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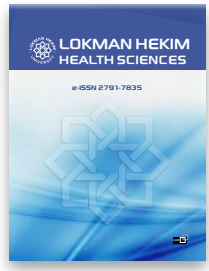

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ORIGINAL ARTICLE

Factors Associated with Nurses' Intention to Apply Current Guidelines for Medication Administration through Feeding Tube: Application of the Theory of Planned Behavior

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Abstract

Introduction: Administering medication through a feeding tube is difficult. To avoid tube obstruction, ensure therapeutic effectiveness, and decrease drug toxicity, protocols for delivering medication through a feeding tube must be followed. This study aimed to identify factors associated with the intention (INT) of nurses to apply the current guidelines for medications administered through feeding tubes.

Methods: In this cross-sectional study, a paper-based survey was conducted among nurses working at the state hospital who have experience in administering medication to patients using feeding tubes. A valid and reliable Turkish scale based on the theory of planned behavior was used to identify factors associated with the INT score by a multiple linear regression model.

Results: One hundred and forty-nine participants (response rate: 80.0%) completed a paper-based survey. Although 85.2% of the participants reported administering medications according to the guidelines, only 34.9%, 22.8%, and 33.6%, respectively, knew that modified-release tablets, enteric-coated tablets, and film-coated tablets should not be crushed. Among participants, 42.2% had not previously received training on administering medication through a tube. The higher scores of attitudes, past behavior (PB), and subjective norm (SN) were associated with higher INT scores.

Discussion and Conclusion: Positive attitudes, positive PB, and positive SNs were associated with nurses' INTs to apply the current guidelines for medications administered through feeding tubes. These factors should be considered when developing interventions to promote the application of the current guidelines. Sustained collaboration among healthcare providers will promote appropriate drug utilization and improve patient care in hospital settings.

Keywords: Current guidelines; Enteral feeding tubes; Nurse; Theory of planned behavior

Oral feeding is unfeasible, especially in critically ill patients, because of intubation, deep sedation, and various comorbidities. In this patient population, nutritional support and the administration of medications, vital parts of medical care, are frequently administered through enteral routes. The administration of drugs to patients receiving enteral nutrition presents complexities and is a significant concern in clinical practice. Not taking the right

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precautions when giving drugs along with enteral nutrition or inappropriate dosage form selection for administration through enteral feeding tubes (EFT) can cause problems such as tube occlusion, reduced effectiveness of the treatment, and diarrhea.[1] Prior studies have identified inadequate knowledge of dosage forms among healthcare professionals and insufficient collaboration among them as the main factors leading to medication administration errors related to EFT.[2,3]

Enhancing the quality of medication administration with EFT is crucial for critically ill patients. Although the American Society for Parenteral and Enteral Nutrition and the European Society for Clinical Nutrition and Metabolism guidelines outline the procedures for administering medications through feeding tubes, adherence to these guidelines is low.[4,5] Errors in the administration of medications through EFT complicate patient management. According to the study, hospitalized patients utilize EFT between 43% and 80% of the time.[1] Walther et al.[6] investigated the administration and prescription of medications administered through EFT in neurology and neurosurgery intensive care units. Nursing personnel indicated that 44% of modified-release medications administered through EFT were administered improperly. Previous investigations indicated that healthcare workers in an education program had a limited understanding of medications administered through EFT guidelines.[7,8] Hossaini Alhashemi et al.[9] conducted similar research, revealing that fewer than 20% of participants were aware of how to smash solid dosage forms prior to the teaching intervention.

Psychosocial models may help identify critical determinants of individuals' intentions (INTs). Several behavior models have been used to investigate barriers to the implementation of medical practice or health behavior change, including the theory of goal-oriented behaviors and the transtheoretical model of behavior change.[10,11] The theory of planned behavior (TPB) is often used to predict behavior. TPB was developed by Ajzen, who proposes that human behavior is primarily determined by behavioral INT, which reflects an individual's motivation to perform a specific action. INT is shaped by three key constructs: attitude toward the behavior, subjective norms (SNs), and perceived behavioral control (PBC). Attitude refers to a person's positive or negative evaluation of performing the behavior; SNs involve perceived social pressure from significant others; and PBC reflects one's belief in their ability to perform the behavior.[12] Together, these factors predict INT, while PBC may also directly influence actual behavior. TPB is widely used to understand and predict health-related and clinical behaviors across various settings.[13–15] TPB is deemed the most appropriate model for this study, which investigates nurses' INTs to implement the current guidelines for medications administered through feeding tubes.

