

Patient perceptions of the importance of maintaining preoperative NPO status

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Although traditional “NPO (nothing by mouth) after midnight” policies are being liberalized, noncompliance with NPO status remains a threat to patient safety and may result in delays of elective surgical procedures, decrease the efficiency of the ambulatory surgery setting, and waste healthcare dollars. The purpose of the present study was to examine how comprehensive NPO instructions affected group differences in knowledge and perceptions of importance of maintaining preoperative NPO status.

In this posttest-only study, 122 ambulatory surgery patients were randomly assigned to the experimental group (n = 66), who received comprehensive NPO instructions, or the control group (n = 56), who received the usual NPO instructions. Outcome measures were taken on the day of surgery via a questionnaire developed by the investigator. Outcome differences were examined, and group means were compared using analyses of variance and covariance. Although findings revealed comparable compliance rates between the groups and no significant differences when knowledge about NPO status was compared, a significant difference was found when perception of importance of maintaining NPO status was compared.

Findings from the study suggest that

providing patients with the rationale for adhering to preoperative NPO orders can significantly increase the patient’s perception of the importance of maintaining preoperative NPO status.

Key words: NPO status, NPO rationale, patient knowledge, preoperative education.

Introduction

Aspiration during anesthesia accounts for a varying number of anesthesia-related deaths.^{1,2} Although the incidence of aspiration is quite low, currently reported at 0.3 to 4.7 per 10,000 anesthetics,³ it remains a serious and potentially preventable complication of anesthesia.⁴ Thus, preoperative fasting is still the mainstay of attempts to minimize the risks of regurgitation and aspiration during general anesthesia for elective surgery.⁵ Patient failure to comply with NPO (nothing by mouth) instructions often results in delay or cancellation of elective surgical procedures. Every rescheduled procedure results in wasted healthcare dollars and has a negative impact on hospital revenues, while it inconveniences patients, their families, the surgeon, the anesthesia team, and the surgery staff.⁶⁻⁸

Currently, traditional “NPO after midnight” policies are being liberalized.^{3,9-15} Guidelines vary among institutions, and some suggest clear liquids up to 2 hours before surgery. However, studies

investigating patients' knowledge of anesthesia and perioperative care have found that patients have limited understanding about preoperative fasting.¹⁶⁻¹⁹ It is alarming that Hume et al¹⁷ found 28.3% of 166 patients believed that preoperative fasting referred to abstinence from solid foods only and that unlimited fluids could be consumed. Zvara et al²⁰ found that 44.9% of 178 patients clearly understood when to stop eating and drinking before surgery. In a recent survey of anesthesia providers, 56.8% of the 191 respondents reported that their NPO policies have been changed within the last 3 years. However, no consensus exists regarding the definition of appropriate clear liquids.²¹ "It is important to note that if confusion exists among physicians, then patients may not be able to identify appropriate clear fluids prior to surgery."^{21(p126)}

A study of patients' failure to follow medical instructions correctly²² and a study of patients' failure to follow preoperative NPO instructions correctly⁶ indicated similar reasons for the failure, such as not understanding the instructions, conflicting instructions given by more than one source, and not remembering the instructions. Patients also may have been misinformed by well-meaning friends or reports in newspapers, magazines, or television. In a pilot study (N = 100) examining patient perceptions about preoperative NPO status, I found that some patients had misconceptions about preoperative NPO status (unpublished data). These misconceptions included that there was no real reason for maintaining NPO status before surgery, that preoperative NPO status was merely a surgical convenience, and that the purpose of being NPO before surgery was to prevent vomiting after surgery. Chapman²³ also found that patients regarded the purpose of preoperative fasting to be the prevention of perioperative vomiting but found that few patients associated this with the prevention of aspiration and anesthesia safety. It may be that patients simply do not understand the significance of NPO status.²⁴ Thus, the purpose of the present study was to examine the effect of giving comprehensive preoperative NPO instructions (which included rationale and procedural information) on patient knowledge about preoperative NPO status and patient perceptions of the importance of maintaining preoperative NPO status.

