Preoperative Fasting - The Slippery Slope of Changing Guidelines

The Impetus for Change

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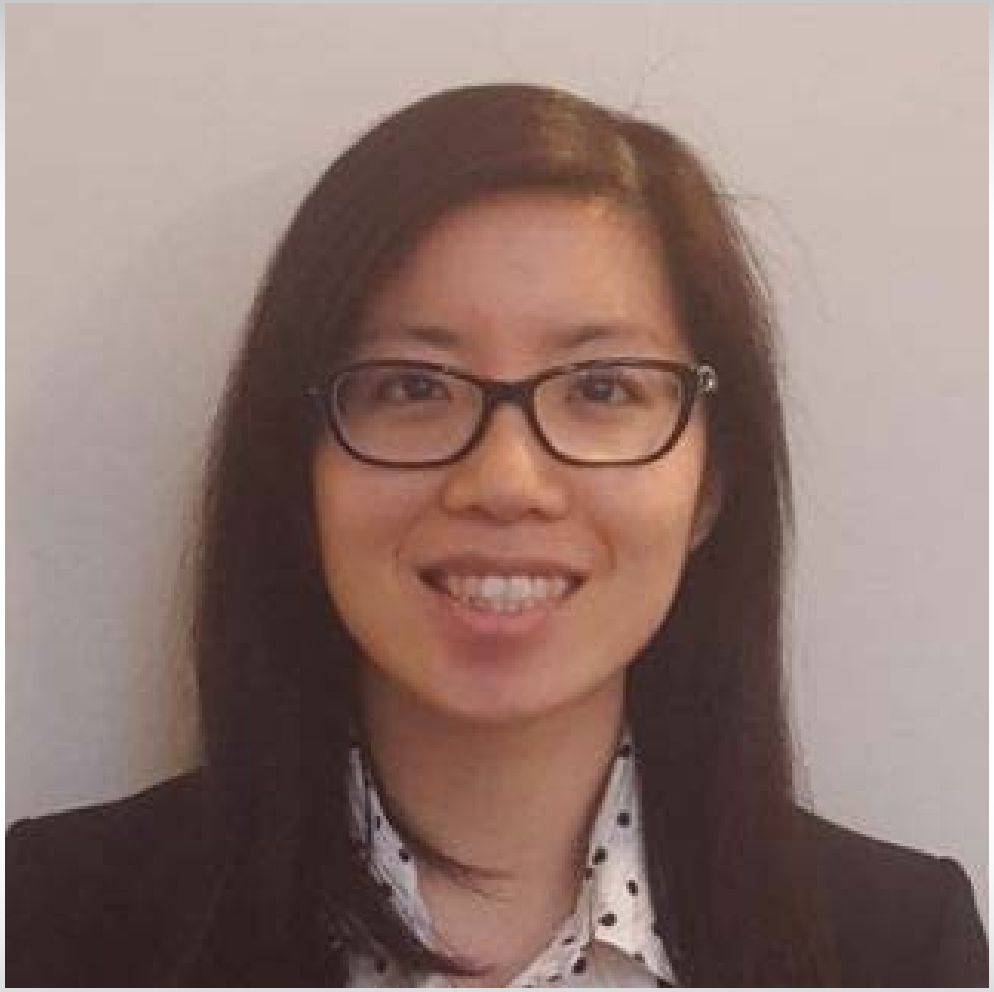
Overview

- Discuss the evidence “supporting” the status quo
- Discuss the reasons for change
- Win this debate
- Stay friends with everyone!
- Stimulate discussion



- What is the first rule of evidence based medicine?
  - Know the evidence!!!!

- Where did fasting guidelines originate?

- Curtis Lester Mendelson
- Am J Obstet Gynecol 1946
- 66/44,016 pregnancies (1932 – 1945) had aspiration (0.15%)
- 2 deaths due to complete airway obstruction with large particulate matter

Vol. 176, No. 3 229

Aspiration Pneumonitis—Mendelson's Syndrome

David E. Dines, M.D., William G. Baker, M.D., and Willard A. Scantland, M.D., Denver

MENDELSON'S syndrome, or peptic-aspiration pneumonia, was first described in obstetrical cases by Mendelson [1] in 1946. Classically, there is a history of vomiting after inhalation anesthesia, either during the operation or in the early postoperative period. Two to five hours after aspiration there is a dramatic onset of cyanosis, dyspnea, tachycardia, and shock.[2] Examination of the patient shows no localized signs of lung disease but generalized adventitious sounds and bronchospasm. The condition simulates pulmonary edema with rales, wheezes, and rhonchi throughout both lungs. There is a bloody, frothy sputum and marked pulmonary congestion. A very high pulse and respiratory rate are common, and gross pulmonary edema may supervene, with a rapidly deteriorating course resulting in death from cardiac failure. X-ray of the chest shows soft patchy mottling scattered through the lung fields but no evidence of lung collapse. Postmortem examination of the lungs will show gross swelling of tissue and a pink frothy edema fluid throughout the trachea, bronchi, bronchioles, and alveoli. Microscopically, peribronchiolar hemorrhages and exudate, areas of necrosis of bronchiolar epithelium, and a marked leukocytic reaction can be seen. Free hydrochloric acid can often be demonstrated by staining.[3]

Wykoff [4] has emphasized the prevention of this catastrophe, and it must diligently be pursued. However, aspiration of gastric contents can and will continue to occur, even in the face of conscientious efforts toward prevention. No single method or combination of technics recommended is completely foolproof. Obvious vomiting is not a prerequisite to the entrance of stomach contents into the respiratory tree.[5, 6] Silent regurgitation is a hazard recognized by all those indoctrinated in the complications attending anesthesia. The origin of material found in the pharynx of an anesthetized individual is not easily identified. The addition of gastric contents to pharyngeal secretions does not always impart a characteristic appearance, odor, or consistency to the resultant material. For these reasons, it is not always easy to know when aspiration of gastric contents has occurred, or when immediate vigorous suctioning and irrigation of the respiratory tract is indicated.

Recognizing the facts that this critical illness can occur in spite of conscientious efforts toward prevention and that relatively little attention is devoted to treatment of this condition in recent literature, we present the following case report.

Report of a Case

The patient, a 23-year-old male, was admitted to Presbyterian Hospital on March 18, 1960, with a diagnosis of acute appendicitis. He had been seen by one of us on Feb. 16, 1960, for a routine physical examination. At that time, the chest x-ray, hemoglobin, white blood cell count, sedimentation rate, and urinalysis were normal. An electrocardiogram taken at that time at the patient's request was normal. He was 30 lb. (13.6 kg.) overweight and was placed on a weight-reduction program. He was well until March 18, when he developed acute abdominal pain associated with anorexia, nausea, and vomiting. The white blood cell count on admission to the hospital was 16,000 per cu. mm., with 81% segmented neutrophils, 17% lymphocytes, and 2% monocytes. The urinalysis was normal, and the flat plate of the abdomen was negative. The diagnosis of acute appendicitis was confirmed at surgery.

He was brought to the operating room for emergency surgery at 2:30 A.M. after having received 100 mg. of secobarbital (Seconal) sodium, 10 mg. of morphine, and 0.4 mg. of atropine, intramuscularly at 1:20 A.M. He was talkative and did not appear depressed. Orotracheal intubation was achieved immediately after injection of 300 mg. of thiamylal sodium and 80 mg. of succinylcholine chloride intravenously. Anesthesia was maintained with 2% liters of nitrous oxide, 1½ liters of oxygen, and fluothane. Muscle relaxation was achieved with 0.2% succinylcholine given as an intravenous drip, with a total of 500 mg. being used during the 75-minute procedure. At the termination of surgery, the patient was awake, restless, and making efforts to remove his own endotracheal tube. On removal of the tube, the patient sustained an immediate and severe laryngospasm requiring an additional 40 mg. of succinylcholine intravenously, followed by artificial ventilation with 100% oxygen and suctioning of the pharynx. After full muscle power had returned, he was moved to his room at 4:30 A.M., in apparently good condition.

