FNJN

İSTANBUL UNIVERSITY CERRAHPAŞA

Florence Nightingale Journal of Nursing

DOI: 10.5152/FNJN.2025.23271

Research Article

Nasogastric and Nasoenteric Tube-Related Incidents: A Cohort Study with Hospitalized Brazilian Older Adults

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Cite this article as: Pereira, R. M. d. P., Storti, L. B., Diniz, M. A. A., Gimenes, F. R. E., Herrera, C. N., & Kusumota, L. (2025). Nasogastric and nasoenteric tube-related incidents: A cohort study with hospitalized brazilian older adults. *Florence Nightingale Journal of Nursing*, 33, 0271, doi: 10.5152/FNJN.2025.23271.

What is already known on this topic?

- *The prevalence of NGT/NET feeding in both community and hospital settings remains a significant concern.*
- *Older adults, or the elderly, constitute the largest group undergoing this procedure.*
- *Patient safety has become a worldwide concern, with incidents related to NGT/NET being particularly high in this population.*

What this study adds on this topic?

- *The incidents related to the use of NGT/NET, their consequences, and the associated factors in hospitalized older adults were identified and analyzed.*
- *Most of the incidents caused mild or moderate harm to the older adults. Among the factors associated with the occurrence of incidents, only the level of nursing care dependence and age were statistically linked to mechanical and gastrointestinal incidents.*
- *Highlights the urgent need for the development and adoption of robust institutional protocols and indicators based on updated scientific evidence, as well as investments in the training and continuous education of nursing care providers to ensure quality and safe care for older adult patients using NGT/NET.*

Abstract

AIM: The natural aging process, aggravated by the presence of disease and other factors, makes older adults more susceptible to the need for nutritional therapy. Patient safety is a worldwide concern, and older adults are one of the age groups at risk for incidents, especially related to the use of nasogastric and nasoenteric tube feeding.

METHODS: This prospective cohort study aimed to identify and analyze incidents related to the use of nasogastric and nasoenteric tubes, their consequences, and the associated factors in hospitalized older adults. The study was carried out in a public general hospital in the state of São Paulo. Data were collected between October 2016 and November 2017 for this study, and continued until April 2019 in other hospitals involved in the "Multicentre study" through voluntary reporting by healthcare providers, patients or their companions, active searches during ward visits, and reviews of medical records.

RESULTS: The sample consisted of 86 older adults, with a mean age of 71.33 years, high nursing care dependence (39.53%), and a high risk of death (59.30%). The primary reason for tube use among older adults was sensory decline in health (31.40%), followed by lack of appetite and poor oral diet acceptance (22.09%). The most common insertion technique was blind bedside insertion (45.35%), with gastric positioning being the most frequent (44.18%), according to patient records. The prevalence of incidents was 43.02%, among these 35.14% older adults experienced only one incident, 18.91% had two incidents, and 45.95% had three or more incidents. The unplanned removal of the tube was the most frequent event (28.71%), and 56.44% of the cases resulted in mild harm. The death of older adult patients using NGT/NET was not associated with age, sex, level of consciousness, level of nursing care dependence, risk of death, length of monitoring, length of hospital stays, or total incidents.

CONCLUSION: The level of nursing care dependence and age were associated with the occurrence of incidents, highlighting the urgent need to adopt protocols based on updated scientific evidence to guarantee quality and safe care for hospitalized older adults.

Keywords: Aged, gastrointestinal intubation, geriatric nursing, medical errors, patient safety, tube feeding

Introduction

Older adults are more susceptible to the use of nasogastric tubes (NGT) and nasoenteric tubes (NET) and enteral nutrition therapy (ENT) due to the loss of physiological drivers of appetite and satiety, alongside swallowing difficulties. These challenges result from the natural aging process and are often exacerbated by underlying health conditions that contribute to inadequate food intake and malnutrition (Veronese, et al., 2020). Studies have shown that the majority of patients receiving ENT are older adults (Ang et al., 2020; Freitas et al., 2021; Gimenes et al., 2020). This population often presents with multiple comorbidities, making them more vulnerable to complications and at a higher risk of adverse events related to the use of NGT and NET (Gimenes et al., 2020).