Medication administration procedures are primarily the responsibility of nurses. This study aimed to identify factors associated with the INT of nurses to apply the current guidelines for medications administered through feeding tubes.

Materials and Methods

Study Type, Setting, and Subjects

The study was conducted with nurses working at the state hospital in Eskişehir between September 2024 and May 2025, who were willing to participate in the study and had experience in administering medication to patients using feeding tubes. The survey was carried out following face-to-face interviews with nurses conducted by the clinical pharmacist.

The study was approved by the Non-Interventional Clinical Trials Ethics Committee Anadolu University (Date: 09.08.2024, No: 768031), ensuring adherence to the principles outlined in the Declaration of Helsinki 1975, revised Hong Kong 1989. The participants signed a written informed consent form.

Data Collection

The survey consisted of three sections. The first section was about the participants' demographic information (age, gender, educational status, and years of experience in a hospital) and experiences (administering medications via the feeding tube according to current guidelines and receiving training on drug administration via enteral tube).

The second section was related to general knowledge on drug administration through a feeding tube, including the crushing of tablets (conventional tablet, modified-release tablet, enteric-coated tablet, film-coated tablet, and sublingual tablet), the administration of capsule-form preparations through a feeding tube, and the preferred method in case of a feeding tube blockage. The dosage form of pharmaceutical medications influences their compatibility with feeding tubes. Immediate-release tablets should be crushed and dissolved in water for administration. Do not crush or split film-coated, enteric-coated, or modified-release formulations, as such actions may alter the release mechanism of the medication, potentially reducing its efficacy or increasing toxicity and

harm. Diluting liquid drugs with clear tap water prior to administration may mitigate blockage. While it is possible to open and combine capsules with water, water may not always serve as an advantageous medium. Enteric-coated or granule/pellet capsules may be opened; however, crushing them is not recommended.[2]

The first and second sections of the survey were developed based on the literature on drug administration through feeding tubes by two clinical pharmacists and one nurse experienced in administering medication through a feeding tube.[16–18]

The third section included a TPB-based questionnaire. The survey consists of 35 items and was developed in accordance with the TPB literature and a guidebook designed for health services researchers conducting TPB studies.[19–21] The survey comprises 35 items that evaluate attitude (ATT; 3 items), (SN; 5 items), perceived behavioral control (PBC; 5 items), past behavior (PB; 13 items), and (INT; 9 items). The items were assessed using a 5-point Likert scale, from strongly disagree (1) to strongly agree (5), for the constructs of ATT, SN, PBC, and INT. In this context, positive/high frequency refers to the percentage of agreement, which is the sum of those who strongly agree and agree. Conversely, negative/low frequency indicates the percentage of disagreement, encompassing those who strongly disagree, disagree, and are neutral. PB items were evaluated using a 5-point Likert scale, with responses ranging from never (1) to regularly (5). In this context, positive/high frequency indicates the percentage of responses identified as regularly and often, whereas negative/low frequency signifies the percentage of responses categorized as never, occasionally, and sometimes.

The processes of Turkish translation and cultural adaptation followed the guidelines established by the International Society for Pharmacoeconomics and Outcomes Research.[22] The expert panel included two clinical pharmacists and one nurse who assessed the content validity of the TPB-based survey. The expert panel clarified and structured the components of the TPB framework and conducted translations and backtranslations for linguistic adaptation. A pilot study involving 20 nurses was conducted to assess the clarity of all items.[23] A minimum of 12 participants was required for the pilot study. The data of the participants in the pilot study were not included in the study. A minimum of 30 nurses, not part of the study dataset, were required for test-retest analysis to complete assessments at baseline and again 2 weeks later.[24] In addition, test–retest analysis was conducted with 40 nurses (response rate 95.0%) at a 2-week interval to assess the temporal stability of the TPB-based subdimensions. The purpose of this analysis was to evaluate the stability of construct-level measurements over time and to justify the aggregation of item scores within each subdimension, rather than to establish a newly validated scale. The intraclass correlation coefficient was 0.82, indicating strong reliability ($p<0.001$).

