Journal of Pediatric Nursing (2014) **29**, 258–267

Pediatric Fasting Times Before Surgical and Radiologic Procedures: Benchmarking Institutional Practices Against National Standards[1,2]

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Received 3 August 2013; revised 20 November 2013; accepted 25 November 2013

Key words:
Pediatric preoperative fasting;
Pediatric fasting time orders;
Fasting before sedated radiological procedures;
Compliance with ASA preoperative fasting guidelines

Prolonged preoperative fasting can be associated with adverse outcomes, particularly in children. Our aims were to assess the time pediatric patients fasted prior to surgical or radiologic procedures and evaluate whether fasting (NPO) orders complied with national guidelines. We measured NPO start time, time of last intake, and time test or surgery was scheduled, took place, or was cancelled in 219 pediatric patients. Findings demonstrate that pediatric patients experienced prolonged fasting before procedures and that the majority of NPO orders were non-compliant with national guidelines. We have developed strategies to reduce fasting times and ensure compliance with recommended national fasting standards.

NON PER OS or nil per os (NPO) is the Latin phrase for nothing by mouth and defines a medical instruction to withhold oral food or fluids from a patient. In 1883, Lister recommended that there should be no solid matter in the stomach, but patients should drink clear liquid about 2 hours before surgery. For the next 80 years most textbooks recommended a 6 hour fast for solids and 2–3 hours for clear liquids (Maltby, 2000).

The traditional practice of "NPO after midnight" (or no liquid or food after 12 am) on the day of surgery likely originated in 1946 because of a report by Mendelson documenting a high incidence of pulmonary aspiration in obstetric patients following general anesthesia (Mendelson, 1946). Thereafter, prolonged preoperative fasting became a "time–honored" tradition. However, large studies have documented a progressive decline in incidence of

[1] Funded by Children's Research Institute, Research Advisory Council Grant # 203 (2007–2010), Children's National Medical Center, Washington, DC.

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0882-5963/$ – see front matter
http://dx.doi.org/10.1016/j.pedn.2013.11.011

aspiration, from 0.15% in 1946 (Mendelson, 1946) to 0.006% in 2002 (Fasting & Gisvold, 2002). In addition, the typical order of "NPO after midnight" has been challenged because of complications associated with prolonged fasting.

The American Society of Anesthesiologists (ASA) developed evidence-based guidelines (Hung, 1992; Smith, 1997; Yogendran, Asokumar, Cheng, & Chung, 1995) that support more liberal preoperative fasting times both in healthy patients undergoing elective general anesthesia for surgical procedures and those undergoing radiology tests that require sedation (American Society of Anesthesiologists, 1999, 2011). Both the American Academy of Pediatrics (AAP) and the American Academy of Pediatric Dentistry (Cote & Wilson, 2006) have endorsed the ASA fasting guidelines; these apply to patients of all ages (ASA, 1999). ASA developed the guidelines based on compelling evidence that:

- Pulmonary aspiration is a rare complication of modern anesthesia
- There is little relationship between fasting duration and gastric volume or pH
- Prolonged fasting can be associated with adverse effects and
- Liquids and solids are eliminated differently from the stomach (clear liquids leave the stomach almost immediately whereas solids are not eliminated until they are broken down into smaller particles (Pandit & Pandit, 1997).

The 1999 ASA preoperative fasting guidelines, updated in 2011, allow patients to ingest clear liquids up to 2 hours, breast milk up to 4 hours, and a regular meal up to 8 hours before a surgical or radiologic procedure with sedation or general anesthesia.

Although research findings document that pulmonary aspiration is a rare complication of modern anesthesia, prolonged fasting prior to surgery is unnecessary and can, in fact, lead to adverse effects such as hunger, thirst, hypoglycemia, dehydration, hypovolemia (Hung, 1992; Experts debate NPO, 1994), ketosis, discomfort (Manworren & Fledderman, 2000), electrolyte imbalance, malnutrition, and general malaise (Brady et al., 2010; Watson & Shupikai, 2002). Three to 12 hours after eating the body shifts into a state of early fasting, also known as a post-absorptive state. After 12 hours of fasting, the post-absorptive state shifts to that of a fasting state, which is characterized by hypoglycemia or low blood sugar levels (Johnson & Leck, 2010). Signs of hypoglycemia include hunger, shakiness, dizziness, confusion, difficulty speaking and feeling anxious or weak (Feldman, Friedman, & Brandt, 2010; Halaby & Steinkrauss, 2012). Neuroglycopenic symptoms include somnolence, visual disturbances, irritability, abnormal behavior, confusion, amnesia, paresthesias, stupor, drowsiness, coma, and seizures. Symptoms of hypoglycemia can also be caused by catecholamine release (adrenergic symptoms) and include anxiety, palpitations, weakness, fatigue, headache, tremor, and sweating. Coma occurs in up to 53% of patients and convulsions in 12% (Feldman et al., 2010).

Dehydration may also be imminent in children because they have a higher potential for fluid loss than do adults (Manworren & Fledderman, 2000). Placing children on maintenance intravenous fluids during periods of preoperative fasting may prevent dehydration and hypoglycemia (Ferrari, Rooney, & Rockof, 1999) as well as decrease patient irritability. Maintenance fluids do not, however, prevent the uncomfortable side effects pediatric patients often experience such as hunger, thirst, and headache. For infants and children, extended fasting also can be associated with discomfort and distress that can reduce the quality of their inpatient stays and contribute to parent and patient dissatisfaction with their hospital experiences. Clear liquids appear to add no additional risk for aspiration of gastric content in normal healthy children and may provide some psychological benefit, as demonstrated by a decrease in irritability before induction of anesthesia (Muslim, Engin, Tahir, & Abdullah, 2009).

The NPO policy at our pediatric organization is congruent with fasting recommendations from the ASA (1999). While some of our providers believed that we were complying with ASA fasting time guidelines, others believed that prolonged fasting times were being imposed unnecessarily for our pediatric patients who are more susceptible to the adverse effects of fasting than are adults. Preliminary data from a unit-based project at our institution indicated that our fasting times before surgical or radiologic procedures that required sedation or general anesthesia were longer than necessary (mean fasting = 10.9 hours) based on ASA guidelines. Because of these findings, we believed that further investigation was warranted.

Purpose

The primary aim of this study was to measure the length of time inpatients fasted prior to surgical or radiologic procedures (including the length of time patients fasted before procedures were cancelled) and evaluate whether our written fasting orders were compliant with ASA guidelines. We also evaluated fasting times for patients who had scheduled and unscheduled (add-on) procedures, determined the total amount of preoperative IV maintenance fluids infused, and recorded adverse fasting signs and symptoms observed by caregivers. Our long-term objective was to determine if corrective interventions were required to ensure that fasting times for our patients were consistent with recommended national standards without prolonging fasting times unnecessarily.

Methods

Design, Sample, and Setting

Our descriptive, exploratory study, approved by the hospital's institutional review board was conducted in an