Received: November 22, 2024
Revision requested: December 15, 2023
Last revision received: November 21, 2024
Accepted: January 14, 2025
Publication Date: March 10, 2025

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Enteral nutrition therapy involves procedures to maintain or restore a patient's nutritional status via enteral feeding. It is preferred for patients with a fully or partially functioning gastrointestinal tract due to its cost-effectiveness and reduced risk of septic complications (Marshall, 2012; Matsuba et al., 2021). Typically administered through short-term enteral tubes like NGT or NET (Matsuba et al., 2021; Bowman et al., 2022), ENT is not risk-free (Bowman et al., 2022). Incidents related to NGT/NET use, defined as events that could or did result in harm to the patient (WHO, 2009), are also referred to as adverse events by the American Society for Parenteral and Enteral Nutrition (ASPEN), defined as any undesirable experience with an enteral access device (ASPEN, 2018). These incidents have been documented in the literature (Bowman et al., 2022).

Research indicates that ENT-related incidents can occur at various stages, originating from mechanical, infectious, metabolic, or gastrointestinal complications. Mechanical issues include tube-related injuries like mucosal edema or accidental dislodgement, while infectious risks encompass gastroenterocolitis and aspiration pneumonia. Metabolic imbalances, such as electrolyte disturbances and liver dysfunction, and gastrointestinal problems, like obstruction and diarrhea, are also prevalent. These findings emphasize the importance of continuous monitoring and proactive management to enhance the safety and efficacy of ENT (Ang et al., 2020; Motta et al., 2021).

A study comparing NGT feeding and percutaneous endoscopic gastrostomy (PEG) feeding found that patients receiving NGT feeding experienced more complications than those receiving PEG feeding, underscoring the importance of choosing the appropriate feeding modality for optimal patient outcomes (Ang et al., 2020). In Brazil, an analysis of health institution data revealed that NGT/NET removal is among the most common incidents (Xelegati et al., 2019). Such occurrences have led to a decline in tube use and an increased preference for ostomy procedures in the country (Motta et al., 2021).

To address these challenges, the Brazilian Society of Parenteral and Enteral Nutrition (BRASPEN) has published updated guidelines for nursing care in oral, enteral, and parenteral nutrition. These guidelines aim to enhance clinical practices and address gaps in ENT, promoting safer and more effective patient care. They standardize the processes for prescription, administration, and monitoring of enteral nutrition, ensuring consistent adherence to best practices and reducing variability to improve patient safety (Matsuba et al., 2021).

Given the increasing prevalence of NGT/NET feeding in both community and hospital settings, and the fact that older adults constitute the largest group undergoing this procedure, patient safety has become a worldwide concern. Despite extensive literature on NGT and NET use, there is a notable lack of research specifically addressing incidents related to these feeding methods in older adults. This population is particularly vulnerable due to age-related physiological changes and comorbidities that complicate their care.

There is a pressing need for more detailed analyses of the consequences of incidents involving NGT/NET use, particularly regarding patient harm and outcomes. Additionally, the relationship between nursing care dependency levels and the occurrence of such incidents remains underexplored. The present study aimed to identify and analyze the incidents related to the use of NGT/NET, their consequences, and the associated factors in hospitalized older adults during their stay in a Brazilian public hospital.

Research Questions

1. How do incidents related to the use of NGT and NET occur in elderly individuals during hospitalization?
2. What variables are associated with such incidents?
3. What is the incidence of mortality in elderly individuals using NGT and NET?

Methods

Study Design

The study was designed as a prospective cohort study. This prospective cohort study is an integral part of the study titled "Nasogastric/Nasoenteric Tube-Related Incidents in Hospitalized Patients: A Study Protocol of a Multicentre Prospective Cohort Study," conducted in public hospitals of Brazil (Gimenes et al., 2019). From this point forward, we will refer to this larger study as the "Multicentre study". Our specific study focuses on the analysis of the sample from only one of the seven hospitals involved in the "Multicentre study."