His postoperative progress was apparently satisfactory until 1 P.M., when he rapidly became acutely and critically ill with a clinical picture of dyspnea, tachypnea, profuse perspiration, tachycardia, cyanosis, and a cough, productive of frothy pink fluid. There were rales, wheezes, and rhonchi throughout both lungs. He appeared to have pulmonary edema. An electrocardiogram showed sinus tachycardia. Suction was carried out and oxygen was started. A diagnosis of aspiration pneumonitis was entertained clinically and confirmed by portable chest x-ray (Fig. 1).

The patient was given 100 mg. of hydrocortisone, intravenously, and 500 mg. of aminophylline in 500 cc. of 5% dextrose in water by intravenous drip. At 5 P.M., when the hydrocortisone was given, the patient was semicomatose and deteriorating rapidly. Within the next hour, his dyspnea subsided; by 8 P.M. his chest was clear, he was sensing well, and his color was described as good. By the next morning, he appeared to be completely recovered, although a repeat chest x-ray showed only slight improvement. He was given steroids and prophylactic penicillin for 3 days,

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Where did fasting guidelines originate?

lungs of adult rabbits. . . . The fol-

. . . Following aspiration of neutral liquid (distilled water, normal saline, or neutralized liquid vomitus) in equal quantities to the preceding series of acid experiments, the animals go through a brief phase of labored respirations and cyanosis, but within a few hours they are apparently back to normal, able to carry on rabbit activities uninhibited. . . . The gross path-

"Aspiration of stomach contents into the lungs is preventable. The dangers of this complication as an obstetric hazard may be avoided by: (a) withholding oral feeding during labor and substituting parenteral administration where necessary; (b) wider use of local anesthesia where indicated and feasible; (c) alkalinization of, and emptying the stomach contents prior to the administration of a general anesthetic; (d) competent administration of general anesthesia with full appreciation of the dangers of aspiration during induction and recovery; (e) adequate delivery-room equipment, including transparent anesthetic masks, tiltable delivery table, suction, laryngoscope, and bronchoscope; and (f) differential diagnosis between the two syndromes described, and prompt institution of suitable therapy." 3 references.

1. Withhold oral feeding
2. Avoid GA where possible
3. Alkalinize stomach
4. Be competent
5. Be prepared (see 4)
6. Quickly treat the right problem (see 4)

Aspiration Pneumonitis—Mendelson's Syndrome

David E. Dines, M.D., William G. Baker, M.D., and Willard A. Scantland, M.D., Denver

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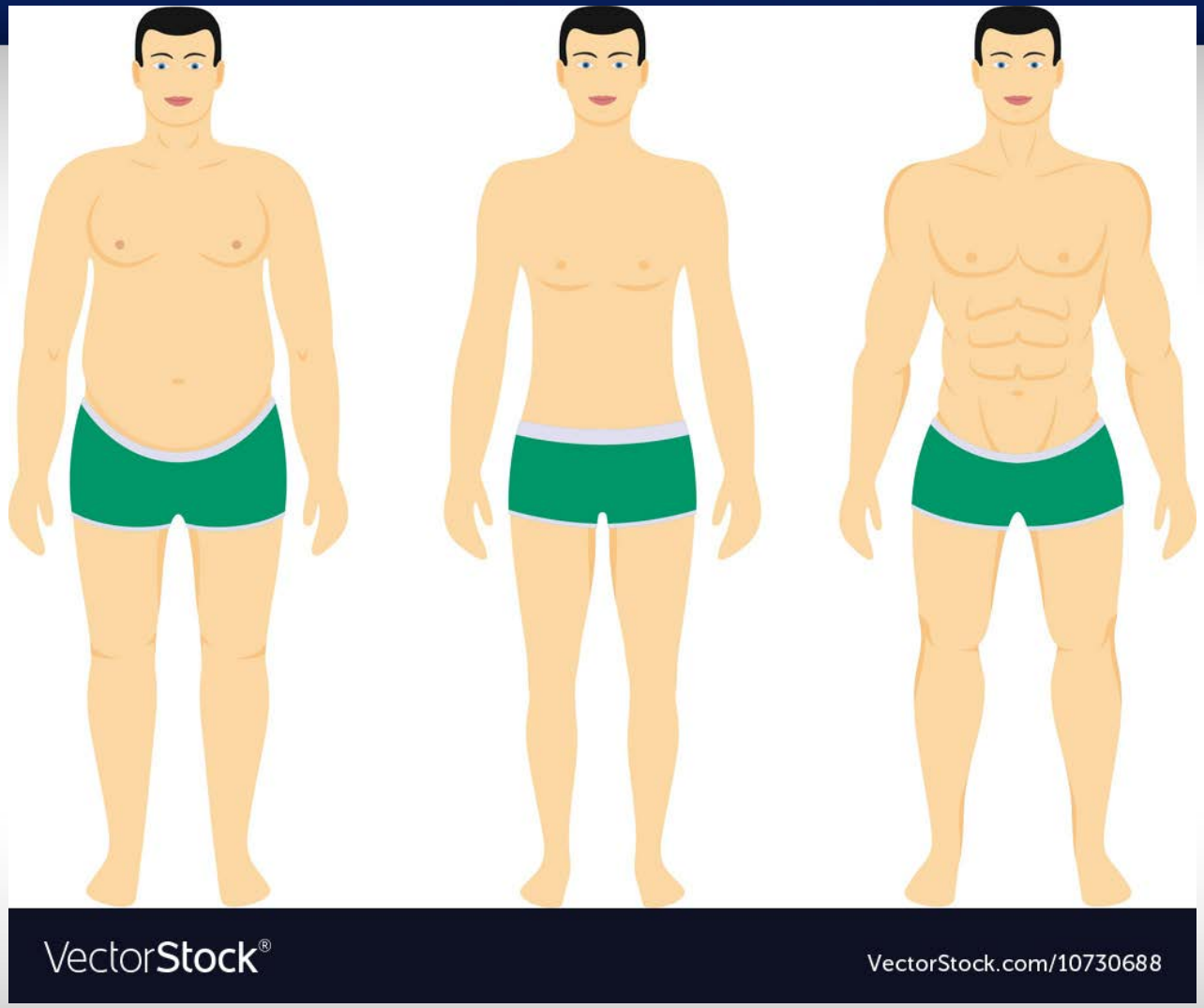

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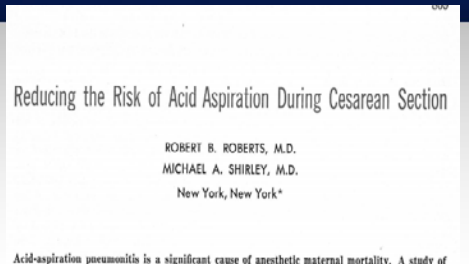

Reducing the Risk of Acid Aspiration During Cesarean Section

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MICHAEL A. SHIRLEY, M.D.
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Acid-aspiration pneumonitis is a significant cause of anesthetic maternal mortality. A study of

A recent case brought to our attention has led us to reconsider the significance of one of our experiments with Rhesus monkeys, performed in 1974.[4] In this case, which cannot be reported fully because of continuing litigation, a young woman anesthetized without endo-

- This was never published

varies with the locality and with the experience of the anesthesiologist or anesthetist present, a substantial proportion of maternal anesthetic deaths are due to acid-aspiration pneumonitis. In 1940, Hall[6] first drew attention to the frequency of aspiration pneumonitis in obstetrics. Three of his 14 cases involved c-section. Mendelson,[7] in his

