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Original Article

Evaluation of a Safety Protocol for the Management of Thirst in the Postoperative Period

Natiely Haila Motta, RN *, Leonel Alves do Nascimento, MSN, RN, Isadora Pierotti, MSN, RN, Marília Ferrari Conchon, PhD, MSN, RN, Lígia Fahl Fonseca, PhD, MSN, BSN

Nursing Department, State University of Londrina, Londrina, Paraná, Brazil

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A B S T R A C T

Purpose: To associate medications, anesthetic techniques, and clinical conditions that interfere in the time of patient approval in the safety protocol for thirst management.
Design: A quantitative, analytical, and longitudinal study conducted in Southern Brazil.
Methods: A nonprobabilistic sample, of 203 adult patients in the immediate postoperative period, evaluated every 15 minutes for 1 hour.
Findings: A general prevalence of thirst of 67.7%, and mean intensity of 6.38. Fentanyl, morphine, rocuronium, and sevoflurane increased lack of approval in the protocol within 30 minutes ($P < .05$). General anesthesia ($P < .0001$) and level of consciousness (95.4%) presented the highest nonapproval rates.
Conclusions: Anesthetics and general anesthesia delayed protocol approval; however, after 30 minutes, 75.4% of patients had been approved. Level of consciousness was the main criterion of disapproval. The protocol identified crucial clinical conditions that made it impossible for the patient to receive thirst relief strategies and demonstrated that thirst can be satiated precociously with safety.
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In the immediate postoperative period (IPP), the surgical patient is susceptible to numerous complications inherent to the anesthetic-surgical procedure and to their clinical conditions.[1,2] In addition to situations that may cause clinical worsening, discomfort that interferes with the quality and well-being of the patient in the IPP, such as nausea, pain, and thirst, has a considerable impact both on the perception of the surgical experience and on recovery.[3,4]

Thirst is a highly prevalent discomfort during the period of anesthetic recovery.[5] Its intensity can be measured using numerical and visual analog scales, ranging from 0 to 10,[6] presenting high values in the IPP.[7] Despite this scenario, thirst is still undervalued and undertreated during the postanesthetic recovery period.[3,8]

The main factors that can trigger symptoms of thirst include preoperative fasting, anxiety, endotracheal intubation, and medications used during the anesthetic-surgical process.[9,10] Some drugs are related to the perception of thirst, of which, among those widely used in the intraoperative period, are the opioids and anticholinergics, which reduce the production of saliva, triggering thirst.[9]

Because of the fear of adverse events, especially bronchoaspiration, the usual practice of care in the postanesthesia care unit (PACU) is the maintenance of absolute fasting. The patient is vulnerable to this complication because of lowering of the level of consciousness, ineffective airway protective mechanisms, and systemic alterations arising from substances used in the intraoperative period.[11,12]

The recovery of the patient is evidenced by the emergence of consciousness as well as by the recovery of protective reflexes. Thus, both the medications used in the intraoperative period and the choice of the hypnotic agent may have an impact on the early recovery.[13,14] During recovery, all inhalation and intravenous drugs are metabolized during different periods. Therefore, monitoring patients continuously is crucial for their safety.

Safety issues needed to be addressed to consider mitigating patients' thirst in the postanesthesia care unit (PACU). Filling the gap for the need of a specific instrument to assess safety criteria in the IPP, the safety protocol for thirst management (SPTM) was developed and validated. The SPTM enables the health team to determine the administration, or not, of a relief method. The SPTM obtained high levels of validation of content and reliability, presenting the following safety criteria: evaluation of the level of consciousness, airway protection reflexes (cough and swallowing),

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* Address correspondence to Natiely Haila Motta, Nursing Department, State University of Londrina, Robert Koch 60, Londrina, Paraná, Brazil.
E-mail address: natielyhaila@hotmail.com.

