

# Nasal Tube Securement: Randomized Controlled Trial in Pediatric Hospitalized Patients

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## Abstract

**Purpose:** The aim of this study was to compare accidental dislodgement rates of nasal gastric tubes secured with standard methods or a nasal tube securement device in pediatric patients.

**Design:** A randomized controlled trial was conducted.

**Methods:** Participants ( $n = 43$ ) were randomized into standard securement or nasal tube securement device using block randomization to control for age and diagnosis. Surveys were collected from staff and caregivers on device ease of use and satisfaction.

**Results:** There were a similar number of tube dislodgements for patients in the nasal tube securement device group ( $n = 6$ ) and the standard practice group ( $n = 7$ ). The median hospital length of stay was higher for the standard practice group (13 days vs. 9 days).

**Conclusion:** Use of the nasal tube securement device did not significantly decrease the rate of tube dislodgements compared with standard practice.

**Clinical Relevance to Rehabilitation Nursing:** The study provides information for pediatric rehabilitation nurses in choosing securement options for nasal gastric tubes.

**Keywords:** Nasal bridle; feeding tube securement; tube dislodgement; pediatric; randomized controlled trial.

## Introduction

Pediatric patients recovering from a traumatic brain injury (TBI) on a rehabilitation unit frequently require a nasal gastric tube for nutritional support during their early recovery phase. Accidental dislodgement is a common complication associated with the use of a nasal gastric tube and has been cited in numerous articles (Bechtold et al., 2014; Kang et al., 2018; Lynch et al., 2018; Mayes et al., 2020; McGinnis, 2011; Newton et al., 2016; Parks et al., 2013; Puricelli et al., 2016; Seder et al., 2010). When a patient requires numerous episodes of enteral feeding tube reinsertion, it increases a patient's risk of anxiety, possible sedation

(Mayes et al., 2020), and potential life-threatening events such as inadvertent placement of the tube in the lungs and pneumothorax (Gunn et al., 2009; Lyman et al., 2018; Lynch et al., 2018; Metheny et al., 2019; Stabler et al., 2018; Wathen & Peyton, 2014). Patients recovering from a TBI, as well as other pediatric patients, are at higher risk for accidental tube dislodgement because of their impulsivity and lack of understanding of the necessity of the tube to remain in place (Kang et al., 2018).

A nasal tube securement device is a commercially manufactured device used to hold tubes in place and discourage patients from pulling on their enteral feeding tube (Applied Medical Technology, 2020; Lavoie et al., 2021). A nasal gastric tube securement device utilizes a magnetic retrieval system that is attached to microfilament tubing, which is inserted via the nares, looping around the vomer bone. The nasogastric (NG) tube is secured to a clip, which is attached to the microfilament tubing 1 cm below the nose (Applied Medical Technology, 2020) and ending with both ends of the securement device (microfilament tubing) clamped together around the feeding tube just outside the nose (Bechtold et al., 2014).

Side effects and risks with placement of this device from the two small nasal probes for insertion most commonly include temporary discomfort when initially placing the securement device. Epistaxis may occur but should not

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continue after placement. Less common potential injury to the nasal passages may be present if the tube or nasal tube securement device are pulled on with force or pulled consistently. However, if the tube securement device is pulled with extreme force, the feeding tube narrows, which allows the tube to be pulled through the clip, as to not cause damage to the vomer bone or nares (Parks et al., 2013; Seder et al., 2010; Stabler et al., 2018). Lynch et al. (2018) performed a systematic review and found no articles reporting any major complication with the use of the nasal tube securement device, even if the tube was removed forcefully by the patient. If the nasal tube securement device is damaged or removed improperly by cutting both sides of the microfilament tubing, there is also a risk for aspiration or swallowing a piece of the device. There is no evidence for increased incidence of sinusitis with placement of the device (Parks et al., 2013, Seder et al., 2010).