In 1956, Edwards and coworkers,[11] reviewing 1000 deaths associated with anesthesia in the United Kingdom (U.K.), reported that over half of all obstetric anesthetic deaths were due to aspiration of vomitus. An U.K. report[12] for 1967-69 confirms this, and provides further depressing evidence that, from 1961 through 1969, both

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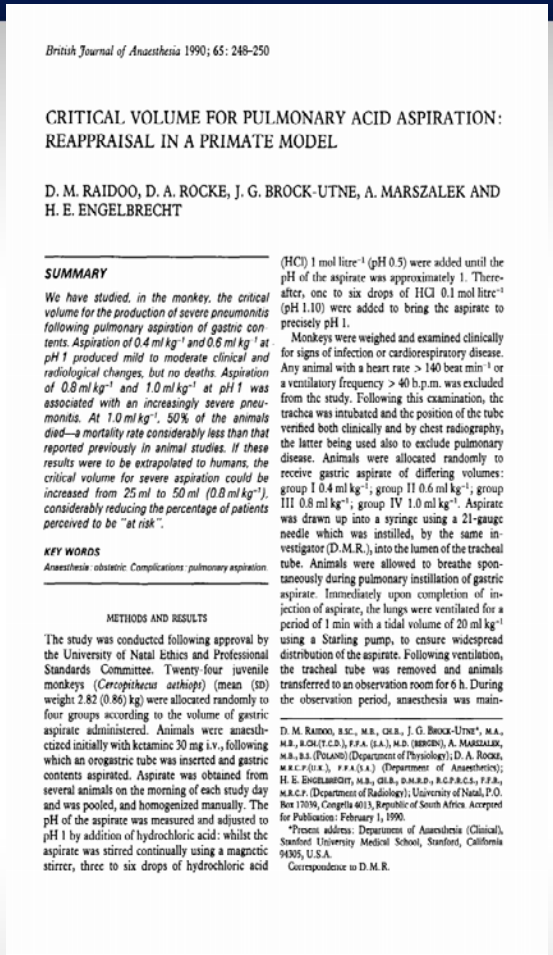
- Raidoo, et al. Br J Anaesth. 1990 Aug;65(2):248-50.
- gastric residual fluid volume >0.8 mL/kg and pH <2.5



British Journal of Anaesthesia 1990; 65: 248-250

CRITICAL VOLUME FOR PULMONARY ACID ASPIRATION: REAPPRAISAL IN A PRIMATE MODEL

D. M. RAIDOO, D. A. ROCKE, J. G. BROCK-UTNE, A. MARSZALEK AND H. E. ENGELBRECHT

SUMMARY

We have studied, in the monkey, the critical volume for the production of severe pneumonitis following pulmonary aspiration of gastric contents. Aspiration of 0.4 ml kg^{-1} and 0.6 ml kg^{-1} at pH 1 produced mild to moderate clinical and radiological changes, but no deaths. Aspiration of 0.8 ml kg^{-1} and 1.0 ml kg^{-1} at pH 1 was associated with an increasingly severe pneumonitis. At 1.0 ml kg^{-1}, 50% of the animals died—a mortality rate considerably less than that reported previously in animal studies. If these results were to be extrapolated to humans, the critical volume for severe aspiration could be increased from 25 ml to 50 ml (0.8 ml kg^{-1}), considerably reducing the percentage of patients perceived to be "at risk".

KEY WORDS

Anaesthesia: obstetric. Complications: pulmonary aspiration.

METHODS AND RESULTS

The study was conducted following approval by the University of Natal Ethics and Professional Standards Committee. Twenty-four juvenile monkeys (*Cercopithecus aethiops*) (mean (SD) weight 2.82 (0.86) kg) were allocated randomly to four groups according to the volume of gastric aspirate administered. Animals were anaesthetized initially with ketamine 30 mg i.v., following which an orogastric tube was inserted and gastric contents aspirated. Aspirate was obtained from several animals on the morning of each study day and was pooled, and homogenized manually. The pH of the aspirate was measured and adjusted to pH 1 by addition of hydrochloric acid: whilst the aspirate was stirred continually using a magnetic stirrer, three to six drops of hydrochloric acid (HCl) 1 mol litre^{-1} (pH 0.5) were added until the pH of the aspirate was approximately 1. Thereafter, one to six drops of HCl 0.1 mol litre^{-1} (pH 1.10) were added to bring the aspirate to precisely pH 1.

Monkeys were weighed and examined clinically for signs of infection or cardiorespiratory disease. Any animal with a heart rate > 140 beat min^{-1} or a ventilatory frequency > 40 b.p.m. was excluded from the study. Following this examination, the trachea was intubated and the position of the tube verified both clinically and by chest radiography, the latter being used also to exclude pulmonary disease. Animals were allocated randomly to receive gastric aspirate of differing volumes: group I 0.4 ml kg^{-1}; group II 0.6 ml kg^{-1}; group III 0.8 ml kg^{-1}; group IV 1.0 ml kg^{-1}. Aspirate was drawn up into a syringe using a 21-gauge needle which was instilled, by the same investigator (D.M.R.), into the lumen of the tracheal tube. Animals were allowed to breathe spontaneously during pulmonary instillation of gastric aspirate. Immediately upon completion of injection of aspirate, the lungs were ventilated for a period of 1 min with a tidal volume of 20 ml kg^{-1} using a Starling pump, to ensure widespread distribution of the aspirate. Following ventilation, the tracheal tube was removed and animals transferred to an observation room for 6 h. During the observation period, anaesthesia was main-

D. M. RAIDOO, B.SC., M.B., CH.B., J. G. BROCK-UTNE*, M.A., M.B., B.CH.(T.C.D.), F.F.A. (S.A.), M.D. (BERGEN), A. MARSZALEK, M.B., B.S. (POLAND) (Department of Physiology); D. A. ROCKE, M.R.C.P.(U.K.), F.F.A.(S.A.) (Department of Anaesthetics); H. E. ENGELBRECHT, M.B., CH.B., D.M.R.D., R.C.P.R.C.S., F.F.R., M.R.C.P. (Department of Radiology); University of Natal, P.O. Box 17039, Congella 4013, Republic of South Africa. Accepted for Publication: February 1, 1990.

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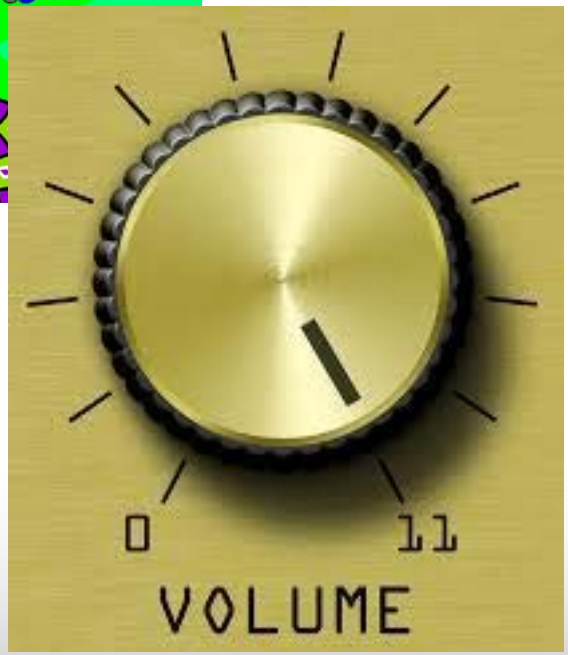

Problems

- Problems with the concept of volume reduction
  - The stomach is never empty!!