Sample

The study was conducted in a public general hospital in the state of São Paulo, with 815 beds performing over 700,000 procedures and consultations annually, including 33,000 hospitalizations of patients of various age groups and clinical conditions. To determine the sample size for the "Multicentre study," stratified random sampling was carried out with proportional allocation by strata, where each stratum was defined by the floors/wings of the data collection hospital (Gimenes et al., 2019). By adopting a parameter of 20% relative error and a 5% significance level, with a total population of 6564 across the seven hospitals, a sample size of 391 patients was calculated for the "Multicentre study." Therefore, this sample size can be considered representative of a larger population. The multicenter study included hospitalized patients aged over 18 years, using NGT or NET, and hospitalized for at least 24 hours. Patients with enteral tubes for nutrition via ostomy were excluded from the study (Gimenes et al., 2019).

The estimated sample size for the selected hospital, out of the seven hospitals that are part of the multicenter study, was 134 patients. However, the final sample size exceeded this estimate, totaling 148 patients at the referred hospital (Gimenes et al., 2019). This study applied a single exclusion criterion to the sample of 148 patients from the "Multicentre study." Patients under 60 years of age were excluded to focus the analysis on incidents in elderly patients, as defined by Federal Law No. 10,741 (2003), which includes only patients aged 60 years or older. Based on the inclusion criteria, the total sample size was 86 older adult patients. Sixty-two individuals were excluded for not meeting the inclusion criteria.

Data Collection

Data collection for the "Multicentre study" was carried out between October 2016 and April 2019, using electronic forms provided through the Survey Monkey® tool, which were developed by the research team and evaluated for face and content validity by an expert committee (Gimenes et al., 2019). The experts were identified by reviewing the curricula available in the Brazilian National Council for Scientific and Technological Development database. Once selected, they were invited to participate in the study, and upon their acceptance, access links to the electronic forms were provided (Gimenes et al., 2019).

General Data Form

Demographic and clinical data on admission of the older adults to the clinical medical wards were obtained from the electronic medical record. The main medical diagnosis was registered according to the International Classification of Diseases. Data related to the NGT/NET were also collected, including the date of tube insertion, reason for use, caliber, position (whether gastric or enteric), method used to confirm tube placement, and planned date of tube removal.

Patient Monitoring Form

Older adults were assessed for levels of consciousness, level of nursing care dependence, and risk of death upon admission to the wards and weekly until discharge (due to death or other reasons). The level of consciousness was established using the ACDU Scale (Subbe, et al., 2001), which assesses patients for alertness, confusion, drowsiness, and unresponsiveness.

The level of nursing care dependence of older adults was assessed by a trained nurse, using the Patient Classification System proposed by Fugulin and collaborators (1994), as recommended by the Federal Nursing Council of Brazil (COFEN, 2017). This system considers nine areas of nursing care: mental state, oxygenation, vital signs, mobility, ambulation, alimentation, body care, elimination, and therapeutics. A score from 1 to 4 was assigned to each area, with the highest value indicating the highest care complexity. The final score was obtained by summing the scores of the nine areas and classifying the patient into one of five levels of dependence: minimal care (9–14 points), intermediate care (15–20 points), high dependency care (21–26 points), semi-intensive care (27–31 points), and intensive care (above 31 points).

To assess the risk of death among older adults, the Charlson comorbidity index (CCI), developed by Charlson and colleagues (1987) to predict 1-year mortality, was calculated. The final CCI score was determined by summing the weights (ranging from 0 to 6) attributed to 19 predefined clinical conditions, classifying the patient into mild risk (1–2 points), moderate risk (3–4 points), and high risk (5 or more points) (Huang et al., 2014). It is important to note that there is no classification for zero risk. In the present study, the risk of death was adjusted according to the age of the patients (Charlson et al., 1987), given that all participants were over 50 years of age.

Incident Form

Three methods were used to identify NGT and NET-related incidents: (1) voluntary notification by health professionals, patients, or their companions when any tube-related incident was identified; (2) active search for incident-related information conducted by researchers during daily ward visits; and (3) review of medical records of older adults (Gimenes et al., 2019).

The level of harm caused by an incident, when it occurred, was defined according to the classification established by the World Health Organization (WHO). This classification categorizes the harm into the following: (a) none: absence of detected symptoms with no treatment required; (b) mild: presence of mild symptoms, minimal or intermediate loss of function or harm, and of short duration, necessitating minimal interventions; (c) moderate: presence of symptoms requiring intervention and increased length of hospital stay, with permanent or long-term harm or loss of function; (d) severe: presence of symptoms requiring life-saving intervention or major clinical/surgical intervention, resulting in a decrease in life expectancy, with major, permanent, or long-term harm or loss of function; (e) death: when it is probable that the event caused or accelerated the patient's death in the short term (WHO, 2009).