Other possible risks include sores to the nose caused by the tube pushing against the skin, which could be caused from any method of securement. Lavoie et al. (2021) noted 2.3% of patients in a study of 244 ambulatory patients with nasal tube securement devices developed skin breakdown. Adhesive attached to skin, not associated with the nasal tube securement device, leads to risks of skin breakdown, rash, redness, or soreness after the tape is removed from the cheek, nose, or face. Potential benefits to a nasal tube securement device use may include improved ability to meet caloric intake needs (Lavoie et al., 2021), reduced costs from replacement of dislodged tubes, lower rate of unintentional tube dislodgements (Gunn et al., 2009, Lavoie et al., 2021, Seder et al. 2010), and decreased exposure to radiation from radiological studies to verify tube placement.

Discovering a better method to secure nasal gastric tubes prompted one of the researchers of this study to review current products that are available to prevent dislodgements. A review of available literature indicated that the use of a nasal tube securement device has been less documented in the pediatric population as compared with the adult population (Mayes et al., 2020). Two more recent studies have found the use of a nasal securement device has been successful in decreasing dislodgements of nasal gastric tubes in the pediatric population (Kang et al., 2018; Mayes et al., 2020). Because there is a dearth of literature on the effectiveness of the nasal tube securement device in children, a randomized controlled trial was initiated to evaluate the effectiveness of this device to reduce the rate of dislodgements in the pediatric hospitalized population. Secondary aims of the study included ease of use of the securement device and patient/parent satisfaction on the level of comfort with the nasal tube securement device.

## Purpose

The primary purpose of this study was to compare accidental dislodgement rates of enteral feeding tubes secured with standard adhesive tape practice to those with a nasal tube securement device in hospitalized pediatric patients. Satisfaction and perceptions on ease of use of the device were also collected from the perspectives of the nurses, patients, and families. The findings from this study will provide additional information to address the existing gaps in the literature because there have been limited studies in pediatrics and across different hospital specialty units.

## Methods

The research site is a free-standing pediatric academic hospital. The standard of practice for tube securement at the research site has been to use an adhesive tape/transparent dressing secured to the patients' cheek, nose, or upper lip. The study was approved by the Colorado Multiple Institutional Review Board and registered with ClinicalTrials.gov (Identifier 16-0691). This study was designed as a randomized controlled trial. Eligible participants for the study included pediatric patients aged 1 month to 21 years who were admitted to the surgical and rehabilitation unit, medical unit, cardiac intensive care unit (ICU) and cardiac progressive care unit, or the pediatric ICU (PICU) from November 2017 to March 2020. In addition, eligible participants had an order for an enteral feeding tube placed in the electronic medical record with a predicted length of use of at least 48 hours. Eligible participants could also have an existing feeding tube that needed to be replaced after accidental dislodgement or because of a required tube change per policy. Participants were required to have an enteral feeding tube size of 5, 6, or 8 French, as the original intent was to study only the microdevice sizes. Certain patient populations were excluded from the study: burn patients because the nasal tube securement device was the standard of practice for this population, any patient with contraindications for nasal tube securement device placement (mechanical obstruction of the nasal airway; facial or nasal fractures; fracture of the anterior part of the cranium or basilar skull fractures; noninvasive ventilation using the nasal delivery devices, i.e., nasal bi-pap/c-pap; and nasal intubation), and use of any tubes placed for decompression (i.e., Salem sump tubes).

Electronic records review from the study organization from January to December 2015 revealed that there were 541 gastric/transpyloric tubes identified for 369 patients. Of the 369 patients with an enteral feeding tube placed, there were 162 that had documentation

indicating there was an “unplanned removal” or “accidental dislodgement,” representing a 29% dislodgement rate. Clinical experience determined by the research team indicated a 20% difference in dislodgement rate to be of clinical importance. Initial sample size estimates indicated that an enrollment of 134 (67 per group) patients would attain 80% power to test for a clinically meaningful absolute risk reduction of 20% in proportion of dislodgement rate between groups with a Type I error rate of 5%. Sample size calculations were conducted using SAS software Version 9.4, PROC POWER procedure (2012, SAS Institute, Inc.).

Once informed consent was obtained, the patient was randomized into either the standard practice group (control group) or the nasal tube securement device group. Assent was also obtained when possible for children 7 years old and older; however, many patients were unable to assent because of sedation, developmental status, or condition. Overall, study recruitment was a challenge, which is reviewed later in the discussion section. This resulted in the inability to meet adequate power and ensure the limitation of error in the findings.