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6-4-2

Problems with the 6 hour part

Pediatric Anesthesia

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ORIGINAL ARTICLE

Fasting times and gastric contents volume in children undergoing deep propofol sedation – an assessment using magnetic resonance imaging

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Keywords
magnetic resonance imaging; gastrointestinal contents; propofol; deep sedation; preoperative period; fasting

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Summary

Aim: To investigate the effect of fasting times for clear fluids and solids/non-clear fluids on gastric content volume using magnetic resonance imaging (MRI).

Methods: Pediatric patients undergoing diagnostic MRI under deep propofol sedation, with the stomach located within the area of diagnostic study, were included in this clinical observational study. According to standard institutional guidelines, children were allowed to eat/drink until 4 h and to drink clear fluids until 2 h before scheduled induction time of anesthesia. Gastric content volume per kg body weight (GCV_w) was determined using MRI and compared with actual fasting times prior to induction.

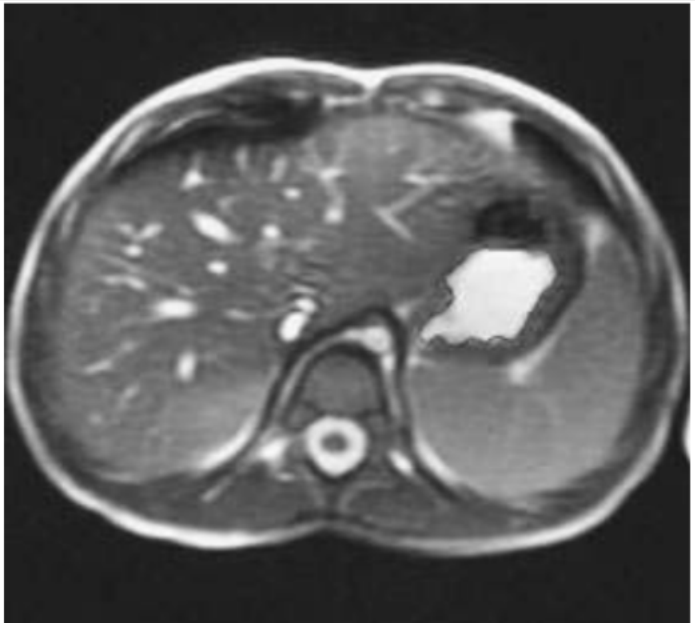
Results: Overall 68 patients aged from 0.3 to 19.6 (2.8) years were investigated. Fasting time for clear fluids ranged from 1.1 to 15.5 (5.5) h, for non-clear fluids/solids from 4.0 to 20.2 (6.7) h. GCV_w ranged from 0.2 to 6.3 (0.75) $ml \cdot kg^{-1}$ and showed no significant negative correlation to fasting times for clear fluids ($r = -0.07$, $P = 0.60$) and non-clear fluids/solids ($r = -0.08$, $P = 0.51$).

Conclusions: Based on this preliminary data, GCV_w showed considerable variation but did not correlate with fasting times in children and adolescent patients. Recommended fasting times were often exceeded.

Introduction

While preoperative fasting is the main concept in anesthesia to prevent perioperative pulmonary aspiration of gastric contents in elective procedures, prolonged fasting has negative impact on intravascular volume status, blood glucose level, behavior, and patient/parent satisfaction (1). Discomfort resulting from hunger and thirst is clearly in favor of shorter fasting times of 2 h for clear fluids. Both comfort and safety aspects have been considered in currently used fasting guidelines, e.g., the fasting guidelines of the American Society of Anesthesiology (ASA) which recommend 2 h fasting for clear fluids, 4 h for human breast milk, and 6 h for food and other fluids (2). According to several surveys, liberalized fasting times seem to be generally applied, but with some variations in clinical practice (3–5). In the authors' institution, the concept of 2 h fasting for clear fluids and 4 h for other fluids and light meals has been established several years ago and is routinely applied in children undergoing general anesthesia or deep sedation with the preservation of spontaneous ventilation (6,7).

Modern magnetic resonance scanners produce high resolution images and allow accurate volume measurement of various organs (8,9). Magnetic resonance imaging (MRI) has been used in adults to examine gastric volume and emptying (10–15) and in a preoper-



- What does the literature say about actual patient outcomes?
- Does fasting actually reduce risk of aspiration?

Table 1. Procedures Performed by NPO Status

	NPO	Not NPO	Missing NPO
	N = 82,546	N = 25,401	N = 31,195
Airway (bronchoscopy)	713 (0.86)	202 (0.80)	369 (1.18)
Bone (fracture reduction)	1,699 (2.06)	949 (3.74)	554 (1.78)
Cardiac (catheterization or echocardiogram)	966 (1.17)	303 (1.19)	480 (1.54)
Dental	485 (0.59)	70 (0.28)	94 (0.30)
Foreign body removal (nose, ear, or skin)	9 (0.01)	5 (0.02)	9 (0.03)
Gastrointestinal (upper or lower endoscopy)	9,794 (11.86)	638 (2.51)	2,619 (8.40)
Oncology (lumbar puncture or bone marrow)	14,226 (17.23)	2,199 (8.66)	4,254 (13.64)
Neurology (EEG)	4,623 (5.60)	1,476 (5.81)	1,923 (6.16)
Ophthalmology examination	68 (0.08)	30 (0.12)	31 (0.10)
Radiology (MRI or CT scan)	44,168 (53.51)	17,963 (70.72)	18,789 (60.23)
Sexual abuse examination	15 (0.02)	3 (0.01)	8 (0.03)
Surgical (minor procedure)	6,881 (8.34)	1,914 (7.54)	2,548 (8.17)

Entries in each cell are the counts and column percentages stratified by NPO status. For example, airway procedures comprised 0.86% of the 82,546 procedures for which NPO status is known. Examples are given in parentheses for some procedures and are not meant to be an exhaustive classification.
CT = computed tomography; EEG = electroencephalogram; MRI = magnetic resonance image; NPO = *nil per os*.

This article is featured in "This Month in Anesthesiology," page 1A.
Submitted for publication January 13, 2015. Accepted for publication September 29, 2015. Corrected on February 20, 2017. From the Departments of Anesthesiology and Pediatrics (M.L.B.) and Department of Biomedical Data Science (M.L.B., S.M.G.), Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire; Department of Emergency Medicine, Nationwide Children's Hospital, Columbus, Ohio (D.M.C.); and Department of Anesthesiology, Perioperative and Pain Medicine, Boston Children's Hospital, Boston, Massachusetts (J.P.C.).

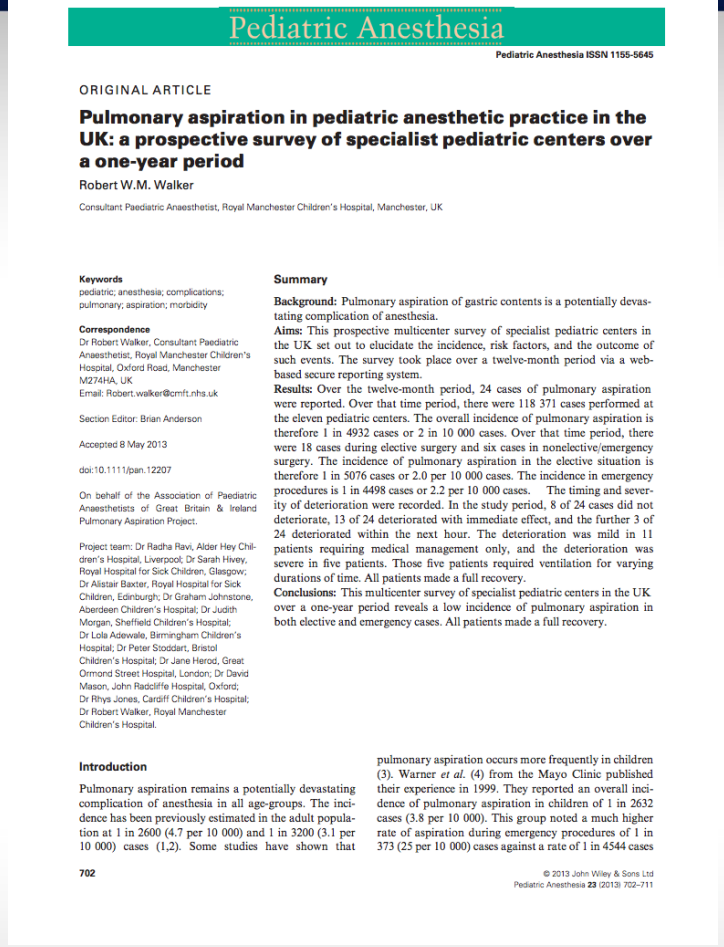
Table 4. Rates for Major Complications/Aspiration and NPO Status

