. In such cases, immediate removal of the catheter is indicated, along with urgent oxygen inhalation or mechanical ventilation support; if airway obstruction is caused by mucus plugging, enhanced suctioning, nebulization, and airway humidification therapies should be implemented. To prevent airway obstruction, it is recommended to select a soft, flexible nasogastric tube with a diameter of 8 - 12 Fr. Ultrasound-guided placement can be employed to minimize blind insertion and repeated adjustments, thereby reducing patient discomfort [42]. During fixation, avoid compressing the airway region, and regularly monitor the external length and position of the catheter. Additionally, airway care measures such as regular turning, percussion, and nebulization can help reduce secretion retention and lower the risk of obstruction [43].

6. Conclusion

As an important method of clinical enteral nutrition, the nasoenteric tube plays a key role in improving the efficiency of nutrition supply and prognosis of critically ill patients. However, a variety of complications are prone to occur during its placement and use, especially tube plugging, displacement, and nasal mucosal pressure injury, which not only affect the recovery of patients, but also significantly increase the length of hospital stay and medical costs. Studies have shown that nasoenteric tube blockage can prolong the length of hospital stay by about 2-3 days [44]. Treatment of displacement and pressure injuries requires additional nursing measures, medications, and possibly surgical interventions, further increasing treatment costs [45]. Therefore, based on a systematic review of domestic and foreign studies, this paper constructed a classification framework of complications from multiple dimensions, such as mechanical, infectious, nutritional, and respiratory, and analyzed the occurrence mechanism, influencing factors, and prevention and control countermeasures of various complications in detail (**Table 1**).

Table 1. Risk factors and nursing interventions for nasoenteric tube-related complications.

Complication Type	*Key Risk Factors*	*Recommended Nursing Interventions*
Tube Obstruction	High viscosity of nutrition, drug precipitation, secretion accumulation, narrow tube, improper nursing operation	Use regular pipe flushing, optimize the compatibility of nutrient solutions, and employ dedicated pipes and filters.
Displacement	Impaired consciousness, severe coughing, vomiting, frequent positional changes, inadequate tube fixation	Use electromagnetic guidance or visualization technology to ensure the correct fixation of pipelines, and regularly inspect the pipeline positions.
Nasal Mucosal Pressure Injury	Prolonged tube placement, improper fixation, inappropriate patient positioning, and conditions such as diabetes or malnutrition	Use soft, well-fitting tubes, proper fixation methods, regular nasal mucosa assessment, and strengthened training for ICU nurses.
Aspiration	Delayed gastric emptying, impaired consciousness, weakened cough reflex, supine feeding, high gastric residual volume	Elevate the head of the bed 30-45˚, maintain position post-feeding, and regularly confirm tube tip position.
Airway Obstruction	Tube pressure on the airway, secretion accumulation, excessively large tube, and limited neck movement	Choose soft tubes, perform regular suctioning, administer aerosol inhalation therapy, and avoid pressure on the airway area.

This study found that there were still deficiencies in risk assessment, standardized nursing procedures, and intervention strategies. In the future, multi-center studies should be strengthened, evidence-based prediction, prevention, and control pathways should be constructed, and precise and individualized enteral nutrition support management should be promoted to improve patient outcomes and save medical resources.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Singer, P., Blaser, A.R., Berger, M.M., Calder, P.C., Casaer, M., Hiesmayr, M., *et al.* (2023) ESPEN Practical and Partially Revised Guideline: Clinical Nutrition in the Intensive Care Unit. *Clinical Nutrition*, **42**, 1671-1689. https://doi.org/10.1016/j.clnu.2023.07.011

[2] McClave, S.A., Taylor, B.E., Martindale, R.G., Warren, M.M., Johnson, D.R., Braunschweig, C., *et al.* (2016) Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient. *Journal of Parenteral and Enteral Nutrition*, **40**, 159-211. https://doi.org/10.1177/0148607115621863

[3] Chinese Nursing Association Intensive Care Nursing Professional Committee, Beijing Medical Association Parenteral and Enteral Nutrition Branch Nursing Group (2022) Expert Consensus on Enteral Feeding Care for Patients with Neurological Critical Illness. *Chinese Nursing Journal*, **57**, 261-264. (In Chinese)

[4] Chinese Medical Association Parenteral and Enteral Nutrition Branch (2023) Clinical Application Guidelines for Parenteral and Enteral Nutrition in Adult Patients in China (2023 Edition). *Chinese Medical Journal*, **103**, 946-974.