Block randomization was used to ensure equal numbers of patients within age groups and hospital units. One randomization list was computer generated by the research statistician for each of the units involved in the study. Computer-generated randomization lists were kept in an envelope in a secure location on each unit. Each participant's randomization assignment was concealed from the research team until the individual envelopes were opened. The researcher or research assistant, after the participant had consented, obtained the next available participant envelope, which had concealed inside the identification of the randomization assignment of which method to use for tube securement. The study personnel and the treatment team were not blinded to the treatment group assignment after randomization, because the securement methods required different supplies and differed in appearance.

The nasal tube securement device was supplied by the industry at no charge to the organization or patients. A select group of nurses were trained and completed a skill validation to be approved to place the nasal tube securement device. Trained nurses were recruited from the clinical translation research team, the organization resource nursing team, and nurses from the specific study units. Placement of the nasal tube securement device is within the scope of practice for a trained nurse.

Two surveys were developed by the study team to assess nurse perception of the use of the device and caregiver/patient experience. The nursing survey consisted of three questions using a 5-point Likert scale about ease of placement,

ease of securing the clip, and ability to pull the tubing around the vomer bone. One additional question asked of the nurse required a yes or no response, which referred to the magnet strength. Paper survey responses were collected and then entered in a secure electronic database by a research team member and then verified by a second team member.

On the patient/caregiver survey a 5-point Likert scale was used for each question. Caregivers of patients were asked to complete a survey within a week after enrollment, and surveys were returned to the nurse or research team when possible. Not all patients/caregivers completed a survey because of situations when they were unavailable for follow-up and collection of the surveys. The questions consisted of how well the tube securement method was tolerated by their child, if the securement device held the enteral feeding tube in place, and how they would rate their child's discomfort when the tube securement device was placed. An additional section was provided for any comments the caregivers had. All surveys were identified with the research number assigned to the patient.

Data from the electronic medical record were retrieved and recorded in REDCap (Research Electronic Data Capture). The data abstracted included patient demographics, patient diagnosis, size of tube/device, indication for use, length of use, number of tube dislodgements, abdominal x-rays for tube location confirmation, use of restraints for tube protection, and skin integrity complications. REDCap was the secure platform used for data export from the electronic medical record and entry of survey data.

### **Statistical Analysis**

The primary outcome was the proportion of accidental dislodgement by group. Participants were stratified by treatment group with summary statistics presented as either frequency (with percent) or median (with interquartile range). Fisher's exact, chi-square, or Wilcoxon tests compared demographic and clinical characteristics by treatment group. Statistical significance was set at an alpha level of .05. Post hoc analyses compared demographics and clinical outcomes by indication of dislodgement (no vs. yes). Analysis was performed using R Version 3.6.3 (R Core Team, 2014).

### **Results**

Forty-three patients were enrolled in the study, 22 patients in the standard practice group and 21 in the study arm with nasal tube securement device placement. Three additional patients consented for inclusion but were later withdrawn from the study and not included in final data reports. One patient was excluded due to requiring a size 10 French feeding tube, and two patients were excluded due to anatomy; their nares would not allow for the tube

securement device to pass around the vomer bone, or staff were unable to place the tube securement device. Demographics and clinical data summaries by group are shown in Table 1. There was no evidence of a statistical difference in demographics or clinical characteristics between study groups, as expected, because of randomization. Patient ages ranged from 1 month to 15 years, and there were more males ( $n = 28$ ) enrolled in the study than females ( $n = 15$ ). There were more patients with NG tubes placed in the standard practice group ( $n = 13$  vs.  $n = 9$ ) and more nasogastric/transpyloric tubes placed in the nasal tube securement device group ( $n = 12$  vs.  $n = 9$ ), although these differences did not reach statistical significance. The two groups had the same number of patients with x-rays to verify tube placements in each group ( $n = 19$  in each group). There were seven tube dislodgements (32%) recorded in the standard practice group and six recorded in the nasal tube securement device group (29%). There was no evidence of a difference in the number of accidental dislodgements in the nasal tube securement device group from the number of accidental dislodgements in the standard practice group (Fisher's exact,  $p = 1.00$ ).