Cronbach's alpha for the total TBP-based questionnaire was 0.98, demonstrating a high level of reliability. Cronbach's alpha values were 0.60 for attitude, 0.75 for SN, 0.66 for PBC, 0.84 for PB, and 0.88 for INT.

The time required to complete the survey was approximately 10–15 min.

Sample Size

Sample size determination depends on statistical power analysis. The analysis requires a clear definition of the study design and the anticipated effect size.[25] A moderate effect size, indicated by a multiple R of approximately 0.3, is a plausible assumption for TPB studies utilizing a multiple regression methodology.[26] A sample size of 80 is typically regarded as adequate.[27] Rashidian et al.[28] assert that a sample size >148 respondents is sufficient to employ the TPB. Analysis was performed on 149 responses from hospital nurses. We employed Soper's Calculator for post hoc Statistical Power in Multiple Regression to evaluate the sufficiency of our sample size. The analysis using Soper's calculator confirmed that the sample size was sufficient for the four latent variables on the TPB questionnaire, yielding an R2 of 0.47 and a sample size of 149, with an observed statistical power of 0.99.[29]

Statistical Analysis

An academic biostatistician employed R (4.4.1, https://cran.r-project.org) and SPSS for Windows 23.0 (Chicago, IL) to conduct data analysis. The Kolmogorov-Smirnov and Levene's tests were used to assess data normality and variance homogeneity. The descriptive statistics were presented as mean±SD, median (25^{th}–75^{th} percentile), and frequencies (percentages) as applicable. The Student's t-test or One-way analysis of variance (ANOVA) was utilized to compare groups for continuous variables. Following one-way ANOVA, post hoc multiple comparisons were conducted using Tukey's honestly significant difference test. Variables with $p<0.20$ were selected as candidates for the multiple linear regression model.[30] Multiple linear regression models were developed utilizing stepwise regression due to the consistent distribution of the residuals. Variance inflation factors for each predictor were used to evaluate multicollinearity. The Durbin-Watson test statistic

Table 1. Demographic characteristics and experiences of the participants

Variables	Participants (n=149)	
	n	%
Age (year)	38 (30–45)	
Gender		
Female	122	81.9
Male	27	18.1
Educational status		
Associate's degree	14	9.4
Bachelor's degree	117	78.5
Master degree	11	7.4
PhD degree	7	4.7
Years of experience in hospital (year)		
<5	15	10.1
5–10	41	27.5
10–15	29	19.5
15–20	9	6
>20	55	36.9
Do you administer medications via the feeding tube according to the current guidelines?		
Yes	127	85.2
No	22	14.8
Have you received training on drug administration via enteral tube?		
Yes	86	57.7
No	63	42.3

PhD: Doctor of Philosophy; Data are presented as median (25–75%) or frequency (percent).

was used to assess residual autocorrelation. The Cronbach's alpha coefficients of these sub-dimensions indicate the internal consistency of the scale. The acceptable range for Cronbach's alpha is 0.6–0.8.[31] Accepted level of statistical significance: $p<0.05$.

Results

One hundred forty-nine participants (response rate: 80.0%) completed a paper-based survey. The median age of the participants (25th percentile–75th percentile) was 38 years (30–45), and 122 of them (81.9%) were female. Nearly 40% of participants had worked in the hospital for more than 20 years. Among participants, 85.2% reported administering medication through a feeding tube in accordance with current guidelines. However, 42.2% had not received training on drug administration through enteral tube. Table 1 presents the characteristics of the participants.

Only 34.9%, 22.8%, and 33.6% of participants knew that modified-release tablets, enteric-coated tablets, or film-coated tablets generally could not be crushed, respectively. However, most of the participants (76.7%) were aware that the sublingual tablet could not be crushed. 22.1% of participants knew the capsule should not be opened, so it could not be given through a feeding tube, and 7.4% knew it would be crushed and mixed with water before use. When the feeding tube was blocked, 69.1% of participants preferred to rinse the tube with warm water, 56.4% chose to replace the tube, 29.5% wanted to increase the pressure inside the tube using a syringe, 14.8% opted for a mixture of sodium bicarbonate and pancreatic enzymes, and 11.4% suggested using cola (Table 2).

Table 3 presents the subscales and their descriptive statistics. Most of the participants thought that "It is important to crush the drugs separately, mix them with water separately, and wash the tube after each medication application to eliminate drug-related problems (91.95%)" and "Administering drugs through a feeding tube according to current guidelines will significantly benefit patients' treatment outcomes (92.62%)". Compared to the other items in the attitude category, the number of participants who thought that "It's important to wait at least 30 min after eating before administering the medication through the feeding tube" was lower (72.48%).