[5] Doley, J. (2022) Enteral Nutrition Overview. *Nutrients*, **14**, Article 2180. https://doi.org/10.3390/nu14112180

[6] Ribeiro, F.A., Sodré da Costa, L.S., Pedroso, A.C., de Paula Nogueira, P.B., Brandi, S., Toledo, D.O., *et al.* (2025) Evaluating Multifaceted Strategies to Prevent Nasoenteral Tube Complications and Achieve Significant Cost Savings in Critically Ill Patients: The ENHANCE-CRIT Trial. *BMJ Open Quality*, **14**, e003177. https://doi.org/10.1136/bmjoq-2024-003177

[7] Freitas, L.A., Fagundes, A.L., do Prado, P.R., Pereira, M.C.A., de Medeiros, A.P., de Freitas, L.M., *et al.* (2021) Factors Associated with Length of Stay and Death in Tube-fed Patients: A Cross-Sectional Multicentre Study. *Nursing Open*, **8**, 2509-2519. https://doi.org/10.1002/nop2.774

[8] Wang, X.L., Jiang, X.M. and Dai, Y. (2014) Advances in the Application and Nursing Research of Nasoenteric Tubes. *Chinese Nursing Journal*, **49**, 1506-1510. (in Chinese)

[9] Borges, J.L.A., De Souza, I.A.O., Costa, M.C.V., Ruotolo, F., Barbosa, L.M.G., De Castro, I., *et al.* (2020) Causes of Nasoenteral Tube Obstruction in Tertiary Hospital Patients. *European Journal of Clinical Nutrition*, **74**, 261-267. https://doi.org/10.1038/s41430-019-0475-0

[10] Ou, Y.F., Zhao, H.H. and Xu, L.N. (2020) Evaluation of the Effect of Different Solutions for Sealing the Nasoenteric Tube in Enteral Nutrition Patients. *Chinese Journal of Practical Nursing*, **36**, 646-650. (in Chinese)

[11] Wang, L., Hou, W., Liu, Z., Chen, L., Lin, R. and Huang, Y. (2025) Nurses' Knowledge in the Prevention and Management of Nasointestinal Tube Obstruction: A Cross-Sectional Study. *Risk Management and Healthcare Policy*, **18**, 309-317. https://doi.org/10.2147/rmhp.s487742

[12] Zhu, X.R. and Fu, H.D. (2022) Method of Establishing a Post-Pyloric Nutrition Pathway Using a Spiral Nasoenteric Tube Combined with a Nasogastric Tube. *Jilin Medical Journal*, **43**, 1103-1106. (in Chinese)

[13] Zhang, Y., Han, M.D., Zhao, Q., Li, M., Feng, Z.Z., Xu, C.H., Du, J.L. and Wang, S.X. (2021) Design and Application of a Preventive Protocol for Nasoenteric Tube Obstruction. *Chinese Nursing Journal*, **56**, 1453-1459. (in Chinese)

[14] Han, M.D., Zhang, Y., Hou, C., Liu, S.J. and Yan, M.G. (2023) Summary of the Best Evidence for Prevention and Management of Nasoenteric Tube Occlusion in Adult Enteral Nutrition Patients. *Military Nursing*, **40**, 88-92. (in Chinese)

[15] Mancini, F.C., de Moura, D.T.H., Funari, M.P., Ribeiro, I.B., Neto, F.L.P., Mendieta, P.J.O., *et al.* (2022) Use of an Electromagnetic-Guided Device to Assist with Post-Pyloric Placement of a Nasoenteral Feeding Tube: A Systematic Review and Meta-Analysis. *Endoscopy International Open*, **10**, E1118-E1126.

https://doi.org/10.1055/a-1789-0491

[16] Li, K., Huang, J., Alhaskawi, A., Wang, B., Ma, N., Yao, C., *et al.* (2024) A Minimally Invasive, Visualized Method for Nasojejunal Tube Placement. *Journal of Visualized Experiments*, **208**, e66551. https://doi.org/10.3791/66551

[17] Wang, Z., Liu, Y., Fang, K., Hao, X., Xue, Z., Dong, X. and Wang, H. (2024) Qualitative Study on the Ability of Neurological Nurses to Manage Patients with Indwelling Gastrointestinal Canal. *Frontiers in Medicine*, **11**, Article 1403173.