Only one report of skin integrity issues was recorded on a patient in the standard practice group. This was an abrasion issue caused by the tape on the cheek. The median length of stay was 9 days for the nasal tube securement device (ranged from 2 to 63 days) and 13 days for the standard practice group (ranged from 2 to 93 days). In the nasal tube securement device group, 50% of patients had a length of stay between 5 and 14 days compared with 7.25 and 17.5 days in the standard practice group ( $p = .42$ ).

A post hoc analysis assessed the differences between patients who had an accidental dislodgement and patients who did not (Table 2). Of the 13 patients who had an accidental dislodgement, 50% were between 5 and 13 months old, and 76.9% were male. Of the 30 patients who did not have an accidental dislodgement, 50% were between 5 and 75 months old, and 60% were male. The median hospital length of stay for patients who experienced an accidental dislodgement was 15 days (IQR = 11–25 days) compared with 9 days (IQR = 5–13.75 days) for patients who did not experience an accidental dislodgement. There was evidence of a significantly longer hospital length of stay for patients who experienced an accidental dislodgement ( $p = .03$ ). There was no significant difference in the odds of accidental dislodgement between floor departments and ICUs ( $p = 1.00$ ). There were no significant findings related to skin integrity in the study. Restraint use, for the purpose of protecting lines and tubes, did not appear to lower the rate of accidental tube dislodgement

**Table 1** Cohort Characteristics and Outcomes

	Nasal Tube Securement Device ( $n = 21$ )	Standard Practice ( $n = 22$ )	$p$
Age (months)			
Median (25%, 75%)	11 (7, 72)	9.0 (4, 30)	.30
Gender			
Female	6 (28.6%)	9 (40.9%)	.53
Male	15 (71.4%)	13 (59.1%)	
Race/ethnicity			
Black	1 (4.8%)	1 (4.5%)	.94
Hispanic	1 (4.8%)	2 (9.1%)	
Other	5 (23.8%)	5 (22.7%)	
White	14 (66.7%)	12 (54.5%)	
Missing	0 (0%)	2 (9.1%)	
Department			
Floor department	6 (28.6%)	8 (36.4%)	.75
Intensive care	15 (71.4%)	14 (63.6%)	
Tube type			
Nasogastric	9 (42.9%)	13 (59.1%)	.37
Nasogastric/transpyloric	12 (57.1%)	9 (40.9%)	
Accidental dislodgement			
No	15 (71.4%)	15 (68.2%)	1.00
Yes	6 (28.6%)	7 (31.8%)	
Length of stay (days)			
Median (25%, 75%)	9.0 (5, 14)	13 (7.25, 17.5)	.42
Tube restraint use			
No	11 (52.4%)	14 (63.6%)	.54
Yes	10 (47.6%)	8 (36.4%)	
X-ray for tube placement			
No	2 (9.5%)	3 (13.6%)	1.00
Yes	19 (90.5%)	19 (86.4%)	
Skin integrity issues			
No	21 (100%)	21 (95.5%)	1.00
Yes	0 (0%)	1 (4.5%)	

Level of significance set at .05 (Harris et al., 2009).

as 7 of the 18 patients with restraints in use still had their tubes dislodged.

Clinician surveys were collected for 90% of patients enrolled in the tube securement device group ( $n = 19$ ; Figure 1). Only subjects in the nasal tube securement device group had clinician surveys distributed; these surveys were intended to address placement of the nasal tube securement devices so they were not collected for the standard practice group. Eleven clinicians (61%) said the ease of placement of the tube securement device was very easy or somewhat easy, four said it was neither easy nor difficult, three rated the placement as somewhat difficult, and none rated it as very difficult. Ease of securing the clip on the device and feeding tube was rated as very easy ( $n = 5$ ), somewhat easy ( $n = 7$ ), neither easy nor difficult ( $n = 1$ ), somewhat difficult ( $n = 3$ ), and very difficult ( $n = 2$ ).