Statistical Analysis

The R statistical software (R Foundation for Statistical Computing, 2018) was used to analyze data, which included measures of position, dispersion, and variability for the quantitative variables, and simple frequencies for the categorical variables. Tests for the normality distribution of the data were conducted to determine whether to perform parametric or non-parametric analyses.

The relationship between the categorical variables was verified using chi-square tests or Fisher's exact tests. The association between the total number of incidents per patient and level of consciousness and nursing care dependence at the time of the older adult's admission to the ward was examined using the Kruskal–Wallis non-parametric test. For the analysis of the association between the occurrence of an incident and the characteristics of the older adult, the odds ratios for gastrointestinal incidents, mechanical incidents, and mortality were evaluated using logistic regression. The significance level adopted for the statistical tests was 5% ($\alpha = .05$).

Ethical Considerations

The study was approved by the Research Ethics Committee of the University of São Paulo (Approval no: 79137217.5.0000.5393, Date: December 5, 2017) and adhered to Brazilian regulations. Written consent was obtained from each participant or their legal representative.

Results

General Data

Among the 86 older adults in this study, the majority were female (51.16%), with a mean age of 71.3 years (range: 60–88 years). Most participants had incomplete elementary education (51.16%) and were hospitalized in specialized oncology units (26.74%). The most frequent main diagnosis was neoplasia (31.39%), with malignant neoplasms of some organs of the digestive system being the most common (16.28%). The mean length of hospital stay was 20.8 days, ranging from 1 to

Table 1.
Clinical Characterization of Hospitalized Older Adults and Characterization of Nasogastric or Nasoenteric Tube Utilization (n = 86)

Clinical Characterization of Hospitalized Older Adults Using a Nasogastric or Nasoenteric Tube		Characterization of the Use of the Nasogastric or Nasoenteric Tube by Hospitalized Older Adults	
Variables	***n* (%)**	**Variables**	***n* (%)**
Level of Consciousness		**Reason for Using the Nasogastric/Nasoenteric Tube**	
Alert	63 (73.25)	Sensory decline/decrease in consciousness level/drop in general status	27 (31.40)
Confused	20 (23.25)	Inappetence/low oral acceptance	19 (22.09)
Drowsy	3 (3.50)	Dysphagia	13 (15.12)
Unconscious	0 (0)	Malnutrition	10 (11.63)
Level of Nursing Care Dependence		Use of orotracheal tube	1 (1.16)
Intensive care	2 (2.33)	Other	16 (18.60)
Semi-intensive care	8 (9.30)	**Position of the Distal End of the Tube**	
High dependency care	34 (39.53)	Gastric	38 (44.18)
Intermediate care	25 (29.07)	Enteric (duodenal/jejunal)	21 (24.43)
Minimal care	17 (19.77)	Data unavailable	27 (31.39)
Risk of Death		**Technique Used to Confirm the Positioning of the Tube**	
High-risk	51 (59.30)	Epigastric auscultation and X-ray	12 (13.95)
Moderate risk	25 (29.07)	Epigastric auscultation and aspiration of gastric contents	10 (11.63)
Low risk	10 (11.63)	Epigastric auscultation only	9 (10.46)
		Epigastric auscultation, aspiration of gastric contents, and X-ray	7 (8.14)
		Aspiration of gastric contents only	2 (2.33)
		Other	3 (3.49)
		Data unavailable	43 (50.00)
		Technique Used to Introduce the Tube	
		Blind/bedside	39 (45.35)
		Endoscopy	3 (3.49)
		Other	1 (1.16)
		Data unavailable	43 (50.00)

107 days. Regarding discharge outcomes, 46.51% of patients returned home, 23.26% were transferred, and 30.23% died. Relationships between categorical variables were analyzed using chi-square tests or Fisher's exact tests.