In the SN category, 88.59% of the participants stated that it was important for the person providing patient care to accept the training given about drugs administered via the feeding tube. 74.5% of participants reported that the doctor supported them in training the caregiver regarding the administration of drugs through a feeding tube. However, about half of the participants (40.94%) indicated that the caregiver would not prefer to administer the drug to the patients instead of them.

In terms of PBC, 122 (81.88%) participants reported having the necessary knowledge and skills to give drugs through a feeding tube, but 76 (51.0%) said that following the current guidelines would make it hard for them to do this, and 70 (46.98%) said it would be difficult for them to find information about how to crush or split the drugs.

In PBs, most of the participants (91.95%) washed the tube before and after administering the medication, but 62.42% (93) administered it after mixing it with food. About 40% of participants checked the suitability of crushing/splitting medications, referred to the relevant guidelines (43.62%), conducted a literature review on the suitability of crushing/splitting medications (40.27%),

Table 2. Questions regarding knowledge of nurse (n=149)

Questions	n	%
Which of the following tablets do you crush and give to the patient?		
Conventional tablet	94	63.1
Modified-release tablet	97	65.1
Enteric-coated tablet	115	77.2
Film-coated tablet	99	66.4
Sublingual tablet	35	23.5
How to administer capsule-form preparations through a feeding tube?		
Capsules should not be opened, therefore it is not appropriate to administer them through a feeding tube	33	22.1
The capsules can be crushed and mixed with water before application	11	7.4
The capsules can be opened and mixed with water before application	59	39.6
The capsules can be opened, crushed until the contents turn into powder, and then mixed with water for application	46	30.9
In the case of a feeding tube blockage, which of the following methods would you prefer? (Multiple options can be selected)		
Increasing the pressure inside the tube using a syringe	44	29.5
Rinsing the tube with warm water	103	69.1
Application of cola (carbonated beverage)	17	11.4
Application of the sodium bicarbonate pancreatic enzyme mixture	22	14.8
Tube replacement	84	56.4

and consulted a pharmacist (40.27%) or a doctor (42.95%) about the suitability of crushing/splitting medications.

Over 65% of participants indicated their INT to apply the current guidelines for medications administered through feeding tubes in response to questions regarding INT.

According to the results of the Kolmogorov-Smirnov goodness-of-fit test, it was found to be 0.031 and p=0.200 for studentized residuals, and it can be said that the residues were normally distributed. The scatter plot of studentized residuals against predicted values shows a random spread around zero, indicating that the assumption of homoscedasticity (constant variance) is met and that there is no systematic error in the model. We can conclude that the model is sufficient since the scatter plot of studentized deleted residuals against predicted values shows a random distribution around zero.

According to the univariate analysis results, gender, years of experience in a hospital, attitude, SN, and PB ($p<0.2$) were selected as candidates for the multiple linear regression model, while educational status, and PBC ($p>0.2$) were not selected. Table 4 presents the results of a multiple linear regression analysis examining the factors associated with the total INT score. Attitude ($p<0.001$), SN ($p=0.021$), and PB ($p=0.013$) were significantly associated with the total INT score (Table 4). Each 1-point increase in the attitude score corresponded to a 0.481-point increase in the INT score, while each 1-point increase in the SN score resulted in a 0.158-point increase in INT. Each 1-point increase in PB score corresponded to a 0.160-point increase in the INT to apply the current guidelines for medications administered through feeding tubes. The adjusted R2=0.470, indicating that the independent variables explained 47.0% of the variation in INT.

Discussion

The study focuses on the factors that influence nurses' INT s to implement current guidelines for medications delivered through feeding tubes. Research indicates that nurses' positive attitudes, favorable PBs, and optimistic beliefs regarding their peers and other healthcare professionals are associated with an increased INT to act.

Modified-release, enteric-coated, and film-coated tablets could not be crushed, however <50% of the participants knew this. Most participants (76.7%) knew the sublingual tablet could not be crushed. The literature evaluating dosage forms administered through EFT indicates a high prevalence of inappropriate enteric-coated, extended-release, and controlled-release formulations, ranging from 9.5% to 79.3%.[32,33] Demirkan et al.[2] demonstrated that only 17% of nurses were aware that enteric-coated tablets should not be crushed owing to the risk of tube occlusion and lack of efficacy when they are administered through feeding tube. Gül-Koçoğlu Kinal et al.[1] reported that nurses had a low level of knowledge about dosage form selection.