Surveys were also collected from 57% of caregivers/patients in the nasal tube securement device group and

**Table 2** Cohort Outcomes by Accidental Dislodgement

	No ( <i>n</i> = 30)	Yes ( <i>n</i> = 13)	<i>p</i>
Department			
Floor department	10 (33.3%)	4 (30.8%)	1.00
Intensive care	20 (66.7%)	9 (69.2%)	
Length of stay (days)			
Median (25%, 75%)	9.0 (5, 13.75)	15 (11, 25)	.03*
Tube restraint use			
No	20 (66.7%)	5 (38.5%)	.10
Yes	10 (33.3%)	8 (61.5%)	
X-ray for tube placement			
No	3 (10.0%)	2 (15.4%)	.63
Yes	27 (90.0%)	11 (84.6%)	
Skin integrity issues			
No	29 (96.7%)	13 (100%)	1.00
Yes	1 (3.3%)	0 (0%)	

\*Significant at alpha level of .05 (Harris et al., 2009).

64% of caregivers/patients in the standard practice group (Figure 2). These surveys were used with the intent to assess tube securement experience. For the patient experience, most patients tolerated the nasal tube securement device (*n* = 10; well or extremely well tolerated) and had mild (*n* = 3) or no discomfort (*n* = 5) from the device.

An additional open-ended comments section was available on the survey for patient and parent caregivers. The comments for the standard tape method included the following:

- "Tape becomes unsticky real fast, have to redo tape after 24 hours."
- "Tape did not stick to skin."

Comments from parent caregivers on the nasal tube securement device included the following:

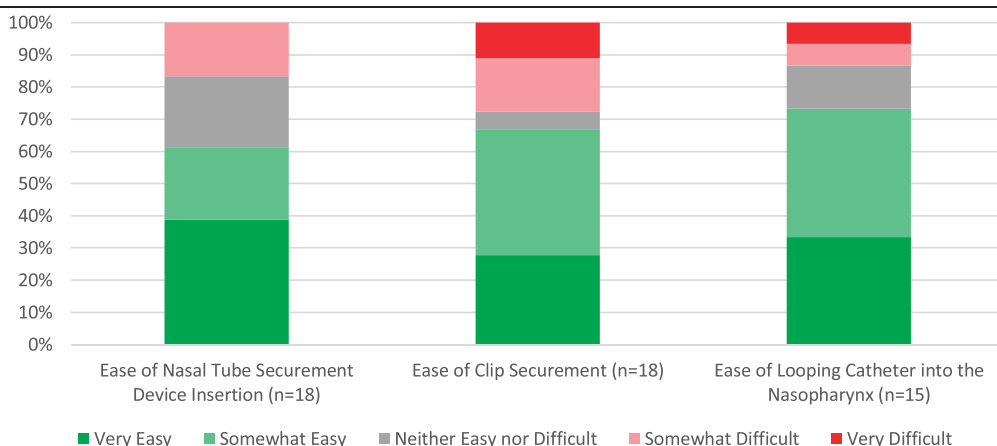
- "It works really well, but with movement of the child it hurts her unless it's taped down."

- "Once the bridle was placed, she was comfortable. Never messed with it."
- "He didn't mess with it at all! I'm not even certain he knew it was there! Amazing!"
- "I (parent) appreciate the lack of tape on skin."
- I believe the nasal bridle tube securement method is or should be a better solution."
- "Nifty."