	Rate per 10,000 (95% CI)	Events	N	Odds Ratio (95% CI for Odds Ratio)	*P* Value
Major complications*					
NPO	5.57 (4.08–7.43)	46	82,546	Reference	
Not NPO†	5.91 (3.31–9.74)	15	25,401	1.06 (0.55–1.93)	0.88
Not NPO for liquids‡	0.00 (0–79.2)	0	464	0.00 (0.00–14.86)	1.00
Aspiration					
NPO	0.97 (0.42–1.91)	8	82,546	Reference	
Not NPO†	0.79 (0.10–2.84)	2	25,401	0.81 (0.08–4.08)	0.79
Not NPO for liquids‡	0.00 (0–79.2)	0	464	0.00 (0.00–85.57)	0.83

* Major complications defined as death, aspiration, cardiac arrest, or unplanned admission. † Defined as solids < 8 h or nonclears < 6 h or liquids < 2 h. ‡ Defined as NPO for solids and nonclears but not NPO for liquids (< 2 h).

NPO = *nil per os*.

- Pulmonary aspiration is rare, the associated morbidity and mortality is hard to study



Pediatric Anesthesia

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ORIGINAL ARTICLE

Pulmonary aspiration in pediatric anesthetic practice in the UK: a prospective survey of specialist pediatric centers over a one-year period

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Keywords
pediatric; anesthesia; complications; pulmonary; aspiration; morbidity

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On behalf of the Association of Paediatric Anaesthetists of Great Britain & Ireland Pulmonary Aspiration Project.

Project team: Dr Radha Ravi, Alder Hey Children's Hospital, Liverpool; Dr Sarah Hivey, Royal Hospital for Sick Children, Glasgow; Dr Alistair Baxter, Royal Hospital for Sick Children, Edinburgh; Dr Graham Johnstone, Aberdeen Children's Hospital; Dr Judith Morgan, Sheffield Children's Hospital; Dr Lola Adewale, Birmingham Children's Hospital; Dr Peter Stoddart, Bristol Children's Hospital; Dr Jane Herod, Great Ormond Street Hospital, London; Dr David Mason, John Radcliffe Hospital, Oxford; Dr Rhys Jones, Cardiff Children's Hospital; Dr Robert Walker, Royal Manchester Children's Hospital.

Summary

Background: Pulmonary aspiration of gastric contents is a potentially devastating complication of anesthesia.
Aims: This prospective multicenter survey of specialist pediatric centers in the UK set out to elucidate the incidence, risk factors, and the outcome of such events. The survey took place over a twelve-month period via a web-based secure reporting system.
Results: Over the twelve-month period, 24 cases of pulmonary aspiration were reported. Over that time period, there were 118 371 cases performed at the eleven pediatric centers. The overall incidence of pulmonary aspiration is therefore 1 in 4932 cases or 2 in 10 000 cases. Over that time period, there were 18 cases during elective surgery and six cases in nonelective/emergency surgery. The incidence of pulmonary aspiration in the elective situation is therefore 1 in 5076 cases or 2.0 per 10 000 cases. The incidence in emergency procedures is 1 in 4498 cases or 2.2 per 10 000 cases. The timing and severity of deterioration were recorded. In the study period, 8 of 24 cases did not deteriorate, 13 of 24 deteriorated with immediate effect, and the further 3 of 24 deteriorated within the next hour. The deterioration was mild in 11 patients requiring medical management only, and the deterioration was severe in five patients. Those five patients required ventilation for varying durations of time. All patients made a full recovery.
Conclusions: This multicenter survey of specialist pediatric centers in the UK over a one-year period reveals a low incidence of pulmonary aspiration in both elective and emergency cases. All patients made a full recovery.

Introduction

Pulmonary aspiration remains a potentially devastating complication of anesthesia in all age-groups. The incidence has been previously estimated in the adult population at 1 in 2600 (4.7 per 10 000) and 1 in 3200 (3.1 per 10 000) cases (1,2). Some studies have shown that pulmonary aspiration occurs more frequently in children (3). Warner *et al.* (4) from the Mayo Clinic published their experience in 1999. They reported an overall incidence of pulmonary aspiration in children of 1 in 2632 cases (3.8 per 10 000). This group noted a much higher rate of aspiration during emergency procedures of 1 in 373 (25 per 10 000) cases against a rate of 1 in 4544 cases

- 118 371 cases (included 12 pediatric centers)
- 2/10 000 cases overall
- 2.2 per 10 000 cases for non-elective
- 16 of the 24 cases deteriorated required care
- 5 required icu
- no deaths

- Overall mortality estimate 1/45000 to 1/180,000
- About ¼ due to aspiration

Table 1: Activities Producing a 1:1,000 Risk of Death	
Activity	Time Spent
Rock climbing	25 hours
Regular skydiving	50 hours
Riding a motorcycle	55 hours (cross-country, one way)
Being a 65-year-old man	336 hours (2 weeks)
Skiing	340 hours
Flying on a scheduled airline	1,200 hours About 5 hr of commercial flight
Adapted from L. Laudan, *The Book of Risks: Fascinating Facts about the Chances We Take Every Day*, 1994.	

- What am I Actually Advocating?

–6-4-0

Pediatric Anesthesia

Pediatric Anesthesia ISSN 1155-5645

ORIGINAL ARTICLE

Low incidence of pulmonary aspiration in children allowed intake of clear fluids until called to the operating suite

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What is already known

- Today most departments apply the 6-4-2 fasting regime. Previous studies have shown incidence of pulmonary aspiration in pediatric anesthesia to be 1–10 in 10 000.

What this article adds

- With a regimen allowing free clear fluids until called to the operating suite the incidence of pulmonary aspiration was 3 in 10 000.

Implications for translation

- Shortened fasting times may improve the perioperative experience for parents and children and reduce dehydration and hypoglycemia.

Keywords
anesthesia general; pediatrics; fasting; intraoperative complications; respiratory aspiration of gastric contents; incidence

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Summary

Background: International guidelines recommend 2 h of clear fluid fasting prior to general anesthesia. The pediatric anesthesia unit of Uppsala University Hospital has been implementing a more liberal fasting regime for more than a decade; thus, children scheduled for elective procedures are allowed to drink clear fluids until called to the operating suite.

Aim: To determine the incidence of perioperative pulmonary aspiration in pediatric patients allowed unlimited intake of clear fluids prior to general anesthesia.