Table 3. Survey statements and descriptive statistics (n=149)

Construct	Survey statement	Median (IQR)	Mean±SD	Positive/ high frequency n (%)	Negative/ low frequency n (%)
Attitude					
ATT1	I think it's important to wait at least 30 min after eating before administering the medication through the feeding tube	4 (2)	3.88±0.95	108 (72.48)	41 (27.52)
ATT2	In cases where multiple drugs need to be administered, I believe it is important to crush the drugs separately, mix them with water separately, and wash the tube after each medication application to eliminate drug-related problems (toxicity, reduced drug efficacy, drug stability, drug interactions, etc.).	4 (1)	4.32±0.70	137 (91.95)	12 (8.05)
ATT3	I believe that administering drugs through a feeding tube according to current guidelines will significantly benefit patients' treatment outcomes.	4 (1)	4.30±0.69	138 (92.62)	11 (7.38)
Subjective norm					
SN1	The doctors I work with accept my responsibility for administering drug to patients with feeding tubes	4 (0)	3.93±0.88	115 (77.18)	34 (22.82)
SN2	The doctors I work with support me in providing training to the person caring for the patient regarding drugs administered through a feeding tube	4 (1)	3.93±0.85	111 (74.50)	38 (25.50)
SN3	The person providing care to the patient prefers that I administer the drug to the patients instead of them	4 (1)	3.56±0.93	88 (59.06)	61 (40.94)
SN4	It is important to me that the person providing care to the patient accepts the training I provided regarding the drugs given through the feeding tube	4 (1)	4.15±0.80	132 (88.59)	17 (11.41)
SN5	What my colleagues and other healthcare workers think about the service I provide is important to me	4 (0)	3.92±0.92	120 (80.54)	29 (19.46)
Perceived behavioral control					
PBC1	I have the necessary knowledge and skills to administer drug through a feeding tube	4 (1)	4.05±0.76	122 (81.88)	27 (18.12)
PBC2	I have the necessary training to administer drug through a feeding tube	4 (1)	3.85±0.85	104 (69.80)	45 (30.20)
PBC3	I have up-to-date guideline information when administering drug through a feeding tube	4 (1)	3.51±0.98	79 (53.02)	70 (46.98)
PBC4	According to the current guidelines, administering the drug through the feeding tube will be difficult for me	4 (1)	3.37±0.93	76 (51)	73 (49)
PBC5	It will be difficult for me to look up drug information sources (guides, Rx Media Pharma, etc.) regarding the crushing/splitting of drugs	3 (2)	3.26±1.02	70 (46.98)	79 (53.02)
Intention					
INT1	I intend to wait at least 30 min after eating before administering the drug through the feeding tube	4 (2)	3.87±0.95	107 (71.81)	42 (28.19)
INT2	I intend to wash the tube before and after administering the drug through the feeding tube	4 (1)	4.29±0.72	137 (91.95)	12 (8.05)
INT3	In cases where multiple drugs need to be administered, I intend to crush the drugs separately, mix each with water separately, and wash the tube after each drug administration	4 (1)	4.01±0.90	115 (77.18)	34 (22.82)
INT4	I intend to refer to the relevant guidelines for the suitability of crushing/ splitting drugs	4 (0)	3.99±0.75	119 (79.87)	30 (20.13)
INT5	I intend to conduct a literature review on the suitability of crushing/splitting drugs	4 (1)	3.83±0.87	101 (67.79)	48 (32.21)
INT6	I intend to consult the pharmacist about the suitability of crushing/splitting the drugs	4 (1)	3.78±0.90	104 (69.80)	45 (30.20)
INT7	I intend to consult a doctor regarding the suitability of crushing/splitting the drugs	4 (1)	3.72±0.89	101 (67.79)	48 (32.21)
INT8	I intend to consult my colleague regarding the suitability of crushing/ splitting the drugs	4 (0)	3.96±0.72	122 (81.88)	27 (18.12)
INT9	I intend to provide training on the drugs administered through a feeding tube to the person caring for the patient	4 (0)	3.97±0.83	121 (81.21)	28 (18.79)