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and the absence of nausea and vomiting. In the protocol, when the patient is not approved in one criteria, the assessment should be interrupted, allowing more time for the recovery to occur before the next evaluation is initiated again.[11,12]

The recommendation is that the SPTM tool should be used on patient's arrival at the PACU, followed by new assessments every 15 minutes during anesthesia recovery, to determine the appropriate time for the administration of a thirst relief method. Studies show that cold and menthol strategies have been adopted with recognized effectiveness and safety for patients in the perioperative period, such as ice and mentholated popsicles.[15-17] Thirst relief can be achieved through stimulation of oropharyngeal thermoreceptors denominated transient receptor potential melastatin 8 by means of menthol substances and cold temperature, which activate preabsorptive thirst satiety-generating sensations of alesthesia.[18-20]

As the SPTM is a recently developed tool, the variables that impede approval of the proposed criteria have not been widely researched in diverse populations. In a study with 109 patients, 69% of postoperative patients were approved in the protocol after 30 minutes of anesthetic recovery.[21] In view of all the issues discussed previously concerning thirst and safety for the surgical patient recovering from anesthesia, it is necessary to further investigate the SPTM approval indices and their relation with intervening variables.

The objective of this study is to analyze the association of medication use, anesthetic techniques, and clinical conditions that interfere in the patient's time of SPTM approval during their recovery from anesthesia. Currently, the use of SPTM enables early evaluation of the risk of the patient receiving a thirst relief method in the PACU; however, new research will add to this by demonstrating its usefulness in clinical practice. This study will contribute to the analysis of patient safety regarding the administration of strategies for the management of thirst in the IPP as well as to determining the time necessary to start the use of SPTM when the patient receives different anesthetic medications.

Method

This quantitative, analytical, and longitudinal study was carried out in a public hospital school in South Brazil, with 316 beds, receiving municipal and state referrals for procedures of high complexity. The institution has seven surgical rooms and a seven-bed PACU and performs, on average, 600 surgical procedures per month.

The patient sample was nonprobability, composed of 203 patients in the IPP, in the PACU, older than 18 years, following any type of anesthesia, and who verbalized thirst spontaneously or when evaluated intentionally. Patients unable to communicate and who had received preanesthetic medication in the preoperative period were excluded. Data collection took place from May to November 2018.

The patient was approached preoperatively and invited to participate in the study by signing the written informed consent form. After the surgical procedure, the researcher followed the patient for 1 hour, from the time of arrival in the PACU. The data were recorded on a form prepared previously by the authors. The form was composed of clinical and demographic data, medications used in the intraoperative period, and data regarding the approval or nonapproval of the patient in the SPTM.

The protocol was applied every 15 minutes for 1 hour, from the time of the patient's arrival in the PACU, for a total of five moments. In each application of the SPTM, the presence of thirst and intensity were evaluated using a numerical verbal scale from 0 to 10. If the patient presented thirst and was approved, a 10-mL ice popsicle was offered for satiety and relief of discomfort, according to the protocol already used in the institution.[22]

The study respected guidelines and rules that cover research involving human subjects and was approved by the Research Ethics Committee of the State University of Londrina, according to resolution no. 466/2012 of the National Health Council, CAAE 29069414.5.0000.523.

Statistical Analysis

The data were analyzed using *IBM SPSS Statistics* software, version 20.0 (Armonk, NY). Descriptive variables were presented in absolute frequencies (n), relative (%), mean, and SD, when they showed normal distribution, and in median and interquartile range, when the variables showed non-normal distribution. The dependent variable was the time of patient approval in the SPTM. The independent variables were intraoperative medications (morphine, fentanyl, rocuronium, propofol, midazolam, and sevoflurane) and anesthesia technique (general, blockade, general + blockade, and sedation + blockade). The term blockade in this study refers to regional nerve block and neuraxial technique procedures.

For statistical analysis, the moment of first approval of the patient in the protocol was analyzed: on arrival in the PACU ($n = 117$), after 30 minutes in recovery ($n = 36$), after 1 hour in the PACU ($n = 22$), and patients who were not approved within 1 hour ($n = 28$), totaling 203 patients evaluated.