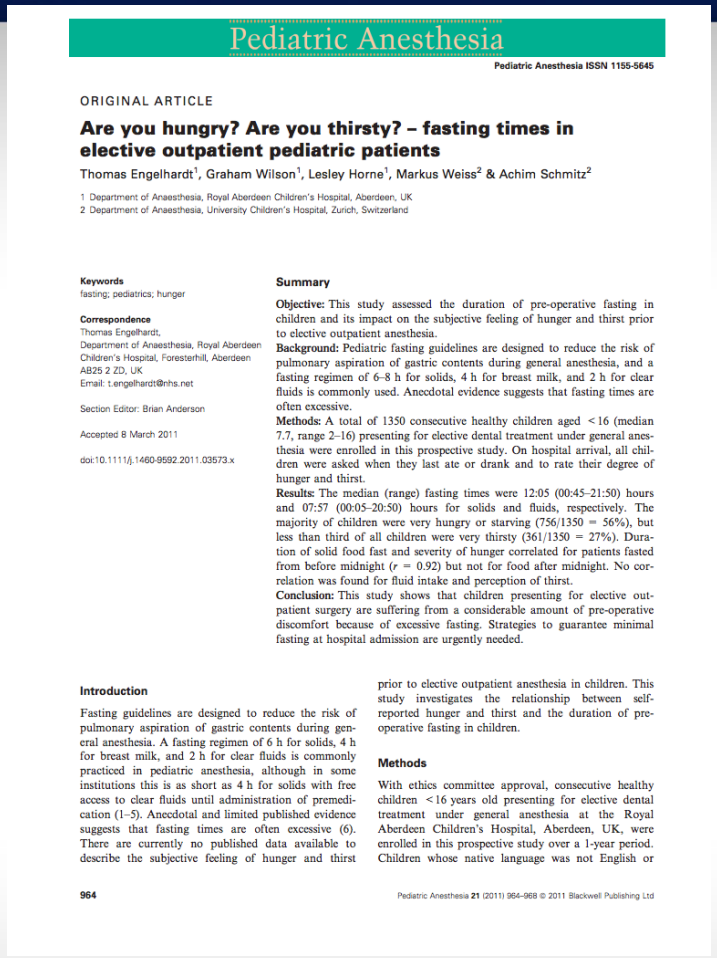
Method: Elective pediatric procedures between January 2008 and December 2013 were examined retrospectively by reviewing anesthesia charts and discharge notes in the electronic medical record system. All notes from the care event and available chest x-rays were examined for cases showing vomiting, regurgitation, and/or aspiration. Pulmonary aspiration was defined as radiological findings consistent with aspiration and/or postoperative symptoms of respiratory distress after vomiting during anesthesia.

Results: Of the 10 015 pediatric anesthetics included, aspiration occurred in three (0.03% or 3 in 10 000) cases. No case required cancellation of the surgical procedure, intensive care or ventilation support, and no deaths attributable to aspiration were found. Pulmonary aspiration was suspected, but not confirmed by radiology or continuing symptoms, in an additional 14 cases.

Conclusion: Shortened fasting times may improve the perioperative experience for parents and children with a low risk of aspiration.

- 10 015 pediatric cases retrospectively review
- 3 aspirations
  - 0 cancellations
  - 0 ICU admissions
  - 0 deaths

- What’s the harm in current fasting guidelines?



Pediatric Anesthesia

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ORIGINAL ARTICLE

Are you hungry? Are you thirsty? – fasting times in elective outpatient pediatric patients

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Keywords
fasting; pediatrics; hunger

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Summary

Objective: This study assessed the duration of pre-operative fasting in children and its impact on the subjective feeling of hunger and thirst prior to elective outpatient anesthesia.

Background: Pediatric fasting guidelines are designed to reduce the risk of pulmonary aspiration of gastric contents during general anesthesia, and a fasting regimen of 6–8 h for solids, 4 h for breast milk, and 2 h for clear fluids is commonly used. Anecdotal evidence suggests that fasting times are often excessive.

Methods: A total of 1350 consecutive healthy children aged <16 (median 7.7, range 2–16) presenting for elective dental treatment under general anesthesia were enrolled in this prospective study. On hospital arrival, all children were asked when they last ate or drank and to rate their degree of hunger and thirst.

Results: The median (range) fasting times were 12:05 (00:45–21:50) hours and 07:57 (00:05–20:50) hours for solids and fluids, respectively. The majority of children were very hungry or starving (756/1350 = 56%), but less than third of all children were very thirsty (361/1350 = 27%). Duration of solid food fast and severity of hunger correlated for patients fasted from before midnight (r = 0.92) but not for food after midnight. No correlation was found for fluid intake and perception of thirst.

Conclusion: This study shows that children presenting for elective outpatient surgery are suffering from a considerable amount of pre-operative discomfort because of excessive fasting. Strategies to guarantee minimal fasting at hospital admission are urgently needed.

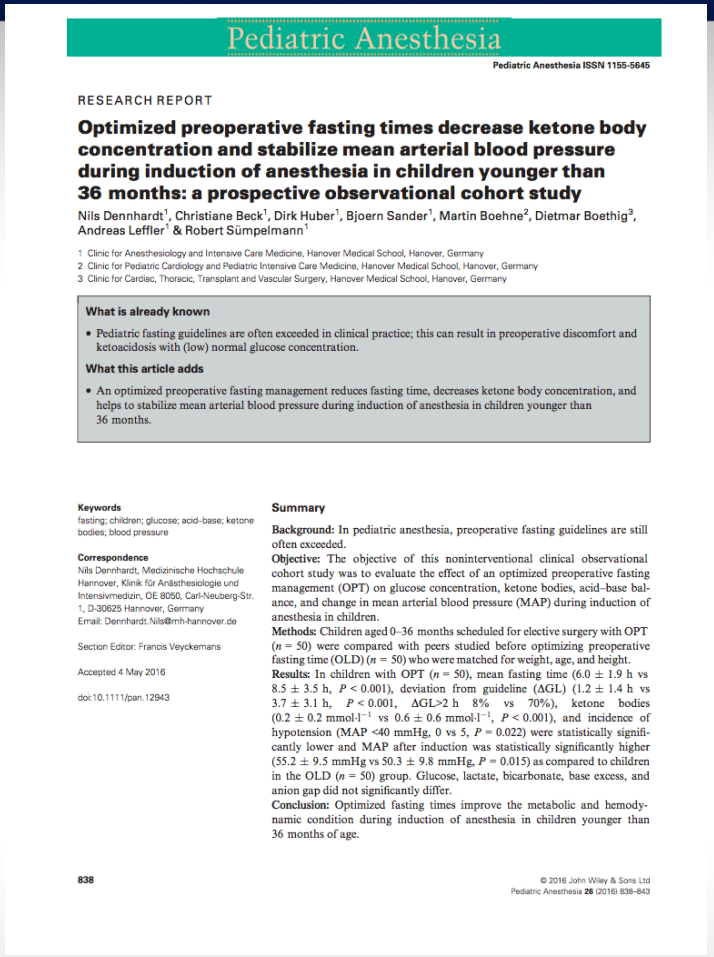
Introduction

Fasting guidelines are designed to reduce the risk of pulmonary aspiration of gastric contents during general anesthesia. A fasting regimen of 6 h for solids, 4 h for breast milk, and 2 h for clear fluids is commonly practiced in pediatric anesthesia, although in some institutions this is as short as 4 h for solids with free access to clear fluids until administration of premedication (1–5). Anecdotal and limited published evidence suggests that fasting times are often excessive (6). There are currently no published data available to describe the subjective feeling of hunger and thirst prior to elective outpatient anesthesia in children. This study investigates the relationship between self-reported hunger and thirst and the duration of pre-operative fasting in children.

Methods

With ethics committee approval, consecutive healthy children <16 years old presenting for elective dental treatment under general anesthesia at the Royal Aberdeen Children's Hospital, Aberdeen, UK, were enrolled in this prospective study over a 1-year period. Children whose native language was not English or

- 1350 consecutive healthy children
- Mean fasting times
  - 12 hours solids
  - 8 hours fluids
- Majority of children were very hungry or starving!