The health belief model²⁵ indicates that people are more likely to follow healthcare directions when they believe the following: (1) they are susceptible, (2) a problem would develop that had serious effects, (3) they know what to do to avoid

the problem, and (4) following the directions would reduce the risk of complications. Based on the health belief model, it was expected that the provision of comprehensive NPO instructions would increase subjects' beliefs that (1) they were susceptible to a problem (aspiration during anesthesia), (2) a problem could develop that had serious effects, (3) they knew what to do to avoid the problem, and (4) following the directions would reduce the risk of complications.

Patient education has been demonstrated as effective in minimizing operating room delays and last-minute cancellations.^{7,26,27} In a 4-month study investigating the factors involved with noncompliance with preoperative NPO instructions, Heimbach and Henninger⁶ found there were irregularities in the NPO instructions that were given to patients and that patients had misperceptions about those instructions. After NPO instructions were revised to include more explicit directions for patients to follow and an explanation of the rationale and necessity for NPO compliance, the compliance rate rose to 100%.

The hypotheses for the present study were as follows:

1. Patients who received comprehensive NPO instructions would have a higher knowledge level about preoperative NPO status than patients who received only the usual NPO instructions.

2. Patients who received comprehensive NPO instructions would perceive a higher importance of maintaining preoperative NPO status than those who received only the usual NPO instructions.

3. Controlling for type of surgery, previous surgical experience, age, and educational level would not affect the results.

Methods

After receiving approval from the hospital's institutional review board, 159 ambulatory surgery patients scheduled for anesthesia who were 18 years or older and able to read and understand English were recruited into the study. Seventeen operations were canceled between the time patients were recruited into the study and before the scheduled date of surgery. Four patients were admitted into the hospital before their surgery dates, preventing them from remaining in the study. Sixteen patients did not complete their questionnaires and were dropped from the sample. The final sample size was 122.

The mean \pm SD age of patients was 49.3 \pm 15.6 years (range, 19-86 years). Of the patients, 32

(26.2%) were men, and 90 (73.8%) were women. Patients' mean \pm SD education was 12.8 ± 2.58 years (range, 5-21 years). Nineteen patients (15.6%) had less than a high school education, and 44 patients (36.1%) had education beyond high school. Eighteen patients (14.8%) were employed in a hospital or healthcare setting, 48 patients (39.3%) were employed in nonhealthcare occupations, 20 patients (16.4%) were homemakers, 16 patients (13.1%) were retired, 14 patients (11.5%) were unemployed or disabled, and 6 patients (4.9%) were students. Of the subjects, 106 (86.9%) had previous surgery and anesthesia experiences. The mean \pm SD number of previous operations was 2.83 ± 2.0 (range, 1-6 or more). Twenty-nine patients (23.7%) experienced surgery within the last year, and 27 (22.1%) experienced surgery within the last 2 years.

This study used a posttest-only design. After written informed consent was obtained, a coin flip was used to assign subjects to 1 of 2 groups, experimental or control. The experimental group included 66 subjects and the control group, 56. Both groups received all then-current instructions and procedures for maintaining NPO status, which included the provision of an ambulatory surgery brochure containing procedural information about all areas of perioperative care, including NPO instructions and a verbal explanation highlighting the key points of these instructions. Subjects in each group also were given a color-coded envelope containing 1 of 2 types of information. Subjects in the control group received envelopes containing another copy of the ambulatory surgery instruction brochure. Subjects in the experimental group received envelopes containing the comprehensive NPO brochure. This brochure was titled "Why can't I eat or drink before my surgery?" and addressed only preoperative NPO instructions, which included the same procedural NPO instructions as the ambulatory surgery preoperative care brochure but also specified the rationale for NPO status and its relationship with anesthesia. Personal safety was stressed as the most important reason for following the NPO instructions.

I developed the knowledge and perception questionnaire (KPQ) for the present study to measure patient knowledge (total knowledge, procedural knowledge, and knowledge of the rationale for NPO status) and perceptions of the importance of maintaining preoperative NPO status. Patients responded to 16 items using a 5-point Likert-type scale, on which responses ranged from 0

"strongly disagree" to 4 "strongly agree." Questions were ordered randomly, and positively and negatively worded items were included to reduce the potential for response set.

