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Surgical fasting guidelines in children: Are we putting them into practice?

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ABSTRACT

Background: Patients are traditionally kept fasting (NPO) from midnight prior to surgery, to prevent aspiration during anesthesia. NPO time is continued postoperatively, out of concern for ileus. Prolonged periods of NPO place the pediatric population at risk for under-nutrition. Published guidelines for preoperative NPO times have been shown to be safe. The aim of this study was to investigate current pre- and postoperative feeding practices of children at a pediatric tertiary care hospital.
Methods: Medical charts were used to extract data prospectively from 53 patients undergoing general, neurosurgical, or urological procedures. Date and time of NPO periods were recorded as well as the physician's postoperative diet orders and diet progression. Surgical procedures were classified as complex or noncomplex by the surgeons. Data were summarized and compared to published recommendations.
Results: Preoperative NPO times were greater than recommended in 70% of patients studied ($n = 37$). Median time spent NPO preoperatively was not significantly different between complex (11.5 h) and noncomplex groups (10.8 h). Postoperative NPO time was significantly greater for complex procedures than for noncomplex. Most patients received some postoperative NPO time, even when it was not included in the physician diet order.
Conclusion: Observed preoperative NPO time exceeded current recommendations in this study.

The American [1], Canadian [2] and European Societies [3] of Anaesthesiologists have published recommended preoperative fasting times before anesthesia for both children and adults. The recommendations state that clear fluids can be consumed up to 2 h prior to surgery, breast milk up to 4 h, infant formula/nonhuman milk/light meals up to 6 h and full, and high fat meals up to 8 h prior. A recent Cochrane review [4] confirmed no benefit to preoperatively limiting clear fluids greater than 2 h in children. The reported incidence of perioperative aspiration is low [5] and relative to traditional feeding regimens, i.e. NPO from midnight, there have been no additional risks of aspiration reported when clear fluids are allowed up to 2 h prior to surgical procedures [6]. Postoperative fasting has been a traditional practice to promote bowel rest during postoperative ileus. It is now understood that small feedings may actually stimulate the gastrointestinal tract and shorten the period of ileus [7,8]. The European Society [3] of Anaesthesiologists recommend beginning oral fluid intake within the first 3 postoperative hours in most pediatric patients.

The metabolic implications of surgery in the fasted state deserve consideration. Children allowed oral intake closer to time of anesthesia induction may be better hydrated and exhibit better hemodynamic stability [9]. In addition, prolonged fasting may result in hypoglycemia, especially in infants and young children that have limited glycogen stores [9]. Recent studies in adults report that feeding carbohydrate in the immediate preoperative period may reduce the stress response associated with surgery and improve postoperative recovery [10–12]. Similar studies in pediatric populations have not yet been reported. In addition to the nutritional and metabolic concerns, prolonged periods of NPO can

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result in increased patient discomfort related to thirst and hunger, especially in younger children where the rationale for the NPO order may be poorly understood by the patient [4,9].

Malnutrition is a concern in the pediatric population [13]. Fasting times must balance safety with the risk of caloric deficits which contribute to delayed recovery and wound healing, immune suppression, and susceptibility to infection [13] Evidence suggests that shorter periods of NPO before and after surgery do not increase the risk for aspiration or ileus and may decrease risk of hospital acquired malnutrition. The primary goal of this study was to identify current NPO and diet transition practices and compare current practices to recommended guidelines.

1. Methods

1.1. Population

This prospective study was approved by the local Health Research Ethics Board and written informed consent was obtained from the child's parent(s)/guardians prior to study initiation. Patients were recruited at a pediatric tertiary care hospital if they had general, neurological or urological surgical procedures during a 5-week period (January–February, 2012) and were admitted pre- and postoperatively to a pediatric surgical ward. Exclusion criteria included any children >17 years, day surgeries, those admitted to an intensive care unit or surgical procedures not in the inclusion criteria.

1.2. Study design

Data were collected by reviewing pediatric medical charts during admission by nutrition personnel. Unclear or missing information from the charts was clarified with staff. Patient demographics included age, gender, height, weight, admission date, admitting diagnosis, surgical procedure, weight upon discharge and date of discharge. Weight for length percentiles and z scores were calculated and recorded using World Health Organization (WHO) Anthro software (version 3.2.2, January, 2011) based on reference growth curves of the WHO [14] for children less than 2 years of age. Body mass index (BMI) and BMI z scores were calculated according to the Centers for Disease Control and Prevention (CDC) (Epi-Info Software, version 3.5.3, January, 2011) [15] for children greater than 2 years of age. Classification of body weights by weight for length and BMI z scores was determined using age/sex specific cut-off points recommended by the WHO [14] which are Z scores of $+2$ and -2.