Table 3 (cont.). Survey statements and descriptive statistics (n=149)

Construct	Survey statement	Median (IQR)	Mean±SD	Positive/ high frequency n (%)	Negative/ low frequency n (%)
Past behavior					
PB1	Taking a break from feeding for at least 30 min before administering the medication through the feeding tube	4 (2)	3.59±1.25	89 (59.73)	60 (40.27)
PB2	Washing the tube before and after administering the medication through the feeding tube	5 (1)	4.43±0.73	137 (91.95)	12 (8.05)
PB3	In cases where multiple medications need to be administered, crush the medications separately, mix each with water separately, and wash the tube after each medication application	4 (2)	3.97±1.11	111 (74.50)	38 (25.50)
PB4	Administering the medication after mixing it with food	4 (2)	3.84±1.23	93 (62.42)	56 (37.58)
PB5	Crush the two medications separately, mix each with water separately, and apply them one after the other immediately	3 (2)	3.12±1.15	60 (40.27)	89 (59.73)
PB6	Crushing two medications together and mixing them with water for application	3 (3)	3.41±1.24	71 (47.65)	78 (52.35)
PB7	To check the suitability of crushing/splitting medications, refer to the Rx Media Pharma drug information database	3 (2)	3.04±1.28	93 (62.42)	56 (37.58)
PB8	To check the suitability of crushing/splitting medications, refer to the relevant guidelines	3 (2)	3.20±1.21	65 (43.62)	84 (56.38)
PB9	Conducting a literature review on the suitability of crushing/splitting medications	3 (2)	3.10±1.25	60 (40.27)	89 (59.73)
PB10	Consulting a pharmacist about the suitability of crushing/splitting medications	3 (2)	3.12±1.22	60 (40.27)	89 (59.73)
PB11	Consult a doctor to determine the suitability of crushing/splitting medications.	3 (2)	3.21±1.19	64 (42.95)	85 (57.05)
PB12	Consulting my colleague about the suitability of crushing/splitting medications	4 (1)	3.60±1.05	87 (58.39)	62 (41.61)
PB13	Providing training on medications administered through a feeding tube to the caregiver	4 (2)	3.61±1.20	93 (62.42)	56 (37.58)

IQR: Interquartile range; SD: Standard deviation; SN: Subjective norm; PBC: Perceived behavioral control; PB: Past behavior; INT: Intention.

Table 4. Multiple linear regression analysis predicting participants' intentions to apply the current guidelines for medications administered via feeding tubes

Factors	Unstandardized coefficients		Standardized coefficients		Collinearity statistics
	B	SE	Beta	p	VIF
Constant	0.288	0.355	–	0.419	–
Attitude	0.481	0.071	0.470	**<0.001**	1.314
Past behavior	0.160	0.064	0.183	**0.013**	1.421
Subjective norm	0.158	0.068	0.155	**0.021**	1.197

R=0.686; R^2=0.470; Durbin-Watson=1.859; F=37.99; p<0.001. Multiple stepwise linear regression model: Gender, years of experience in a hospital, attitude, subjective norm, and past behavior were adjusted. SE: Standard error; VIF: Variance inflation factors.

Abu-Hdaib et al.[32] indicated that nurses have insufficient knowledge regarding the identification of dosage forms. The inadequate understanding of nurses regarding specific drug formulations poses a risk to patient safety, as improper crushing of these preparations may result in adverse outcomes, including mortality. Nurses should be trained on administering medication through the tube in accordance with the guidelines.

In the present study, in terms of attitudes, almost all nurses thought that administering drugs through a feeding tube in accordance with current guidelines would significantly improve patients' treatment outcomes. Findings based on

the TPB generally identify attitude as the most significant predictor of INT.[13] Lapkin et al.[14] demonstrated that nurses' attitudes are the primary predictor of INTs to engage in practices that promote medication safety and collaborative efforts. This study confirms previous findings, demonstrating that attitude significantly and positively predicts nurses' high INTs.