The normality of the data was calculated by the Shapiro-Wilk test and the homogeneity of variances between the groups by the Levene test. The variables morphine, fentanyl, midazolam, propofol, and rocuronium did not present normal distribution, and the variable sevoflurane did not meet the requirement of homogeneity of variances. For these variables, nonparametric statistics were used to compare the drug dose between the groups.

The Kruskal-Wallis statistical test, a nonparametric method, was used to test the distribution of two or more independent variables to determine if the different variables observed actually suggested differences between populations or were only random variations that could be expected between random samples from the same population. When a difference between the groups was identified ($P < .05$), a comparison analysis was performed in pairs to indicate between which groups a difference was observed. For this analysis, the variables were ranked and compared using one-way analysis of variance followed by the least significant difference post hoc. A significance level of $P < .05$ was adopted.

Results

The sample consisted of 103 males (50.7%) and 100 females (49.1%), median age 37 years (first quartile [Q] 26 years to second Q 50 years), American Society of Anesthesiologists (ASA) I in 73 patients (36%), ASA II in 120 (59.1%) patients, and ASA III in 10 (4.9%) patients. The fluid fasting time presented a median of 13 hours and 30 minutes (first Q, 9:40 to 16:10 hours), and solids fasting time a median of 14 hours and 25 minutes (first Q, 11:00 to 2:00 hours).

The mean time of preoperative hospitalization was 2.5 days (SD, 4.7). The most representative surgical clinics were orthopaedics and trauma (34.5%), gynecology and obstetrics (21.2%), and urology (19.2%).

Regarding the surgical procedure, the median duration was 1 hour and 35 minutes (first Q 0:55 to second Q 2:20 hours). The median intubation time for patients submitted to general anesthesia was 3 hours (first Q 2:10 to second Q 4 hours). The anesthetic technique was divided into four categories; the most commonly used was blockade (42.9%), followed by general anesthesia (25.1%),

sedation and blockade (19.7%), and general anesthesia and blockade (12.3%), as displayed in Table 1.

The general prevalence of thirst was 67.7%, and the mean intensity was 6.38. Regarding the first moment of evaluation, 117 patients (57.6%) were approved on arrival at the PACU; after 30 minutes in recovery, 75.4% had already been approved in the protocol.

The most frequent criterion for nonapproval in the five moments of SPTM application was level of consciousness, which represented 95.4% of the patients not approved on arrival at the PACU (Figure 1). This means that as the patient regains consciousness, he is considered suitable on this criterion and has a greater chance of being approved in the subsequent criteria established by the protocol. For this reason, level of consciousness was the most important criterion for approval in the protocol.

During 1 hour of evaluation, 28 patients (13.8%) did not receive approval in the SPTM at any time.

Statistical significance was found between the use of fentanyl ($P < .000$), rocuronium ($P < .0001$), and sevoflurane ($P < .0001$) and nonapproval of the patient in the SPTM on arrival in the PACU. Statistical significance was found between the use of fentanyl ($P < .000$), rocuronium ($P < .0001$), and sevoflurane ($P < .0001$) and nonapproval of the patient in the SPTM at the time of arrival in the PACU. Therefore, the use of these medications in the intraoperative period increased patient's refusal in the protocol on arrival in the PACU. In other words, the medications delayed patients' chances of receiving a thirst relief strategy at admission (Table 2).

The dose of midazolam, propofol, and rocuronium did not present a statistically significant difference ($P > .05$), although the dose of morphine, fentanyl, and sevoflurane was statistically significant at different moments ($P < .05$). The group of patients approved in 30 minutes received lower doses of morphine and fentanyl when compared with groups approved within 1 hour and those not approved. The group of patients approved in 30 minutes also received a lower dose of sevoflurane compared with the nonapproved group (Table 3).

There was also a significant association ($\chi^2 = 55.48$; $P < .0001$) between the anesthetic technique and approval in 30 minutes. Patients who received blockade anesthesia had greater approval in the protocol than patients who received general anesthesia, associated or not with blockade (Table 4).