Six members of an anesthesiology department with expertise about NPO status and 2 nurse researchers with expertise in questionnaire development judged the appropriateness, accuracy, and representativeness of the instrument to establish content validity. The KPQ was pilot tested on a sample of 21 patients for understanding and ease of use; no problems were encountered with its use, and no changes were deemed necessary. Construct validity and instrument reliability measures were determined by factor analysis, using the principal components extraction method with orthogonal rotation. Four factors of conceptual importance were identified: procedural knowledge, rationale knowledge, perception of importance, and perceptions not specific to preoperative NPO status. All items loaded on these factors and ranged from 0.34 to 0.73, accounting for 49.5% of the variance.

The KPQ had an overall Cronbach's alpha coefficient of .73. The alpha coefficients for the scales of the KPQ ranged from .59 to .72. One scale fell slightly below the acceptable criterion alpha level of .60; however, it was kept in the analysis since it was an important part of the KPQ.

It was hypothesized that age, educational level, previous surgical experience, and type of surgery would not influence the outcome variables under study. Analysis with plots, Pearson's product moment correlations, and *Eta coefficients* (which indicate the proportion of variance in the dependent variable explained by the independent variables) did not indicate any relationships between these variables and the outcome variables. However, additional analyses indicated other significant differences. There were significant differences between sex and the 3 knowledge variables, with women having higher mean scores (Figure 1). Significant differences also were found between job category and total knowledge ($P = .039$), with patients employed in hospital settings having higher mean scores. Significant differences on 2 of the knowledge scales also were found between patients who received preoperative NPO instructions from the surgeon and those who did not; patients who did not remember receiving instructions from the surgeon had the highest mean scores (Figure 2). Consequently, the variables of educational level, sex, job category, and whether the patient received preoperative NPO

Figure 1. Sex differences in knowledge scores

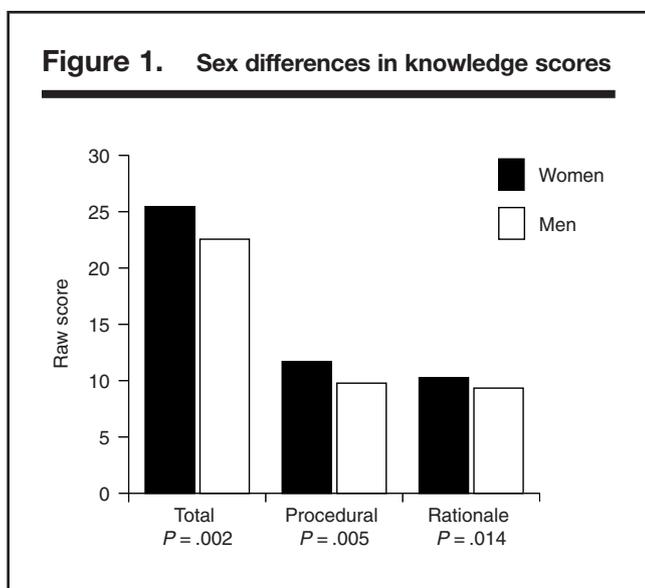
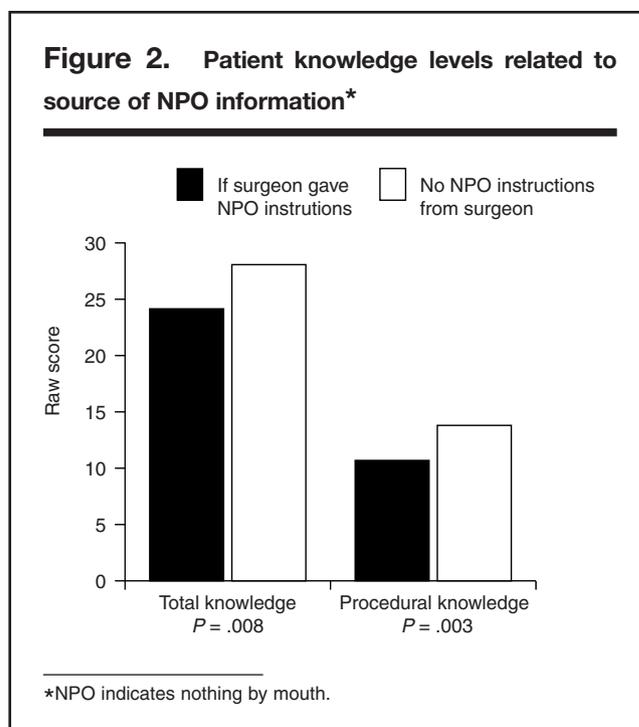