Monitoring of the Patients

Upon admission, 73.25% of the older adults were in an alert state, 39.53% were highly dependent on nursing care, and 59.30% had a high risk of death (Table 1). The main reasons for the tube use among the older adults were sensory decline, decreased level of consciousness, or a drop in general status (31.40%), followed by lack of appetite and poor acceptance of oral diet (22.09%). The most used technique for tube insertion was blind insertion at the bedside (45.35%), with the predominant positioning being at the gastric level (44.18%), according to patients' records. Tube position was confirmed through a combination of epigastric auscultation and X-ray in 13.95% of the cases. Notably, the pH test of the content aspirated by the tube was not performed in any of the cases (Table 1).

Nasogastric Tubes and Nasoenteric Tubes-Related Incidents

A total of 101 incidents related to NGT/NET use were recorded in 37 older adults (43.02%) during the study period. Among these, 13 older adults (35.14%) experienced only one incident, seven (18.91%) had two incidents, and 17 (45.95%) had three or more incidents. Of the total incidents, 56.44% caused mild harm and 24.75% moderate harm. In 60.40% of the cases, the older adult was accompanied at the time of the incident. The incident was reported to the nurse/nursing team in 68.31% of the cases, with the nursing team responsible for reporting 73.26% of the incidents identified in this study. Additionally, 93.06% of the incidents were documented in the medical records (Table 2).

The analysis of the types of incidents revealed a predominance of gastrointestinal (54.45%) and mechanical (31.68%) incidents. The most frequent incidents were unplanned/accidental removal of the tube and diarrhea, occurring in 28.71% and 27.72% of the cases, respectively (Table 3).

Table 2.
Characterization of Incidents Related to the Use of a Nasogastric or Nasoenteric Tube in Hospitalized Older Adults (n = 101)

Variables	*n*	%
Patient with a companion at the time of the incident		
Yes	61	60.40
No	26	25.74
No information	14	13.86
Harm to the patient		
Mild	57	56.44
Moderate	25	24.75
None	15	14.85
Severe	4	3.96
Measures taken after the incident*		
Communicated to the nurse/nursing team	69	68.31
Incident documented in the medical record	67	66.33
Communicated to the physician	41	40.59
New tube inserted	19	18.81
Communicated to family/caregiver	3	2.97
Responsible for information about the incident*		
Nursing team	74	73.26
Medical team	23	22.77
Family member/caregiver	12	11.88
Patient	7	6.93
Source of information about the incident*		
Medical record	94	93.06
Verbal report	17	16.83
Patient notes	4	3.96

Note: *The item could have more than one answer.

Table 3.
Frequency of Incidents Related To the Use of a Nasogastric or Nasoenteric Tube in Hospitalized Older Adults, Categorized by the Types of Incidents (n = 101)

Variables	*n*	%
Mechanical incidents	32	31.68
Obstruction	3	2.97
Unplanned/accidental removal	29	28.71
Gastrointestinal incidents	55	54.45
Abdominal cramps/bloating/flatulence	6	5.94
Constipation	11	10.89
Diarrhea	28	27.72
Nausea/vomiting	10	9.90
Infectious incidents	2	1.98
Aspiration pneumonia	2	1.98
Metabolic incidents	4	3.96
Hyperglycemia	1	0.99
Hypoglycemia	1	0.99
Hyponatremia	2	1.98
Other tube-related incidents	8	7.93
Bronchoaspiration	5	4.96
Medical adhesive-related skin injury	1	0.99
Other	2	1.98

The level of consciousness of older adults at admission was not associated with the occurrence of mechanical ($p = .6142$; chi-square/Fisher's exact tests) or gastrointestinal ($p = .2497$; chi-square/Fisher's exact tests) incidents. The frequency of mechanical and gastrointestinal incidents was similar among older adults classified as alert and confused.

However, the level of nursing care dependence was associated with both mechanical and gastrointestinal incidents. Older adults classified as high dependency care had a higher mean number of mechanical incidents (0.62 ± 1.02; $p = .0430$; Kruskal–Wallis non-parametric) compared to other levels of dependence. Similarly, older adults classified as semi-intensive or intensive care had a higher mean number of gastrointestinal incidents (1.00 ± 1.49; $p = .0145$; Kruskal–Wallis non-parametric).