Postoperative diet orders written by the physician were classified as NPO, clear fluid (CF), full fluid (FF), enteral nutrition (EN), total parental nutrition (TPN) or diet as tolerated (DAT). For the purposes of determining postoperative NPO time, total NPO time included NPO and clear fluids, however, for the purposes of studying diet transition, NPO and clear fluids were considered separately. Diet intolerance such as emesis, diarrhea, distension, nausea, was recorded. Surgical procedures were classified as complex or noncomplex by the surgeons. Complex surgeries were defined as non routine with the expectation of delayed recovery in the patient.

The date, time and duration of NPO were recorded and calculated for each patient. Total time patients spent NPO during their hospital stay was determined by summing the time spent NPO prior to surgery, post surgery and any NPO that interrupted their nutritional intake.

Time to first postoperative nutrition was also calculated by determining the number of hours since the patient started NPO preoperatively until they received full fluids, enteral nutrition, parenteral nutrition, and/or DAT was used. For the purposes of defining postoperative NPO time, a clear fluid diet order was considered NPO because of limited energy and nutrient contributions from this diet order. When a patient received multiple diet orders (i.e., parenteral and clear fluids) simultaneously, the diet that provided the greatest contribution to energy/-protein requirements was recorded.

1.3. Analysis

Nonparametric statistics were used to accommodate violations in the normality assumptions and differences in sample sizes for groups. Descriptive data are expressed as mean ± SD and/or median (range) unless otherwise specified. Data analysis was completed using Microsoft excel. Mann–Whitney U tests were used to compare groups and Fisher Exact test to compare categorical variables. A value of $P < .05$ was considered to be statistically significant.

2. Results

2.1. Study population

The study population ($n = 53$) was comprised of general surgery (59%), neurosurgical (28%) and urology (13%) (Table 1). All surgeries were performed under general anesthesia. The majority of procedures were categorized as noncomplex. Abdominal surgery comprised the largest number of surgeries classified as complex (Table 2). The mean age was 6.3 ± 6 years (2 weeks–16.7 years) and median length of stay was 5 days (1–36). Length of stay (LOS) was significantly ($p < 0.05$) different between all surgical groups; for urology patients a median of 2 (1–9) days compared to general surgery at 4 (1–29) days and neurosurgical patients at 6 (2–36) days. At admission, 80% of the children under the age of 2 years were classified as being in a healthy weight range based on weight for length z scores, while 16% were classified as underweight and 4% as overweight/obese. In children greater than 2 years of age, 79% were in a healthy weight range based on BMI z scores, 3% were underweight and 18% were overweight or obese. Admission weights were recorded, however, discharge weights were recorded in only 14/53 patients.

2.2. NPO times and comparison to recommendations

All feeding instructions were written by the admitting surgical service. Table 3 illustrates the hours spent NPO and time until first nutrition for complex ($n = 10$) and noncomplex ($n = 43$) surgeries. The preoperative NPO time range for both groups was 0–23.5 h with a mean of 11 ± 5 h. Of the 53 patients, 18(34%) were ordered NPO preoperatively at midnight, or earlier, the evening prior to surgery.

The median postoperative time spent NPO for complex procedures was significantly ($p < 0.01$) greater (range 2–75.5 h) than noncomplex procedures (range of 0–63 h; Table 3). Seventy-one percent of the noncomplex patients were NPO postoperatively less than 8 h compared to 18% of the complex patients. The median total NPO time was significantly greater ($p < 0.01$) for complex compared to noncomplex procedures (Table 3). Percentage of hospital stay spent NPO was not significantly different between the groups. Time to first nutrition was significantly longer ($p < 0.01$) for patients receiving complex surgeries at a median of 63.6 h compared with 23.8 h for noncomplex surgeries (Table 3).

Table 3 also compares the proportion of complex and noncomplex patients that met current guidelines for preoperative fasting times with those that did not. When the preoperative NPO times were compared to guidelines, it was observed that none of the patients were

Table 1
Patient demographics.

Surgical group	General	Neurosurgery	Urology	Total surgeries
Population *N* (%)	31 (59)	15 (28)	7 (13)	53 (100)
Age* (y)	6.5 ± 6.4[a]	6.4 ± 5.8[a]	5.3 ± 5.5[a]	6.3 ± 6
Male *N* (%)	17 (55%)	8 (53%)	6 (86%)	31 (58%)
Length of stay* (days)	4[a] (1–29)	6[b] (2–36)	2[c] (1–9)	5(1–36)

* Age reported as mean ± SD. Length of stay reported as median (range) values within the same row with different superscript letters indicate significant differences between groups ($p < .05$).