Figure 2. Patient knowledge levels related to source of NPO information*



instructions from the surgeon were used as covariates in the analyses.

Findings

The groups were equivalent when age, sex, job category, type of surgery, previous surgical experience, number of previous operations, time of the last surgery, and whether or not the patient received NPO instructions from the surgeon were compared. A significant difference existed between the groups when educational level ($t = 2.11$; $P = .037$) was compared. Patients in the experimental group had almost 1 year more education than those in the control group. Table 1 gives sample characteristics.

Total knowledge was measured using the subscales for procedural knowledge and rationale knowledge from the KPQ. The higher the scores, the greater the levels of knowledge about preoperative NPO status. Subjects in the experimental group had mean raw scores that were higher in the total knowledge and rationale subscales compared with those of the control group. Mean raw scores in the procedural knowledge subscale were identical for both groups (Table 2). Data analysis indicated normal distribution and nonsignificant group variances. An analysis of variance (ANOVA) of the means of the study groups indicated no significant differences on the procedural knowledge subscale ($P = .958$), the rationale knowledge subscale ($P = .085$), or the total knowledge scores ($P = .354$). No significant differences were demonstrated between the groups when analysis of covariance (ANCOVA) was used to compare the

Table 1. Sample characteristics (N = 122)

	Group*	
	Experimental (n = 66)	Control (n = 56)
Mean age (y)	50.2	48.3
Male	16	16
Female	50	40
Mean years of education	13.3	12.3
Employed (nonhealthcare setting)	29 (44)	19 (34)
Employed (healthcare setting)	11 (17)	7 (13)
Not employed	26 (39)	29 (52)
Had previous surgery	57 (86)	49 (88)
Mean no. of previous operations	2.84	2.82
Surgery within last year	18 (15)	11 (9)
Surgery within last 2 years	12 (10)	15 (12)

* Data are given as number (percentage) unless otherwise indicated.

knowledge variables (procedural knowledge, $P = .518$; rationale knowledge, $P = .099$; and total

Table 2. Raw scores on the knowledge and perception questionnaire

Variable	Range	Group means	
		Experimental (n = 66)	Control (n = 56)
Total knowledge	0-28	21.5	20.9
Procedural knowledge	0-16	11.2	11.2
Rationale knowledge	0-12	10.3	9.7
Perception of importance	0-20	16.1	14.3

knowledge, $P = .545$). Thus, the hypothesis that patients receiving comprehensive NPO instructions would have a higher knowledge level about preoperative NPO status was not supported.

The perception of importance the patient attributed to maintaining preoperative NPO status was measured using the KPQ perception scale. The higher the score, the greater the perception of importance the patient attributed to maintaining preoperative NPO status. Subjects in the experimental group had higher mean raw scores on the perception scale than did subjects in the control group. Data analysis indicated normal distribution and nonsignificant group variances. The ANOVA indicated a significant difference between the groups when perception scores on the KPQ were compared ($F = 7.67$; $P = .007$). The hypothesis that patients receiving comprehensive NPO instructions would have a greater perception of importance of maintaining preoperative NPO status than patients who received only the usual NPO instructions was supported.

The ANCOVA of the group means indicated that the significant difference in the means of the groups for the outcome variable perception of importance remained ($F = 5.21$; $P = .02$). The hypothesis that controlling for type of surgery, previous surgical experience, age, and educational level would not affect the results was supported (Table 3).