Considering the level of dependence on nursing care, older adults requiring minimal care were used as a baseline. Older adults needing high dependency care were found to be 6.6612 times more likely to experience a gastrointestinal incident related to tube use ($p = .0064$; Kruskal–Wallis non-parametric). Those requiring semi-intensive or intensive care were 5.0606 times more likely to suffer a gastrointestinal incident related to tube use ($p = .0372$; Kruskal–Wallis non-parametric).

Using logistic regression to assess the odds ratio for the occurrence of gastrointestinal incidents, mechanical incidents, and death, while considering the characteristics of the elderly, the results are shown in Tables 4–6. The age of the patients was also associated with the occurrence of incidents. For mechanical incidents, each additional year of life increased the chance of this incident by 1.0876 times ($p = .0027$; logistic regression). For gastrointestinal incidents, each additional year of life increased the chance of an incident by 0.9141 times ($p = .0009$; logistic regression) (Tables 4 and 5).

The death of older adult patients using NGT/NET was not associated with age, sex, level of consciousness, level of nursing care dependence, risk of death, length of monitoring, length of hospital stay, or total incidents (Table 6).

Discussion

This study broadens our understanding of critical aspects of patient safety in hospitalized older adult patients receiving ENT. Notably, approximately four in 10 patients in this analysis experienced harm due to incidents related to NGT/NET use, emphasizing the clinical, epidemiological, and social significance of this issue.

Table 4.
Logistic Regression Analysis with Gastrointestinal Incident as the Outcome for Hospitalized Older Adult Patients Using a Nasogastric or Nasoenteric Tube

Parameters	β[a]	SE(β)[b]	z	p	OR[c]	95% CI[d]	
Age	−0.0899	0.0270	−3.3327	.0009**	0.9141	0.8649	0.9619
Level of dependence							
Minimum care (REF)[e]	4.4421	1.9297	2.3020	.0213**			
High dependency care	1.8963	0.6956	2.7263	.0064**	6.6612	1.9124	31.6121
Intermediate care	0.7610	0.7418	1.0259	.3050	2.1403	0.5424	10.8028
Semi-intensive or intensive care	1.6215	0.7782	2.0836	.0372**	5.0606	1.1973	27.2270

Note: [a]β = estimated; [b]SE(β) = standard error; [c]OR = odds ratio; [d]CI = confidence interval; [e]REF = reference group.
**$p < .05$.

Table 5.
Logistic Regression Analysis with Mechanical Incident as the Outcome for Hospitalized Older Adult Patients Using a Nasogastric or Nasoenteric Tube

Parameters	β[a]	SE(β)[b]	z	p	OR[c]	95% CI[d]	
REF[e]	−7.3979	2.0724	−3.5697	.0004**			
Age	0.0839	0.0280	3.0029	.0027**	1.0876	1.0307	1.1509

Note: [a]β = estimated; [b]SE(β) = standard error; [c]OR = odds ratio; [d]CI = confidence interval; [e]REF = reference group.
**$p < .05$.

The hospitalization of the older adults analyzed in this study was predominantly for the treatment of chronic diseases. At the time of admission, they were highly dependent on nursing care. These findings are consistent with those of other studies (Almagro et al., 2020; Freitas et al., 2021). The mean length of stay on the ward was 20.8 days, significantly longer than reported in studies that evaluate patients over 18 years old receiving ENT (Gimenes et al. 2020; Freitas et al., 2021). This

Table 6.
Logistic Regression Analysis with Death as the Outcome for the Characteristics of Hospitalized Older Adult Patients Using a Nasogastric Tube or Nasoenteric Tube

