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Incidence of excessive preoperative fasting: a prospective observational study

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Editor—Preoperative fasting is a standard procedure before surgery that aims to prevent pulmonary aspiration. However, consequences of excessive preoperative fasting include dehydration, reduced patient comfort, increased post-operative insulin resistance, and increased catabolic response to surgery.^{1,2} Current preoperative fasting guidelines advise that adults should fast 6 h for solids and 2 h for clear fluids, the 6–2 hour rule.^{3,4} Children should fast 6 h for solids, 4 h for human milk, and 1 h for clear fluids (the 6–4–1 hour rule).⁵ Moreover, intake should be encouraged up to these limits.^{3,5} Small cohort studies, mostly from surgical specialities, suggest that adherence to fasting guidelines is poor and excessive fasting seems the rule rather than the exception.^{6–8} We hypothesised that excessive preoperative fasting is still common practice. We aimed to assess the average preoperative fasting times for electively scheduled adult and paediatric surgical patients, and to identify risk factors influencing preoperative fasting.

We conducted a single-centre, prospective, observational cohort study to assess preoperative fasting times in adult and paediatric patients undergoing elective surgery in the operating theatres of a university hospital in Amsterdam, the Netherlands. Emergency surgical patients were excluded. The Medical Ethical Committee of the Amsterdam UMC, location AMC, confirmed that the Medical Research involving Human Subjects Act (WMO) did not apply for this study (registered as W20_303 # 20.338). The trial was registered in the National Trial Register (<https://trialsearch.who.int/Trial2.aspx?TrialID=NL8999>). Patients were recruited at the preoperative holding between September 9 and October 21, 2020.

After obtaining consent, patients (in the case of children, their parents/caregivers) answered a questionnaire regarding their last dietary intake. Patient characteristics, admission, and surgery details were retrieved from the electronic patient record. A sample size of 759 patients was calculated using nQuery (version 8.5.1.0) assuming normally distributed data and a population standard deviation of 4 h,⁶ with the goal of obtaining a sample size sufficient to have a single mean for preoperative fasting from solids with 95% confidence interval (CI; based on an infinite population) extending 0.3 h both ways and a drop-out percentage of 10%.

Primary endpoints were preoperative fasting times for solid food, clear fluids, and human milk, and the incidence of prolonged preoperative fasting. Prolonged preoperative fasting ('excessive fasting') from solids was defined as fasting for ≥ 8 , ≥ 12 , and ≥ 16 h. Excessive fasting from clear fluids was defined as fasting for ≥ 6 , ≥ 8 , and ≥ 12 h. We defined intake of clear fluids as intake of at least one glass. Secondary endpoints were factors possibly influencing preoperative fasting times, including age, fasting protocol of the ward (standard 6–2 h rule or 6–4–1 h rule, nil per os [NPO] from midnight, use of carbohydrate drinks), surgical schedule (scheduled first of the day, in the morning, or in the afternoon), and surgical pathway (day-case surgery, surgery with same-day or earlier admission).

Data were screened and analysed using IBM SPSS statistics, version 26 (IBM Corp., Armonk, NY, USA). Continuous data are presented as mean (standard deviation [sd]) when normally distributed, and as median with inter-quartile range (IQR) when non-normally distributed. Categorical variables are presented as absolute numbers (n) with percentage (%). A P-value < 0.05 was considered significant.

Table 1 Preoperative fasting times. CI, confidence interval; IQR, inter-quartile range.

Fasting time	All patients			Adults		Children	
	n	Mean (95% CI)	Median (IQR)	n	Median (IQR)	n	Median (IQR)
Solids	749	14.1 h (13.8–14.3 h)	14.1 h (12.2–16.0 h)	609	14.2 h (12.5–16.2 h)	140	13.3 h (9.0–15.2 h)
Clear fluids	727	9.0 h (8.6–9.3 h)	9.8 h (3.8–13.2 h)	596	10.5 h (4.6–13.5 h)	131	3.6 h (2.4–10.0 h)
Human milk	11	4.9 h (4.3–5.5 h)	4.7 h (4.3–5.0 h)	—	—	11	4.7 h (4.3–5.0 h)

We included 757 patients: 610 adults (mean age 53 yr, 52.5% female) and 147 children (mean age 7 yr, 36.1% female) (see [Supplementary Fig. S1](#)). Patient characteristics are shown in [Supplementary Table S1](#). Mean and median preoperative fasting times are shown in [Table 1](#). In contrast to our assumption, data were not normally distributed. For completeness, we provide the mean as well as the median results for the total patient group in [Table 1](#). Median (IQR) preoperative fasting times for all patients were 14.1 (12.2–16.0) h for solids, 9.8 (3.8–13.2) h for clear fluids, and 4.7 (4.3–5.0) h for human milk. The incidence of prolonged fasting (≥ 8 h) occurred in 94.8% of all patients, 98.0% of adults, and 80.7% of children. In [Supplementary Tables S2 and S3](#), the potential risk factors for prolonged preoperative fasting times are shown. Amongst others, increased age correlated with longer preoperative fasting times in adults and in children (adults: $r=0.088$, $P=0.029$; children: $r=0.235$, $P=0.005$). Adult patients restricted to NPO from midnight fasted longer from clear fluids than patients instructed to follow the 6–2 h rule with preoperative carbohydrate drinks. Adult patients undergoing surgery later in the day fasted longer from solids than patients operated during the morning hours. In children, fasting time from clear fluids was associated with the surgical pathway: patients with early admission fasted shorter than day-case patients did.