Pediatric Anesthesia

Pediatric Anesthesia ISSN 1155-5645

RESEARCH REPORT

Optimized preoperative fasting times decrease ketone body concentration and stabilize mean arterial blood pressure during induction of anesthesia in children younger than 36 months: a prospective observational cohort study

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2 Clinic for Pediatric Cardiology and Pediatric Intensive Care Medicine, Hanover Medical School, Hanover, Germany
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What is already known

- Pediatric fasting guidelines are often exceeded in clinical practice; this can result in preoperative discomfort and ketoacidosis with (low) normal glucose concentration.

What this article adds

- An optimized preoperative fasting management reduces fasting time, decreases ketone body concentration, and helps to stabilize mean arterial blood pressure during induction of anesthesia in children younger than 36 months.

Keywords
fasting; children; glucose; acid–base; ketone bodies; blood pressure

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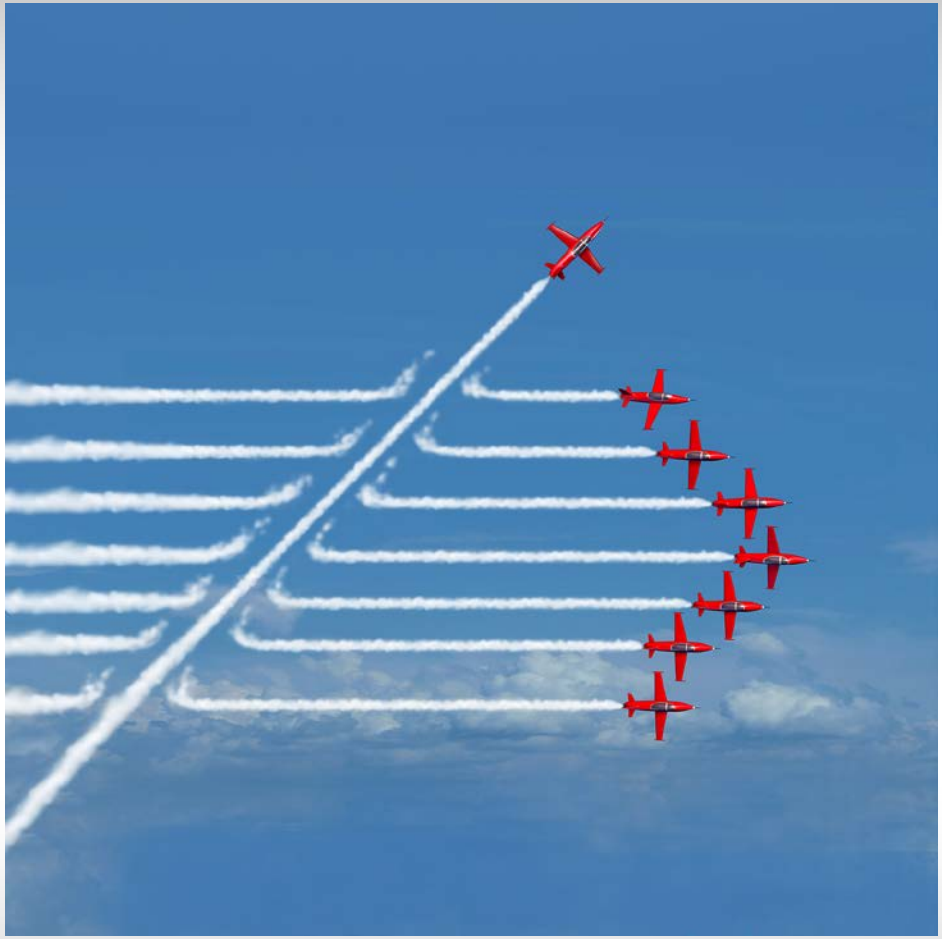
Summary

Background: In pediatric anesthesia, preoperative fasting guidelines are still often exceeded.
Objective: The objective of this noninterventional clinical observational cohort study was to evaluate the effect of an optimized preoperative fasting management (OPT) on glucose concentration, ketone bodies, acid–base balance, and change in mean arterial blood pressure (MAP) during induction of anesthesia in children.
Methods: Children aged 0–36 months scheduled for elective surgery with OPT ($n = 50$) were compared with peers studied before optimizing preoperative fasting time (OLD) ($n = 50$) who were matched for weight, age, and height.
Results: In children with OPT ($n = 50$), mean fasting time (6.0 ± 1.9 h vs 8.5 ± 3.5 h, $P < 0.001$), deviation from guideline (ΔGL) (1.2 ± 1.4 h vs 3.7 ± 3.1 h, $P < 0.001$, ΔGL>2 h 8% vs 70%), ketone bodies (0.2 ± 0.2 mmol·l^{-1} vs 0.6 ± 0.6 mmol·l^{-1}, $P < 0.001$), and incidence of hypotension (MAP <40 mmHg, 0 vs 5, $P = 0.022$) were statistically significantly lower and MAP after induction was statistically significantly higher (55.2 ± 9.5 mmHg vs 50.3 ± 9.8 mmHg, $P = 0.015$) as compared to children in the OLD ($n = 50$) group. Glucose, lactate, bicarbonate, base excess, and anion gap did not significantly differ.
Conclusion: Optimized fasting times improve the metabolic and hemodynamic condition during induction of anesthesia in children younger than 36 months of age.

- Improved hemodynamics and metabolic state

Table 2: Some Risks for Average Americans Annually and Over a Lifetime		
Risk	Annual	Lifetime
You will die of heart disease.	1:340	1:3
You will die of cancer.	1:500	1:5
You will die in an automobile accident.	1:5,000	1:45
You will be murdered.	1:11,000	1:93
You will die from AIDS.	1:11,000	1:97
You will die in an airplane crash.	1:250,000	1:4,000
Adapted from L. Laudan, *The Book of Risks: Fascinating Facts about the Chances We Take Every Day*, 1994.		



- Scientometrics
  - The science of measuring and analyzing science
  - In fact – Medical facts have half lives!!

Truth Survival in Clinical Research: An Evidence-Based Requiem?

Thierry Poynard, MD, PhD; Mona Munteanu, MD; Vlad Ratziu, MD; Yves Benhamou, MD, PhD; Vincent Di Martino, MD; Julien Taieb, MD; and Pierre Opolon, MD

Purpose: Factors associated with the survival of truth of clinical conclusions in the medical literature are unknown. The authors hypothesized that conclusions derived from studies using better methodology should have a longer half-life.

Data Sources: MEDLINE and hand searches of journals with studies on cirrhosis and hepatitis.

Study Selection: Original articles and meta-analyses published from 1945 to 1999 about cirrhosis or hepatitis in adults.

Data Synthesis: In 2000, 285 of 474 conclusions (60%) were still considered to be true, 91 (19%) were considered to be obsolete, and 98 (21%) were considered to be false. The half-life of truth was 45 years. The 20-year survival of conclusions derived from meta-analysis was lower (57% ± 10%) than that from nonrandomized studies (87% ± 2%) ($P < 0.001$) or randomized trials (85% ± 3%) ($P < 0.001$). The survival of conclusions was not different when studies of high methodologic quality were compared with those of low quality. In randomized trials, the 50-year survival rate was higher for 52 negative conclusions (68% ± 13%) than for 118 positive conclusions (14% ± 4%) ($P < 0.001$).

Conclusions: Contrary to the authors' hypothesis, conclusions based on recognized, good methodology had no clear survival advantage. To better convince clinicians of the long-term utility of evidence-based medicine, better prognostic factors should be developed.

Ann Intern Med. 2002;136:888-895. www.annals.org
For author affiliations, see end of text.