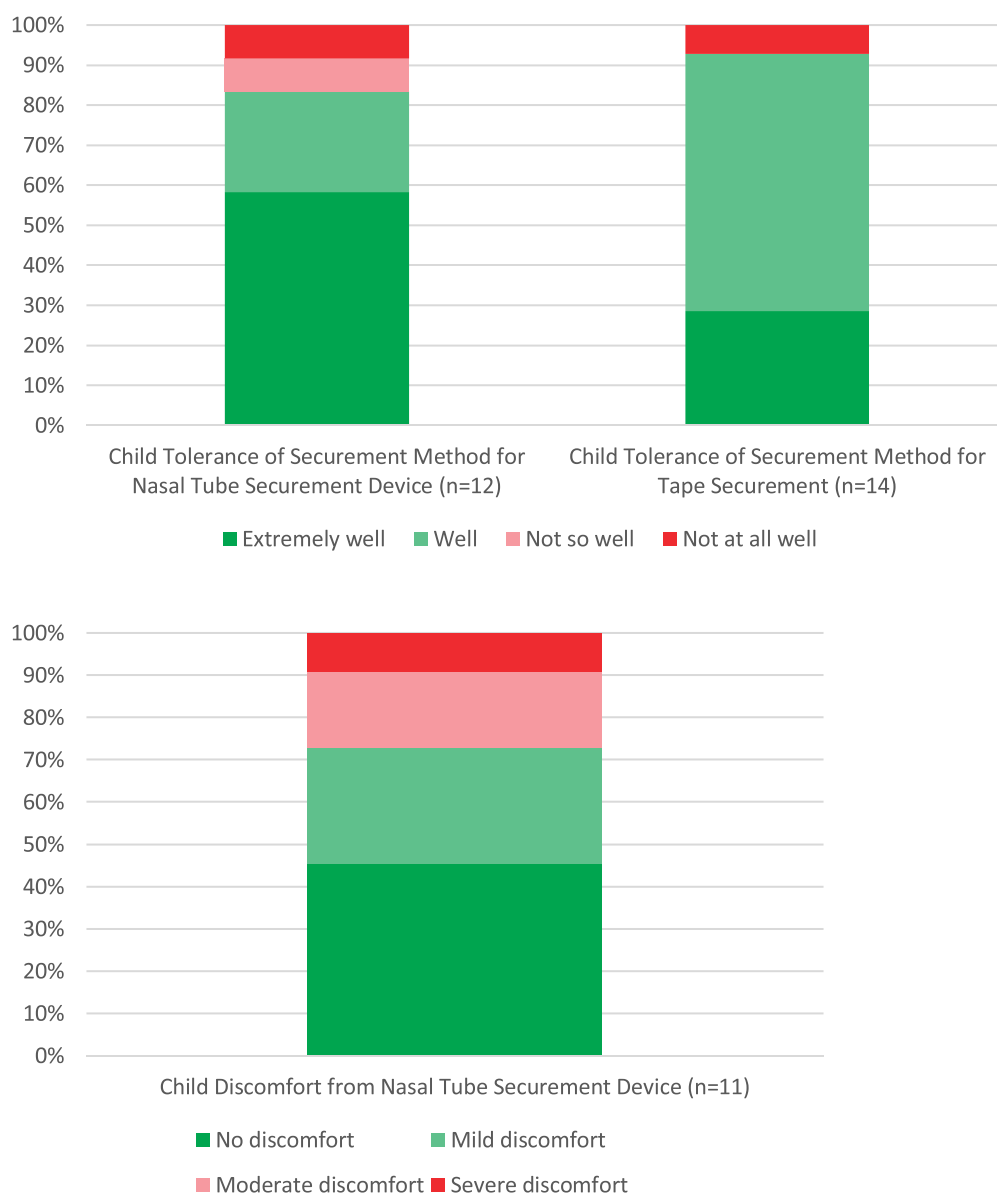
For the clinicians placing the tube securement device, there seemed to be hesitation with placing the first few tube securement devices due to feeling uncomfortable with placement. This appeared to reduce over time as the nurses became familiar with the placement of the device. Based on the experience with one 5-month-old patient who was removed from the study, there can be complications during placement. However, there was no harm or adverse event for this participant or any other participant in the study that needed to be reported. Upon placement, the tube securement device would not advance in the nares and was stuck near the vomer bone. The tube securement device was stuck until the other probe was replaced and the magnet was pushed back around the vomer bone. The study team was not certain what happened, if this was a defect of the device or a potential obstruction because of some anatomical feature of the child. The nasal tube securement device was returned to the manufacturer for further investigation without any findings, and a tube was secured using the standard practice for this patient; the child was removed from the study.