Our primary finding concerning preoperative fasting times from solids confirms earlier research reporting average fasting times between 13.5 and 16.1 h, with sample sizes ranging from 155 to 343 patients.^{6–8} We found that next to the hospitals' standard preoperative fasting guidelines (adults: 6–2 h rule; children: 6–4–1 h rule), the NPO from midnight regimen was still largely used. A national survey in Japan indicated that health personnel preferred NPO from midnight over more liberal fasting guidelines.⁹ Reasons could include practicality and fear of changing operating room schedules. However, allowing free consumption of clear fluids 2–3 h preoperatively does not lead to more cancellations of procedures or delayed surgery compared with an NPO policy.¹⁰ Our results show that incorporation of preoperative carbohydrate drinks in standardised care protocols leads to shorter fasting time from clear fluids. Incorporating this in a wider variety of standardised care protocols might be beneficial.

Our study has several limitations to be considered. We performed a single-centre study and our patient population might differ from that of other hospitals. Potential selection bias might have coincided with the COVID-19 pandemic, which had a relevant influence on the surgical schedule during the data collection period. Our data depended on patient recall of last intake, which might not always be accurate, creating a recall bias. Finally, we did not assess how patients interpreted the explained fasting times at the outpatient anaesthesiology clinic, which is also of influence on preoperative fasting times.

In conclusion, our results show that patients fast excessively before surgery, and adherence to preoperative fasting guidelines remains poor. Improving adherence requires implementation of the existing guidelines with new strategies, alternative strategies, or both in which all involved specialties cooperate together with the surgical patient. Future studies should focus on existing barriers and how to address them to improve guideline implementation.¹¹ Future studies should focus on making food and drink easily accessible to surgical patients in the waiting period before surgery in the ward to shorten preoperative fasting times, which is one of the known barriers.

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Declaration of interest

None of the authors had conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.bja.2022.12.017>.

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Cancer treatment and perioperative neurocognitive disorders: cognitive evaluation during the perioperative period

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Editor—The *British Journal of Anaesthesia* recently published two review articles, which discussed emerging immunotherapy-related perioperative risks and potential traditional adjuvant chemotherapy-induced perioperative neurocognitive disorders.^{1,2} Although Lewis and colleagues¹ emphasised the importance of immunotherapy-related peripheral organ toxicities, immune checkpoint inhibitors can also enhance systemic immune activation, exert detrimental effects on the brain, and trigger cognitive impairment.³ This raises concerns regarding cognitive deterioration in such patients undergoing surgery and anaesthesia. Therefore, Guran and colleagues² suggested that neuropsychological testing should be routinely performed in patients with cancer before and after chemotherapy treatment, and during the perioperative period.

Many patients undergoing chemotherapy report cognitive complaints; however, most show no objective cognitive decline.⁴ Cancer treatment-associated cognitive changes are usually mild to moderate, and most cancer patients show cognitive recovery after discontinuing chemotherapy.⁵ One nationwide cohort study showed no differences in long-term subjective cognitive impairment at 7–9 yr postoperatively between breast cancer survivors treated with systemic treatment and untreated patients.⁶ Interestingly, preclinical research has described a protective effect of programmed cell death protein (PD)-1 immune checkpoint blockade on cognitive impairment in animal models of Alzheimer's disease.⁷ Blocking the PD-1 pathway evokes a systemic immune response and increases cerebral immunomodulatory monocyte-derived macrophages, subsequently promoting clearance of amyloid plaques, a hallmark of perioperative neurocognitive disorders.

Evidence has shown that cognitive impairment can be affected by the duration of cancer treatment: the longer the duration of chemotherapy, the more profound the impairment can be.⁸ Preoperative adjuvant therapy for invasive cancer can be transient, and these patients often require long-term treatment with multiple modalities, including chemotherapy and immunotherapy after surgery, depending on the pathologic and genetic diagnosis. It has been presumed that the risk of cognitive impairment after completing treatment is higher than that after surgery or anaesthesia. Given that cognitive decline increases with age, cancer-related cognitive impairment is particularly relevant for older individuals. However, few studies have investigated cognitive impairments in older cancer patients treated with chemotherapy and immunotherapy.⁹

One difficulty in performing perioperative cognitive evaluation is determining the true change over time, as neuropsychological testing can be influenced by clinical practice. Only a weak association has been observed between objective neuropsychological tests and cognitive symptoms in cancer patients receiving chemotherapy.¹⁰ These patients score in the normal range on neuropsychological tests despite often having cognitive complaints, which is mostly linked with psychological factors such as anxiety, depression, or insomnia that are also common before surgery.⁴ Further studies are needed to evaluate the effects of anaesthesia and surgery on patients with cancer treated before surgery. Risk factors for cognitive decline – including age, duration, and type of preoperative cancer treatment, and type of tumour and surgery – should be explored and recognised. Moreover, it is crucial to