Compliance with preoperative NPO instructions was measured by 1 "yes or no" question at the end of the demographic survey. Only 2 patients did not follow preoperative NPO instructions, 1 in each group.

Discussion

No significant differences were found be-

Table 3. Differences between experimental and control groups*

Knowledge	ANOVA [†]	ANCOVA [†]
Procedural	.958	.518
Rationale	.085	.099
Total	.354	.545
Perception of importance	.007	.024

* Values given are the P values. A value of $<.05$ was considered statistically significant.

† ANOVA indicates analysis of variance; ANCOVA indicates analysis of covariance.

tween groups when total knowledge about preoperative NPO status was compared. This finding is consistent with a study by Zvara et al,²⁰ who found no significant differences in the understanding of preoperative NPO instructions between 2 groups of ambulatory surgery patients. One group received the usual routine preanesthetic information and interview; the other group viewed a 10-minute anesthesia video about ambulatory surgery admission procedures and when to stop eating and drinking preoperatively, in addition to receiving the usual preanesthetic information. Low instrument sensitivity was one of the factors these authors attributed to finding no difference between the groups in their study. The instrument used to measure knowledge in the present study was developed by the investigator. Alpha coefficients for the instrument's scales ranged only from .59 to .72 and may indicate that the instrument was not explicit enough to detect a difference between the groups, accounting for the similar findings.

Other possible explanations for the lack of a significant difference when total knowledge was compared between the groups in the present study may be attributed to the unstructured method of giving information that was used and to the preoperative period itself, when the intervention was implemented. Simply giving information brochures to patients, without reviewing or explaining them, may not be the same as interactive teaching, which is defined as interactive involvement of the person conveying information to the patient.²⁸ Anxiety about and preoccupation with the events associated with the forthcoming surgery also may have interfered with assimilation of the information. Elevated anxiety levels can diminish cognitive ability.²⁹

Another possible explanation for the lack of a significant difference when total knowledge was compared between the groups in the present study can be postulated from examining the study's design. The posttest-only design of the study did not provide a baseline measure of knowledge about NPO status. Patients in the present study had a high degree of previous experience with surgery (86.9% had undergone previous surgery). Since patients tend to accumulate information as they progress along the course of their experiences, perhaps patients in the present study already had high levels of knowledge about preoperative NPO status. However, since the posttest-only design did not provide a way to measure existing knowledge, there was no way to measure a change in knowledge level.

Findings showed that women and men had significant differences in knowledge scores (total knowledge, procedural knowledge, and rationale knowledge). Women had higher mean scores for these scales across the experimental and control groups. It has been shown that women desired more information about anesthesia than men,³⁰ in which case women's interest in acquiring information about anesthesia may account for the difference in knowledge levels between sexes in the present study. Nevertheless, future exploration about sex and anesthesia knowledge is warranted.

Findings also showed that patients in different job categories had significant differences in total knowledge scores. Subjects in the hospital or healthcare job category had higher scores for total knowledge than did subjects in the other job categories. Examination of these differences revealed that the experimental group included 11 subjects in the hospital or healthcare job category, while the control group included only 7 subjects in this job category. Although the groups were mathematically equivalent for job category, it is plausible that subjects with healthcare-related jobs would have a greater level of knowledge about medical topics. Hence the different numbers of subjects with hospital or healthcare-related jobs in the study groups could have accounted for the difference in total knowledge scores between the groups.

Findings indicated that patients who received NPO instructions from the surgeon had lower mean scores on the total knowledge and procedural knowledge variables than did other patients. Agency procedures indicated that some surgeons gave patients instructions to abstain from food or liquids after midnight. It is possible that patients who received instructions from the surgeon did

not pay attention to the written NPO instruction brochures with the same detail or interest as the patients who did not receive instructions from the surgeon. This possibility could account for the differences in total knowledge and procedural knowledge scores between these patients.