[18] Kaplan, H. and Curd, D. (2023) Safety of Blind versus Guided Feeding Tube Placement: Misplacement and Pneumothorax Risk. *Intensive and Critical Care Nursing*, **79**, Article 103492. https://doi.org/10.1016/j.iccn.2023.103492

[19] Anziliero, F., Nora, C.R.D. and Beghetto, M.G. (2023) Incidence and Time until the First Traction or Obstruction of the Nasoenteral Tube in Hospitalized Adults. *Revista Gaúcha de Enfermagem*, **44**, e20210343. https://doi.org/10.1590/1983-1447.2023.20210343.en

[20] Anziliero, F. and Beghetto, M.G. (2018) Incidents and Adverse Events in Enteral Feeding Tube Users: Warnings Based on a Cohort Study. *Nutricion Hospitalaria*, **35**, 259-264. https://doi.org/10.20960/nh.1440

[21] Gimenes, F.R.E., Baracioli, F.F.L.R., Medeiros, A.P.D., Prado, P.R.D., Koepp, J., Pereira, M.C.A., *et al.* (2020) Factors Associated with Mechanical Device-Related Complications in Tube Fed Patients: A Multicenter Prospective Cohort Study. *PLOS ONE*, **15**, e0241849. https://doi.org/10.1371/journal.pone.0241849

[22] Wang, C.E., Chen, X.R., Zhu, R.R., Liu, J.X., Huang, L.N. and Hu, W.P. (2017) Effects of Nasoenteric Tube and Nasogastric Tube Enteral Nutrition on Prognosis, Complications, Inflammatory Response, and Intestinal Mucosal Barrier Function in Patients with Severe Traumatic Brain Injury. *Chinese Journal of Neurological Medicine*, **16**, 599-603. (in Chinese)

[23] Yang, Q., Huang, B., Jiang, M., Liang, Y.P., Zhao, X.M. and Zou, H. (2021) Observation of the Application Effects of Three Different Fixation Methods in the Treatment of Nasoenteric Tube Patients. *Practical Journal of Hospital Clinical Medicine*, **18**, 78-80. (in Chinese)

[24] Nan, R., Su, Y., Pei, J., Chen, H., He, L., Dou, X., *et al.* (2023) Characteristics and Risk Factors of Nasal Mucosal Pressure Injury in Intensive Care Units. *Journal of Clinical Nursing*, **32**, 346-356. https://doi.org/10.1111/jocn.16193

[25] Coyer, F., Miles, S., Gosley, S., Fulbrook, P., Sketcher-Baker, K., Cook, J., *et al.* (2017) Pressure Injury Prevalence in Intensive Care versus Non-Intensive Care Patients: A State-Wide Comparison. *Australian Critical Care*, **30**, 244-250. https://doi.org/10.1016/j.aucc.2016.12.003

[26] Chen, X.E., Wen, W., Chen, X.F., Shen, F.F., Su, B. and Lin, B.L. (2019) The Current Status and Intervention Strategies for Medical Device-Related Pressure Injuries in Tertiary Grade A Hospitals in Hainan Province. *Modern Biological Medicine Progress*, **19**, 1108-1114. (in Chinese)

[27] Gao, J., Zhou, H.L., Chen, K.Y. and Yang, M.F. (2023) Research Progress on Nasal Mucosal Pressure Injuries in ICU Patients. *Nursing Research*, **37**, 3659-3664. (in Chinese)

[28] Shapira-Galitz, Y., Karp, G., Cohen, O., Halperin, D., Lahav, Y. and Adi, N. (2018) Evaluation and Predictors for Nasogastric Tube-Associated Pressure Ulcers in Critically Ill Patients. *The Israel Medical Association Journal*, **20**, 731-736.

[29] Fulbrook, P., Lovegrove, J. and Butterworth, J. (2023) Incidence and Characteristics

of Hospital-Acquired Mucous Membrane Pressure Injury: A Five-Year Analysis. *Journal of Clinical Nursing*, **32**, 3810-3819. https://doi.org/10.1111/jocn.16473

[30] Zheng, S.Y., Liu, G. and Chen, L. (2020) Causes and Prevention of Medical Device-Related Skin Pressure Injuries in Frontline Healthcare Workers During the COVID-19 Epidemic. *Journal of the Chinese People's Liberation Army Medical*, **32**, F3. (in Chinese)

[31] Dang, W., Liu, Y., Zhou, Q., Duan, Y., Gan, H., Wang, L., *et al.* (2022) Risk Factors of Medical Device-Related Pressure Injury in Intensive Care Units. *Journal of Clinical Nursing*, **31**, 1174-1183. https://doi.org/10.1111/jocn.15974

[32] Zhang, Y.B., He, L., Gou, L., Pei, J.H., Nan, R.L., Chen, H.X., *et al.* (2021) Knowledge, Attitude, and Practice of Nurses in Intensive Care Unit on Preventing Medical Device-Related Pressure Injury: A Cross-Sectional Study in Western China. *International Wound Journal*, **18**, 777-786. https://doi.org/10.1111/iwj.13581

[33] Heuft, L., Voigt, J., Selig, L., Stumvoll, M., Schlögl, H. and Kaiser, T. (2023) Refeeding Syndrome. *Deutsches Arzteblatt International*, **120**, 107-114.