The SN items assessed nurses' perceptions of the opinions held by other health professionals, patients, and family members regarding the application of current guidelines for medications administered through feeding tubes. The SN was associated with adherence to current guidelines for medications administered through feeding tubes in this study. This study aligns with the results of Lapkin et al.,[14] which indicated that students who view nursing staff and clinical preceptors as helpful and who expect that errors will not result in punishment do not fear reporting mistakes.[14] Furthermore, Ben-Natan et al.'s[15] study indicated that social pressure from peers and clinical preceptors influenced students' INTs to disclose prescription errors. Likewise, another study revealed that 63–84% of nurses refrained from reporting prescription errors due to adverse reactions from managers and colleagues.[34]

The results indicate that PBC did not significantly predict the INT to implement current guidelines for medications administered through feeding tubes. In contrast to our results, Ben-Natan et al.[15] identified an association between nurses' knowledge regarding the reporting of medication errors and their PBC as well as their INT to report. In addition, Ekayani et al.[35] indicated that PBC significantly influenced nurses' INT to report adverse events. In the studies conducted, it was observed that as healthcare workers' self-confidence increased, there was a rise in their INT to provide more accurate services in many areas of healthcare.[36,37] This study operationalized PBC as necessity and ease/difficulty. Unmeasured factors like controllability and enabling environments could have changed the model's construct relevance. These factors may have contributed to non-significant results. The role of PBC in medication guidelines for feeding tubes needs further study.

Similar to attitude and subject norm in this study, the PB construct was a significant predictor of INT to apply current guidelines for medications administered through feeding tubes. Most participants (91.95%) cleaned the tube before and after providing the drug; however, 62.42% mixed it with food for administration. Only 40% of nurses crushed the two medications separately, mixed each with water separately, and applied them one after the other immediately. About 40% of participants assessed the suitability of crushing/splitting medications, referred to relevant guidelines, conducted a literature review, and consulted a pharmacist or doctor. Guidelines for the safe administration of medications through an EFT are available,[4,5] however researches suggest that nurses frequently do not follow them.[38] Studies show that there is an ongoing problem with following flushing and separate administration guidelines: only 5–43% of healthcare providers flush between medications, and 18–51% give drugs separately.[33] Gül-Koçoğlu Kinal et al.[1] indicated that nurses had a moderate level of knowledge about drug administration through feeding tubes.[1] The primary reason is that nurses lack time to access the correct information source. Nurses consulting pharmacists who are experts in medication will enable them to obtain quick and accurate information.

The adjusted R^2 value of 0.47 indicated that the model explained 47% of the variance in behavioral INT. Although the adjusted R^2 value is not sufficiently high, this situation is consistent with the literature. In behavioral and social sciences, and particularly within the framework of the TPB, this level of explained variance is generally considered substantial. Meta-analytic reviews consistently showed that TPB models explain between 30% and 45% of the variance in INT across domains. For instance, Armitage and Conner, in a comprehensive meta-analysis of TPB studies, reported a mean R2 of approximately 39% for INT.[39] Similarly, McEachan et al.[13] found that TPB variables explained around 44% of the variance in INT in health-related behaviors. Therefore, the adjusted R2 of 0.47 observed in the present study is not only consistent with prior TPB research but slightly exceeds the average explanatory power reported in large-scale meta-analyses.

Limitations

This study has certain limitations. The study involved a limited number of nurses during the designated period; nonetheless, the participant count met the required sample size. Consequently, social desirability bias may exist. Implementing a study that investigates actual behavior and employs random sample techniques may enhance its validity and the generalizability of its findings.

Conclusion

This study is the first investigation in Türkiye assessing nurses' INT s to adhere to current guidelines for medications administered through feeding tubes, framed within the TPB. The findings indicate serious consequences for developing and implementing strategies aimed at improving nurses' adherence to guidelines for the safe administration of

medications via EFT. Research indicated that nurses' positive attitudes, favorable PBs, and optimistic perceptions of their peers and other healthcare professionals correlated with elevated INT scores.

Nurses should exercise heightened caution when selecting medications for administration through a feeding tube, considering the altered pharmacological efficacy and safety profiles, as well as the potential risk of tube occlusion. Pharmacists are healthcare professionals who offer insights into the physicochemical, pharmacokinetic, and pharmacodynamic characteristics of drugs, along with issues related to stability, incompatibility, and the availability of different pharmaceutical dosage forms in the market. A sustained collaboration among healthcare providers will promote appropriate drug utilization and improve patient care in hospital settings.

Ethics Committee Approval: The Anadolu University Non-Interventional Clinical Trials Ethics Committee granted approval for this study (date: 09.08.2024, number: 768031).

Informed Consent: Written informed consent was obtained.

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