Discussion

The relevance of this study is that it presents an issue, *thirst*, which is still undervalued despite its high prevalence in daily practice. The protocol was accurate in identifying the safety criteria not reached by the patients, demonstrating sensitivity in detecting risk situations. Thus, the SPTM provides support for the health team to make the decision not to administer a thirst relief method,

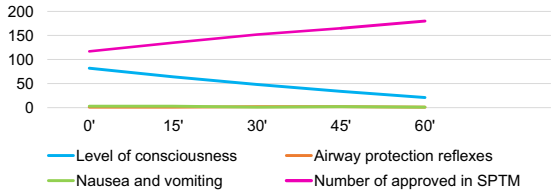

Figure 1. Failure criteria in the safety protocol for thirst management (SPTM) and number of approvals over the evaluation time. This figure is available in color online at www.jopan.org.

ensuring the safety of both the patient and the health care professional. In addition, this study breaks paradigms of the routine of several institutions where the patient remains fasting in the IPP, evidencing that strategies for thirst relief can still be administered in the PACU, to reduce the time of suffering caused by this discomfort, in contrast to the usual practice.

The results of prevalence and intensity of thirst were high, although other studies have found even higher values, reaching 89% prevalence[5] and 8.17 intensity.[7] The patient's perception of their thirst influences how they react to it, making the surgical experience pleasant or unpleasant based on the experience of the symptom.

As it is a multifactorial discomfort, thirst should not be considered in isolation. Thirst can be triggered by individual hydration habits, preoperative fasting time, endotracheal intubation, and intraoperative medications.[8,9]

The management of a symptom begins with the evaluation of the experience according to the perspective of the patient, which justifies an intentional look at this discomfort, which is so common in the perioperative period. A qualitative study showed that the surgical patient perceives thirst as extremely unpleasant. The preoperative period is marked by the presence of a symptom not valuated by the health team, which makes patients feel more anxious. They secretly plan to ingest liquids, breaking protocols and medical guidance on absolute fasting.[3]

Regarding the criteria evaluated by the SPTM, most patients were not approved because of their level of consciousness. The relevance of this criterion as a major step for safety assessment was corroborated by 83% of the specialists during the early study, which elaborated the SPTM, once it indicates the regression of anesthesia during anesthetic recovery.[11,12] In addition, this item is related to the return of airway protection reflexes, coughing and swallowing.[14,23]

During the preparation of the SPTM, it was observed that patients, even when drowsy, were approved in the other safety criteria (cough, swallowing, and the absence of nausea and vomiting). In view of this, the first item to be assessed, level of consciousness, establishes a rigid standard in the patient assessment

Table 1
Frequency and Dose of Medications Used Intraoperatively

Medications	*N* (%)	Median Dose (mg)	IQ
Morphine	127 (62.5)	0.08	0.06-2.00
Fentanyl	156 (76.8)	0.10	0.10-0.20
Midazolam	108 (53.2)	5.0	3.0-5.38
Propofol	97 (47.8)	200	150-200
Rocuronium	73 (36.0)	50	40-60
		Mean time	SD
Sevoflurane*	73 (36.0)	2.8	1.23

IQ, interquartile.
Data are expressed as median, mean, IQ range, and SD.
* Sevoflurane presented in mean time in hours of gas use.

Table 2
Number of Patients Approved in the SPTM on Arrival in the Postanesthesia Care Unit and Medications Used in the Intraoperative Period

Medication	Patients Approved	*P**
Fentanyl, *N* (%)		
Dose <0.1 mg	53 (66.2)	<.000
Dose >0.1 mg	22 (28.9)	
Rocuronium, *N* (%)		
No	100 (76.9)	<.001
Yes	17 (23.3)	
Sevoflurane, *N* (%)		
No	101 (74.9)	<.001
Yes	16 (21.9)	

SPTM, safety protocol for thirst management.
* Kruskal-Wallis test.