## Discussion

The study enrolled a smaller sample size than required to achieve adequate power. Therefore, these study findings



**Figure 1.** Survey results of the provider-reported experience for the nasal tube securement device group (*n* = 21).



**Figure 2.** Survey results of the caregiver/patient experience.

may appropriately be viewed as a pilot. The study team believes the findings contribute to the body of evidence for pediatric populations and should be considered in the readers' determination of relevance to a broader population. The primary aim of this study was to compare the incidence of tube dislodgements in a pediatric patient population when secured via nasal tube securement device or standard practice using adhesive tape. In this randomized controlled study, there was no evidence of a difference in the number of tube dislodgement between the groups. Of the patients who had their tube dislodged, similar proportions of dislodgement were observed in both intensive care and acute care settings. A higher number of dislodgements occurred in ICU patients, but this is representative

of the higher number of participants recruited from the ICU setting, not a difference in dislodgement rates. Also, both NG tubes and nasojejunum/transpyloric tubes were dislodged (six of each type of tube) at similar rates. Patients experiencing a dislodgement had a greater median length of stay.

When comparing rates of dislodgement for enteral feeding tubes secured with adhesive tape or with a nasal tube securement device, the literature supports the use of nasal tube securement devices to decrease tube dislodgement in adult patients (Bechtold et al., 2014; Brugnolli et al., 2013; Griffin, 2015). In a study of 90 adult patients, tube dislodgement was 36% in the control group (tape securement) compared with 10% dislodgement in the tube

securement device group ( $p = .004$ ; Gunn et al., 2009). Similar results were found in a population of 80 adult surgical patients in the ICU showing 63% dislodgement in the control group versus 18% in the tube securement device group ( $p < .0001$ ; Seder et al., 2010). Griffin (2015) completed a randomized controlled trial of 70 adult patients in the trauma ICU and showed a 22.8% pull out rate in the control group compared with a 2.8% pull out rate for tube securement device patients. This study also showed two cases of epistaxis and one minor pressure ulcer in the nasal tube securement device group (Griffin, 2015). A more recent study by Mayes et al. (2020) included 67 pediatric patients with a median age of 6.5 years for the patients with tube securement devices and 3.2 years for the group without the securement device. The incidence rate for dislodgement in the tube securement device group was 0 and 9.4% in the group without the tube securement device (Mayes et al., 2020). Mayes et al. (2020) noted that the increased rate of feeding tube reinsertion resulted in increases in sedation requirements, patient discomfort, and parent/patient anxiety. Kang et al. (2018) implemented the nasal tube securement device on 14 patients less than 1 year of age, with the average age of 30 days; however, no comparison group was used in this study. One accidental dislodgement was noted out of the 14 patients in the sample (Kang et al., 2018).

The secondary aims of the study included assessing ease of placement, cost, utilization of x-rays for verifying tube placement, use of medical restraints to protect tubes, and skin integrity issues. Through surveys, the research team was able to collect data on ease of placement from the perspective of the nurse placing the nasal tube securement device and feedback from the patient/parent on their experience of having the device placed. Overall feedback from the surveys was positive; however, this may have been confounded by the fact that many of the patients were sedated and intubated in the ICU and so did not visibly experience discomfort during placement or issues during use of the nasal tube securement device.

Formal cost assessment was not completed because the rates of dislodgement and use of x-rays were not statistically different between groups. The research team initially thought there might be a lower cost in the nasal tube securement device group if patients were able to maintain their tubes without accidental dislodgement and avoid subsequent x-rays for replaced tubes and verification of their location in the abdomen. However, there was no difference in rates of x-rays used for tube placement verification.

The biggest challenge for the study team was recruitment, which is why the study was stopped prior to reaching the enrollment goal. There was not a consistent way identi-

fied to receive notification for patients with orders to have a new enteral feeding tube placed, and the tube was often placed prior to the study team receiving the alert about the order for the tube. During the study, the team made the decision to expand the study to include the PICU patients to assist with recruitment and enrollment numbers, and approval was obtained from the institutional review board. This ended up being a productive decision, as 29 of the patients were enrolled from an ICU, most of those from the PICU. In addition, during the study period, there was an increase in requests for nasal tube securement device placement by providers for patients with frequent nasal gastric tube dislodgements and reluctance to include their patients in the study because of the possibility of being randomized to standard practice. This was especially true on the rehabilitation unit as the providers noted the advantage of using a nasal tube securement device to prevent frequent tube dislodgements of younger pediatric patients and those with TBI. Despite insufficient published evidence to support the use of the tube securement device in pediatric hospitalized patients, there appears to be a preference for this securement method among some clinicians for high-risk patients. There was also an interest from nursing staff in enrolling patients who had a history of tube dislodgement. Randomization should have controlled for preference. Because the data on previous tube history were not tracked, the study team is uncertain how representative the sample was of all patients needing an NG tube versus more being enrolled who had a history of tube dislodgement.