[34] Pan, S.W., Hong, Y.H., Li, J.J. and Mei, W.P. (2025) Meta-Analysis of Factors Influencing Refeeding Syndrome in ICU Enteral Nutrition Patients. *Evidence-Based Nursing*, **11**, 610-616. (in Chinese)

[35] Cui, Y.R., Chen, L. and Lu, X.M. (2023) Current Status and Influencing Factors of Refeeding Syndrome in Neurocritical Care Unit Patients. *Nursing Research*, **37**, 234-239. (in Chinese)

[36] Liu, C., Jiang, J., Wen, Z. and You, T. (2025) Naso-Intestinal Versus Gastric Tube for Enteral Nutrition in Patients Undergoing Mechanical Ventilation: A Systematic Review and Meta-Analysis. *Systematic Reviews*, **14**, Article No. 13. https://doi.org/10.1186/s13643-024-02743-6

[37] Yang, C. and Pan, Y. (2022) Risk Factors of Dysphagia in Patients with Ischemic Stroke: A Meta-Analysis and Systematic Review. *PLOS ONE*, **17**, e0270096. https://doi.org/10.1371/journal.pone.0270096

[38] Yu, A., Xie, Y., Zhong, M., Wang, F., Huang, H., Nie, L., *et al.* (2021) Comparison of the Initiation Time of Enteral Nutrition for Critically Ill Patients: At Admission vs. 24 to 48 Hours after Admission. *Emergency Medicine International*, **2021**, 1-7. https://doi.org/10.1155/2021/3047732

[39] Boaden, E., Burnell, J., Hives, L., Dey, P., Clegg, A., Lyons, M.W., *et al.* (2021) Screening for Aspiration Risk Associated with Dysphagia in Acute Stroke. *Cochrane Database of Systematic Reviews*, **2021**, CD012679. https://doi.org/10.1002/14651858.cd012679.pub2

[40] Ren, J.R., Zhen, Z.G., Ren, S.H., Zhang, G.L., Jia, G.J. and Ji, H.M. (2018) Efficacy Analysis of Enteral Nutrition Therapy with Combined Nasoenteric and Nasogastric Tubes in Severe Traumatic Brain Injury Patients. *Chinese Journal of Neurosurgery*, **34**, 1143-1147. (in Chinese)

[41] Zhu, J.J. and Guo, H.T. (2020) Application of the Improved Gastric Tube Placement Method Based on Anatomical Structure in Patients with Tracheotomy Due to Stroke. *Journal of the Chinese People's Liberation Army Nursing*, **37**, 90-92. (in Chinese)

[42] Sun, J.H., Luo, H.B., Li, Z.Z., Li, Q., Li, X., Zhao, M.X., *et al.* (2023) Evidence Summary of Bedside Ultrasound-Guided Nasoenteric Tube Insertion in Adult Critically Ill Patients. *Chinese Nursing Journal*, **58**, 986-992. (in Chinese)

[43] Zhao, H.P. and Wang, R.R. (2024) Expert Consensus on Airway Function Rehabilitation and Management in Neurocritical Care Tracheostomy Patients (2024). *Chi-*

nese Journal of Rehabilitation Theory and Practice, **30**, 869-881. (in Chinese)

[44] Klingbeil, K.D., Wu, J.X., Osuna-Garcia, A. and Livingston, E.H. (2023) Management of Small Bowel Obstruction and Systematic Review of Treatment without Nasogastric Tube Decompression. *Surgery Open Science*, **12**, 62-67. https://doi.org/10.1016/j.sopen.2022.10.002

[45] Motta, A.P.G., Rigobello, M.C.G., Silveira, R.C.D.C.P. and Gimenes, F.R.E. (2021) Nasogastric/Nasoenteric Tube-Related Adverse Events: An Integrative Review. *Revista Latino-Americana de Enfermagem*, **29**, e3400. https://doi.org/10.1590/1518-8345.3355.3400