Science progresses through a series of paradigms that are held to be true until they are replaced by a better approximation of reality (1). Since the development of the steam engine in the late 18th century, economists have recognized 50-year cycles during which critical technological innovation is introduced (2). In 1997, Hall and Platell (3) estimated the half-life of dogma relating to the practice of surgery. From their analysis of 260 abstracts published from 1935 to 1994, they estimated that the half-life of truth for clinical conclusions in the surgical literature was 45 years. We hypothesized that some factors should be related to this truth survival.

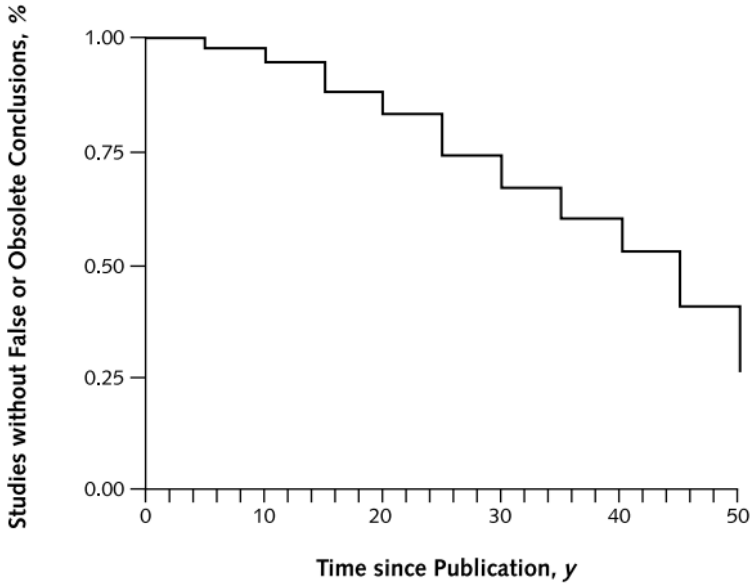
The first hypothesis was that conclusions derived from better methodology should have a longer half-life. If correct, this observation could be a validation of "good methodology," often called *evidence-based medicine* (4). Therefore, we compared the survival of conclusions from meta-analyses with those from isolated, randomized trials or nonrandomized studies. For the conclusions from randomized trials (isolated trials or meta-analyses), we also compared the survival rate on the basis of high versus low methodologic scores.

The second hypothesis was that survival of truth should be higher for negative conclusions than for positive conclusions. A negative conclusion has a better chance of survival because the only way it would not continue to be negative is if it were found to be false. A positive conclusion risks being found to be false or becoming obsolete. We also thought that publication of a negative conclusion in a reputable journal often indicated that a previous positive conclusion had been found to be false. We concluded, therefore, that this second-line analysis should be of higher quality.

To reduce heterogeneity in sampling and evaluation, we chose a single medical discipline—cirrhosis and hepatitis—and focused on two selective journals. We tried to categorize the conclusions into three groups: those that were true (referred to as "true" in this article), those that were not false but became obsolete (referred to as "obsolete"), and those that are now considered false (referred to as "false"). An example of an obsolete conclusion is the efficacy of immunoglobulins for preventing hepatitis A virus infection, since an effective vaccine is now available. An example of a false conclusion is the efficacy of corticosteroids for treating acute viral hepatitis.

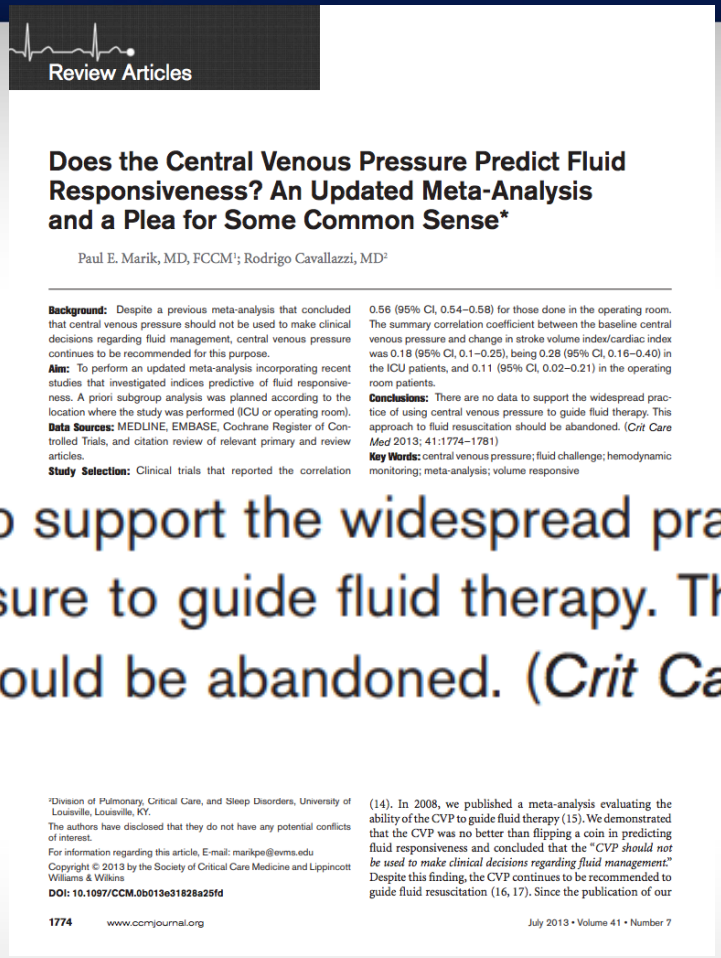
Methods

We identified original articles about cirrhosis or hepatitis in adults from 1945 to 1999. The articles were divided into eleven 5-year periods. Nonoriginal studies and studies involving children were excluded.



The half-life of truth was 45 years

- Central Venous Pressure
  - Good for Fluid Responsiveness



Review Articles

Does the Central Venous Pressure Predict Fluid Responsiveness? An Updated Meta-Analysis and a Plea for Some Common Sense*

Paul E. Marik, MD, FCCM[1]; Rodrigo Cavallazzi, MD[2]

Background: Despite a previous meta-analysis that concluded that central venous pressure should not be used to make clinical decisions regarding fluid management, central venous pressure continues to be recommended for this purpose.
Aim: To perform an updated meta-analysis incorporating recent studies that investigated indices predictive of fluid responsiveness. A priori subgroup analysis was planned according to the location where the study was performed (ICU or operating room).
Data Sources: MEDLINE, EMBASE, Cochrane Register of Controlled Trials, and citation review of relevant primary and review articles.
Study Selection: Clinical trials that reported the correlation 0.56 (95% CI, 0.54–0.58) for those done in the operating room. The summary correlation coefficient between the baseline central venous pressure and change in stroke volume index/cardiac index was 0.18 (95% CI, 0.1–0.25), being 0.28 (95% CI, 0.16–0.40) in the ICU patients, and 0.11 (95% CI, 0.02–0.21) in the operating room patients.
Conclusions: There are no data to support the widespread practice of using central venous pressure to guide fluid therapy. This approach to fluid resuscitation should be abandoned. (*Crit Care Med* 2013; 41:1774–1781)
Key Words: central venous pressure; fluid challenge; hemodynamic monitoring; meta-analysis; volume responsive

Conclusions: There are no data to support the widespread practice of using central venous pressure to guide fluid therapy. This approach to fluid resuscitation should be abandoned. (*Crit Care Med* 2013; 41:1774–1781)

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The authors have disclosed that they do not have any potential conflicts of interest.
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(14). In 2008, we published a meta-analysis evaluating the ability of the CVP to guide fluid therapy (15). We demonstrated that the CVP was no better than flipping a coin in predicting fluid responsiveness and concluded that the "*CVP should not be used to make clinical decisions regarding fluid management.*" Despite this finding, the CVP continues to be recommended to guide fluid resuscitation (16, 17). Since the publication of our