Table 3
Dosage in Milligrams of Medicines Used and Moment of Approval in the SPTM

	Approved in 30 Min	Approved in 1 h	Not Approved
Morphine, IQ range	0.08 (0.06-0.08)*,†	2.00 (0.08-4)	2.00 (0.08-5)
Fentanyl, IQ range	0.10 (0.06-0.20)*,†	0.20 (0.10-0.25)	0.20 (0.15-0.25)
Midazolam, IQ range	5.00 (4-5.87)	5.00 (3-5)	3.00 (2.50-7.50)
Propofol, IQ range	200 (150-200)	175 (120-200)	200 (150-200)
Rocuronium, IQ range	50 (40-50)	60 (40-75)	47.5 (40-50)
Sevoflurane	100 (M, 150-180)†	170 (M and IQ, 105-247)	195 (M, 155-238)

SPTM, safety protocol for thirst management; IQ, interquartile.
One-way analysis of variance test followed by least significant difference post hoc. Data are expressed as median (M) and IQ range.
* Statistical difference ($P < .05$) in relation to the group approved in 1 hour.
† Statistical difference ($P < .05$) from the nonapproved group.

protocol, during which they need to stay awake and alert, without being drowsy.[11,12] Lack of approval in this first item interrupts the whole process, and the other safety criteria are not considered at this moment, justifying the greater nonapproval rate for this criteria.

Subsequent safety criteria, coughing, swallowing, and the absence of nausea and vomiting, did not obtain an expressive disapproval rate. Although the other criteria, coughing, swallowing, and the absence of nausea and vomiting, were not predominant, the SPTM proved to be competent to identify alterations in these safety criteria, interrupting the application of the protocol. This observation reinforces the importance of using the SPTM in clinical practice. The airway protection reflexes compromised during general anesthesia predispose to bronchoaspiration in the IPP.[14,23] Studies show that prolonged time of orotracheal intubation during the surgical procedure increases the risk of aspiration by 5.5 times.[24]

The presence of nausea and vomiting was the second most frequent cause of lack of approval. The main fears that prevent the administration of a thirst relief method are nausea and vomiting, which have an incidence of approximately 25% to 30%, reaching 80% in high-risk populations that do not receive prophylaxis.[25] This complication may be related to different factors in the intraoperative period, such as the use of volatile anesthetics, duration of anesthesia, use of nitrous oxide, use of opioids in the IPP, and manipulation of the gastrointestinal tract.[25]

Research has shown that even in children, the early intake of fluids in the IPP is beneficial[26] and does not increase the incidence of nausea and vomiting, in addition to reducing the use of opioids.[27] In studies with adult populations, the results were similar: early fluid intake was safe and well tolerated, relieving thirst and decreasing the frequency of nausea and vomiting, and increasing patient satisfaction in the IPP.[28]

The medications used in the intraoperative period were associated with the moment of approval in the SPTM. On arrival in the PACU, the use of rocuronium and sevoflurane presented statistical significance, that is, patients who received these medications had a higher nonapproval rate in the protocol. Fentanyl administration also presented statistical significance, when the dose used was greater than 0.01 mg.

These medications (rocuronium, sevoflurane, and fentanyl) are used in the induction and maintenance of anesthesia and cause alterations in the patient's physiological balance. Rocuronium is a drug used to produce muscle relaxation, providing ideal conditions for the surgical procedure. The first 30 minutes in the PACU are the most dangerous as the patient is susceptible to recurarization, inadequately antagonized neuromuscular blockade, a condition present in up to 31% of patients on admission to the PACU.[14]

Respiratory adverse events may occur in patients with residual neuromuscular blocking, such as airway obstruction, inadequate ventilation, and hypoxia. Neuromuscular blockade residual was found to be associated with advanced age, open abdominal surgery, and surgical time less than or equal to 90 minutes. These events were more frequent when the level of consciousness was depressed, which is caused by analgesic and hypnotic medications used intraoperatively.[14]