Parameters	β[a]	SE(β)[b]	z	p	OR[c]	95%	CI[d]
Age	0.0065	0.0388	0.1675	.8670	1.0065	0.9323	1.0874
REF[e]	−2.5804	2.7898	−0.9249	.3550			
Sex—Male	0.0945	0.5292	0.1786	.8582	1.0991	0.3875	3.1420
Level of dependence							
High dependency care	0.6792	0.8469	0.8019	.4226	1.9722	0.3906	11.3534
Intermediate care	0.2983	0.7748	0.3850	.7002	1.3476	0.3010	6.6468
Semi-intensive or intensive care	1.0626	1.0454	1.0165	.3094	2.8939	0.3712	24.1425
Level of consciousness							
Confused	0.1698	0.6874	0.2471	.8048	1.1851	0.2938	4.5196
Drowsy	0.8211	1.4744	0.5569	.5776	2.2730	0.1282	66.1978
Risk of death							
High risk	0.3364	1.0299	0.3267	.7439	1.3999	0.2111	14.0900
Moderate risk	1.3696	1.0088	1.3575	.1746	3.9336	0.6307	38.6584
Length of monitoring	−0.0234	0.0401	−0.5822	.5604	0.9769	0.8996	1.0575
Length of hospital stay	0.0324	0.0354	0.9138	.3608	1.0329	0.9639	1.1111
Total incidents	−0.1481	0.1746	−0.8484	.3962	0.8623	0.5859	1.1886

Note: [a]β = estimated; [b]SE(β) = standard error; [c]OR = odds ratio; [d]CI = confidence interval; [e]REF = reference group.

prolonged hospitalization may be attributed to the higher prevalence of multiple comorbidities in older adults (Siddique et al., 2021). Additionally, the mean length of hospital stay is directly impacted by NGT/NET use, extending by up to 9.2 days compared to patients not using these enteral access devices (Freitas et al., 2021). This indicator is vital, as extended hospital stays are associated with a higher likelihood of adverse events (Hughes et al., 2021).

The risk of death, as measured by the CCI, was high for most patients (59.30%), with a mortality rate of 30.23% during the study period, higher than estimates from studies involving older adults in general and those receiving ENT (Castro et al., 2024). No statistically significant association was found between CCI classification and mortality. Although the CCI is recognized for its relevance to care practices and patient survival (Ferretti-Rebustini et al., 2019), few studies have assessed it specifically in older adults receiving ENT. A multicenter study found that ENT was linked to a higher risk of death (Veronese et al., 2020).

For ENT implementation, nurses typically insert short-term enteral tubes. Confirming tube placement is crucial. This study found that the epigastric auscultation test, despite being unreliable and banned by international organizations like the UK's National Patient Safety Agency since 2005 (National Patient Safety Agency, 2005) due to patient deaths caused by misplaced tubes, was predominantly used (Anderson, 2019).

Current evidence identifies X-ray as the "gold standard" for verifying tube placement (Northington et al., 2022). However, this method was employed in only 22.09% of the older adults in this study. In Brazil, nurses can only request a radiological examination for nasoenteric catheterization (Conselho Federal de Enfermagem [COFEN], 2019). Considering that NGT intubation represents a large number of intubations performed by nurses, the gastric aspirate pH test is the first-line non-radiological method performed at the bedside to confirm positioning (Northington et al., 2022).

Nurses play a crucial and active role in ensuring patient safety during the use of ENT. A study that mapped nursing interventions related to the clinical indicator "Diet by naso/oroenteric tube," described by the Nursing Interventions Classification (NIC), identified 15 essential nursing activities (Camargo, 2020). Nurses are responsible for tube insertion, fixation, administering enteral nutrition, monitoring the tube's condition, recording information, and guiding patients and their families on ENT management. This positions them uniquely to recognize and mitigate risks, preventing incidents and harm to patients (Anderson, 2019).

The occurrence of incidents and harm in this study was verified through three different prospective methods of identification throughout the hospitalization period of older adults: voluntary notification by healthcare providers, patients or their companions; active searches during daily ward visits; and review of medical records. Prospective methods were chosen due to their reliability and greater apparent validity compared to retrospective methods (Michel et al., 2004).

Unplanned removal of the tube was the most frequent incident among the older adults studied (28.71%), a finding consistent with other Brazilian studies (Ang et al. 2020; Motta et al., 2021). The ratio of unplanned removals to the number of patients with a tube in this study was 33.72%, which is higher than the target rate of <10% proposed by the International Life Sciences Institute (ILSI)—Brazil (International Life Sciences Institute [ILSI] Brasil, 2018). This incident results in additional procedures, such as the insertion of a new tube, which pose potential risks, incur extra costs, and cause discomfort for the older adult patient.