There was no significant difference between the study groups when procedural knowledge was compared. This finding is not consistent with a meta-analysis of previous studies that found that the largest effects were in those testing procedural content.³¹ A possible explanation for this inconsistency in findings may be that many of the previous studies focused on knowledge related to skills, such as the performance of coughing, deep-breathing, and postoperative exercises rather than knowledge related to cognitive understanding, as in the present study.

However, finding no significant difference between the groups in procedural knowledge in the present study is consistent with the findings of Zvara et al.²⁰ In their study of ambulatory surgery patients' knowledge about anesthesia care, they found no significant difference in factual knowledge between the study groups. Use of an intervention that may have offered no more information than a conventional intervention was one of the factors these authors attributed to the lack of a difference between groups in their study. The present study may have a similar weakness in the procedural information segment of the intervention that may account for the similar outcomes of the studies.

While there was no difference in procedural knowledge between groups in the present study, findings from previous studies of surgical patients' perceptions of preoperative education indicated that patients rated procedural information as one of the most important dimensions of preoperative education.^{32,33} This was consistent with findings from studies that specifically evaluated the dissemination of preoperative anesthesia information with a video intervention.^{20,34} These studies found that 85% to 90% of patients rated situational or procedural anesthesia information as important and very helpful. Despite this fact, 14 patients (11.5%) in the present study indicated they received NPO instructions that were confusing to them. This information, when considered with the common problem of noncompliance with NPO instructions, underscores the need to provide patients with clear preoperative NPO procedural information.

Patients in the experimental group had higher scores for rationale knowledge about pre-

operative NPO status than those in the control group. However, the difference between the groups was not statistically significant. The instrument was administered on the day of surgery, and it is possible that patients' preoperative anxiety may have interfered with the outcome measurement. Waiting for surgery can be stressful and may cause elevated anxiety levels, which can diminish cognitive abilities.²⁹ The addition of state-trait anxiety level measurements would have allowed for correlations of anxiety levels and cognitive scores, thereby increasing validity of the findings. However, this may not be feasible in the brief ambulatory surgery preoperative period.

A significant difference was noted between the experimental and control groups when the perception of importance of maintaining preoperative NPO status was compared. This finding may be due to the fact that comprehensive NPO instructions help patients comprehend their susceptibility to aspiration and the seriousness of its sequelae. This may have heightened patients' perceptions of importance about maintaining preoperative NPO status.

The compliance rate in the present study was 98.4%. Previous studies indicate that patient compliance rates with prescribed healthcare regimens can range from 10% to 94%³⁵ Given the wide range of compliance rates and the small number of patients in the present study who did not follow instructions, a larger study focused specifically on compliance with preoperative NPO status would be needed to evaluate group differences.

It is interesting to note that only 4 patients in the present study indicated that they had taken morning medications on the morning of surgery. This is surprisingly low, since the mean age of patients in the study was 49.3 years, and 24.6% of the sample was older than 60 years. In addition, of the 6 patients in the present study who reported oral intake, only 3 (50%) indicated the time of their oral intake. These facts suggest that patients might not consider medications, water, or time of oral intake important to report. These findings underscore the importance of educating the patient about the difference between clear liquids and solid foods and the importance of preoperative NPO instructions.

Conclusion

There is considerable variation in the quality and nature of anesthesia information that is given to patients, often based on the notion that avoiding explicit discussions will reduce a patient's fear and anxiety,³⁶ although research findings have not

confirmed this view.³⁷⁻³⁹ Studies investigating what information patients want about anesthesia and the perioperative period indicated that patients had an overall strong desire for information.^{30,40} Findings from the present study suggest that providing patients with the rationale for adhering to preoperative NPO orders can significantly increase the patient's perception of the importance of maintaining preoperative NPO status. This simple intervention has the potential to influence patient safety and to reduce the incidence of delays in and cancellations of elective cases because of noncompliance with preoperative NPO instructions. Other recommendations for anesthesia practitioners include the following:

1. The use of separate brochures specific to preoperative NPO instructions,
2. Precise procedural instructions that offer examples of clear liquids and kinds of medications that should be taken on the morning of surgery, and
3. Provision of uniform instructions by anesthesiology and surgery personnel.

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