Fentanyl and morphine are commonly used opioids in anesthetic procedures. Patients receiving morphine presented a greater nonapproval rate in the SPTM after 30 minutes of recovery than patients who did not receive these medications. The use of fentanyl presented significance on admission to the PACU and also after 30 minutes (Table 3). It is argued that this effect is related to its greater analgesic power and greater intraoperative use of fentanyl when compared with morphine alone.[29] The use of opioids can result in several adverse effects that influence the patient's nonapproval in the SPTM. Respiratory depression, cough suppression, nausea, vomiting, sedation, and euphoria are frequent complications in the PACU because of the use of these medications.[30]

Sevoflurane is a volatile anesthetic, considered less irritating to the respiratory tract, and its solubility in blood is low, which allows rapid recovery from anesthesia.[31,32] As sevoflurane was the only anesthetic gas used for the patients in the study and directly affects level of consciousness, we found significant association with nonapproval in the protocol during the first 30 minutes of assessment.

The anesthetic technique variable presented statistical significance. Patients who received blockade anesthesia without any sedative agent had a higher SPTM approval index when compared with patients undergoing general anesthesia or any type of sedation (Table 4).

General anesthetics progressively depress consciousness until an ideal anesthetic plane is obtained to perform the surgical procedure.[33] On the other hand, the local anesthetics used in the blockade, if properly used, do not cause any type of alteration in the level of consciousness, a factor leading to high lack of approval in the five moments of SPTM application.

Relevant data from this study are the fact that, after 30 minutes in recovery, 75% of patients were approved in the SPTM protocol, and therefore been eligible to receive a thirst relief strategy, such as

Table 4
Association Between Anesthetic Technique and Approval or Nonapproval in the SPTM Within 30 Minutes in the PACU

	General Anesthesia	General Anesthesia + Blockade	Sedation + Blockade	Blockade	Total
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Not approved	28 (54.9)	11 (21.6)	11 (21.6)	1 (2)	51 (25.1)
Approved	23 (15.1)	14 (9.2)	29 (19.1)	86 (56.6)*	152 (74.9)
Total	51 (25.1)	25 (12.3)	40 (19.7)	87 (42.8)	203 (100)

SPTM, safety protocol for thirst management; PACU, postanesthesia care unit.
* Statistical difference ($P < .0001$) in relation to the group that received general anesthesia, associated or not with blockade. One-way analysis of variance test followed by least significant difference post hoc.

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the ice popsicle. This result corroborates previous research, demonstrating that thirsty patients can be safety satiated early on in the recovery period, while still in the PACU.[15,17,21]

The remaining patients who were not approved were at risk for bronchoaspiration and other adverse events, had the team not initiated the protocol, because SPTM proved to be sensitive in identifying patients who did not comply with the necessary safety criteria. This fact justifies the careful evaluation proposed by the SPTM, supporting the health professional and ensuring patient safety and comfort.

Limitations of the Study

As limitations of this study, we can cite the nonprobability sample, constituted of adults, as well as the wide range of doses of medications used in patients. Therefore, other studies in this area should be performed to evaluate clinical variables that interfere in the approval of SPTM in different populations.

Conclusion

Most patients (75.4%) received SPTM approval within 30 minutes of anesthesia recovery. This means that it is possible to intervene safely in the management of thirst and reduce the fluid fasting time during this period. Among the main factors that delayed the time for patient approval, the use of anesthetic medications—fentanyl, morphine, rocuronium, and sevoflurane—and the use of general anesthesia associated or not with blockades are the most important. It is important to mention that, of the safety criteria evaluated by the protocol, one item, the first—level of consciousness—, was responsible for most of the nonapprovals.

Although based on scientific evidence, even today the management of thirst causes uncertainty among nursing professionals working in a surgical center with regard to the ideal time to administer a method of relief. This study strengthened evidence that it is possible to safely apply a thirst relief method to most patients within 30 minutes in the PACU, regardless of the anesthetic technique they have undergone, which has been already used in clinical practice for some years now. For this, the SPTM should be used, which makes a careful evaluation of the patient, supporting the health professional and ensuring intentional evaluation of the discomfort of the surgical patient.

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