Some challenges of this study included having limited resources, such as a full-time research coordinator or research assistant, to be able to meet the needs for recruitment and enrollment. Because the study took place over several years, there were three different part-time study coordinators assigned, which created challenges with consistency during the study. Study team members were not always readily available on hospital units, when patients needed tubes placed, to discuss the study with the patient and their guardian and obtain consent prior to their feeding tube being placed. Many of the tubes were ordered for placement in the evenings, night shifts, or weekends when no study team members were present on site.

After the first 14 patients were recruited for the study, there was a product change, and a new version of the nasal tube securement device was issued. The prior version used umbilical tape for the loop secured around the vomer bone in the patient nares, and the second version, used for the remainder of the patients, was made of monofilament tubing. The monofilament tubing in the second version is stated to decrease the surface area compared with the umbilical tape and decrease the need for lubricant application for insertion (Applied Medical

Technology, 2020). These 14 patients were included in the study results because the change in the product was limited, and the overall functioning and placement method of the device remained unchanged.

This study is one of few randomized studies comparing nasal tube securement devices to standard securement of NG tubes in pediatric patients. Although the study did not attain sample sizes indicated to achieve adequate power, the information provided can be useful to clinicians for current estimates of anticipated dislodgement rates and for the design of future studies. This study looked at pediatric patients across a wide age range. Further analysis was not done to identify if there were differences in dislodgements based on age. Future studies may want to evaluate this. In addition, because of the use of block randomization to control for age and diagnosis, the study team did not further analyze patient diagnosis or functional/cognitive status. This may be an area for future research. There were many helpful lessons learned during this study, mostly around resources needed and the processes involved in conducting inpatient nurse-led research. Attempts to engage frontline nursing staff was actively done in the study. Further research in the pediatric population, especially stratified by age and/or diagnosis, would be helpful to fully understand the potential benefits or risks of the nasal tube securement device.

### Clinical Relevance

In this randomized controlled trial, no difference in the rate of accidental dislodgements for enteral feeding tubes with the two securement methods was found. The study lacks generalizability to other pediatric hospital settings because this was a single center study. However, this study provided additional information about ease of use and patient/caregiver satisfaction of the nasal tube securement device that may help inform other pediatric healthcare clinicians considering use of the device with their patient populations. For pediatric rehabilitation patients, it appears to be a safe option to consider for preventing nasal gastric tube dislodgement. Because of the training needs for safe placement, rehabilitation nurses should maintain competency with the skill of placing nasal tube securement devices. As with any new product or device, some challenges may arise during implementation, and there may be a learning curve for nurses to feel comfortable placing the device. Having a good working relationship with a vendor can facilitate reeducation and trouble-shooting assistance. Clinicians should track recurrence of issues they see with products to facilitate product improvements as they arise.

The nasal tube securement device appears to be an appropriate option for tube securement in patients of all

## Key Practice Points

- Pediatric rehabilitation patients often require a nasal gastric tube for nutritional support during their early hospitalization.
- There are multiple methods to secure nasal gastric feeding tubes, and dislodgement is a common risk associated with the use of these tubes.
- A nasal tube securement device can be considered for tube securement to help reduce accidental tube dislodgements in hospitalized pediatric patients.

ages who are at risk for nasal gastric tube dislodgement such as those with a TBI or who are very young, for children who have skin integrity issues preventing the use of tape/adhesive dressing, and for patients who are sedated with additional medical equipment making it less desirable to have the feeding tube taped on the cheek. Ongoing investigation on the use of medical devices, like the nasal tube securement device, are valuable to advance pediatric nursing care and improve patient outcomes.

### Conflicts of Interests

The authors have no conflicts of interest to disclose related to this study. The project was supported by the industry through the supply of the nasal tube securement devices at no cost to participants or the study team. The project design, data analysis, and publication were independent of the industry organization.

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