A study evaluating the prevalence and prevention of unplanned removal of tubes and catheters among hospitalized patients concluded that removal by the patient was the main reason. Ninety percent of the patient were elderly, and was related to changes in cognition, especially delirium and dementia (Kato et al., 2021). In this study, 23.25% of the older adults were confused at the time of the incident, which may have contributed to the occurrence of the events. Preventive measures for unplanned removals remain challenging due to difficulties in managing delirium and involving companions or family members in patient surveillance (Kato et al., 2021). This evidence is corroborated by the finding that, considering the total number of incidents, older adults were with a companion or family member during 60.40% of the events.

The involvement of patients, family members, and the community in delivering safer healthcare is a strategy for patient safety and harm minimization recognized by the WHO in the 2019 document "Global Action for Patient Safety" (WHO, 2019). This strategy should be implemented globally. Additionally, the WHO recommends assessing and measuring adverse events at all levels of care through notifications by healthcare providers and patients (WHO, 2019). In Brazil, the National Patient Safety Program has encouraged such notifications since 2013 (Ordinance No. 529, 2013).

Nurses are recognized by their peers as responsible for reporting incidents and are also the ones who report the most, according to a study by Dias and de Almeida Carreiro (2020). In the present study, the nursing team was primarily responsible for providing information about the incidents. However, it was identified that 6.9% of the incidents reported to the research team were not recorded in the patient's medical records, suggesting underreporting of incidents in the institution. An integrative literature review on reasons for not reporting patient safety incidents in Brazilian institutions identified that underreporting occurs mainly due to fear or apprehension regarding the report, notifications being focused on more serious events, and a lack of knowledge on the topic or about how to report and centralize the notification (Alves et al., 2019). It is essential that health leaders address the barriers to notification to facilitate learning from mistakes and to build a culture that prioritizes the safety of the care provided.

Study Limitations

The findings of the present study must be interpreted considering its limitations. First, only older adults using NGT/NET

admitted to the clinic wards were included, excluding other hospital units. This should be considered in future studies for a more comprehensive understanding of the broader context and potential biases. Second, the underreporting of incidents and the lack of clear and accurate records on tubes used in the studied units limited the ability to identify and analyze the exact number of incidents and their consequences.

Despite these limitations, the findings of this study are relevant and can support immediate actions at local, regional, and national levels to reduce these incidents and protect older adults. Further studies are desirable and anticipated, expanding the scope and diversity of the older adult population studied to gain a deeper understanding of this reality, its biases, and the necessary actions.

Conclusion and Recommendations

The study of incidents related to NGT/NET use allowed us to identify and analyze 101 incidents that occurred in 37 hospitalized older adults, with a predominance of mechanical and gastrointestinal incidents. The unplanned removal of the enteral tube and diarrhea were the most frequent types of incidents, both exceeding the targets proposed by ENT quality indicators. Most of the incidents caused mild or moderate harm to the older adults. Among the factors associated with the occurrence of incidents, only the level of nursing care dependence and age were statistically linked to mechanical and gastrointestinal incidents.

The study highlights the urgent need for the development and adoption of robust institutional protocols and indicators based on updated scientific evidence, as well as investments in the training and continuous education of nursing care providers to guarantee quality and safe care for older adult patients using NGT/NET.

Availability of Data and Materials: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of the University of São Paulo (Approval no: 79137217.5.0000.5393, Date: December 5, 2017).

Informed Consent: Written consent was obtained from each participant or their legal representative.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – R.M.P.P., L.K.; Design – RM.P.P., L.K., F.R.E.G.; Supervision – L.K., F.R.E.G..; Resources – F.R.E.G. (supported by Sigma Theta Tau International); Materials – R.M.P.P., L.K., F.R.E.G., Data Collection and/or Processing – L.B.S., M.A.A.D., R.M.P.P.; Analysis and/or Interpretation – R.M.P.P., C.N.H., L.K.; Literature Search – R.M.P.P., C.N.H., L.K.; Writing Manuscript – R.M.P.P., C.N.H., F.R.E.G., L.K., L.B.S.; M.A.A.D.; Critical Review – R.M.P.P., C.N.H., F.R.E.G.; Other – Jonas Bodini Alonso (statistician)

Acknowledgment: We thank our research group and participants for their collaboration in this study.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: This project was financially supported by Sigma Theta Tau International for the 2019 Sigma Small Grants (Grant no: 16230).

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