

Pre-operative fasting for paediatric anaesthesia

A survey of current practice

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Summary

There has recently been much debate about pre-operative fasting for paediatric anaesthesia. There is no consensus about the optimum fasting times for children undergoing elective surgery. In order to establish a standard for paediatric pre-operative fasting times, we undertook a postal survey, targeting members of the Association of Paediatric Anaesthetists resident in the United Kingdom and Ireland in 1995. One hundred and sixty-three questionnaires were despatched, 131 (80%) were returned and 110 (67%) were complete. The results show that the following guidelines for duration of fast are acceptable to the majority of respondents – neonates: 2 h for clear fluids, 4 h for breast and formula milk; infants: 2 h for clear fluids, 4 h for breast milk, 6 h for formula milk and solids; children: 2 h for clear fluids, 6 h for milk and solids. We suggest that these times be used as guidelines and audited for pre-operative fasting in paediatric anaesthesia.

Keywords *Anaesthesia; paediatric. Metabolism; fasting.*

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There has been much debate in the literature recently about pre-operative fasting times in children [1–4]. The rationale for fasting is to allow time for the stomach to empty, reducing the risk of regurgitation and pulmonary aspiration of any residual contents. Until recently the traditional ‘nil by mouth’ times for all forms of oral intake in all groups of patients was 6 h before elective surgery. Evidence is accumulating to suggest that clear fluids allowed up to 2 h before surgery do not increase the gastric volume but may even decrease the volume and acidity by promoting gastric emptying [5]. The risk of aspiration and patient safety must be offset against patient comfort and the avoidance of dehydration and hypoglycaemia. In the review by Phillips *et al.* [1] it was suggested that all children should abstain from milk and solid food for 6 h and from clear fluids for 2 h. In discussion with other anaesthetists and whilst revising our own local guidelines it became apparent that many have less stringent guidelines than these. There is relatively little scientific evidence related to gastric emptying of milk in children [6, 7]. An alternative method of setting a standard for acceptable

practice might be a consensus view from practising clinicians; a responsible body of opinion. We therefore undertook a postal survey to determine the current practice amongst members of the Association of Paediatric Anaesthetists (APA) with a view to setting acceptable standards for pre-operative fasting times in children.

Methods

A questionnaire (Appendix 1) was sent in July 1996 to all members of the APA listed in the Association’s 1995 Handbook as resident in the United Kingdom and Ireland. One reminder was sent to those who had not replied within 3 months.

Six questions were asked, the main one being about how long children are kept nil by mouth before elective and emergency surgery. Three categories of patient were identified, neonates (those less than 44 weeks postconceptional age), infants (those less than 1 year old) and children (1–16 years). Four types of oral intake were specified; solids, formula milk, breast milk and clear

Table 1 Respondents suggested fasting times before anaesthesia for neonates, infants and children according to type of oral intake.

Duration of fast (h)	Neonates			Infants				Child			
	Formula	Breast	Clear fluids	Solids	Formula	Breast	Clear fluids	Solids	Formula	Breast	Clear fluids
1	0	0	3	0	0	0	0	0	0	0	0
2	4	9	79	0	2	5	73	0	2	2	70
3	9	34	24	0	2	19	34	0	0	10	32
4	59	54	1	31	47	55	3	24	35	41	7
5	4	2	0	3	3	2	0	3	2	1	0
6	30	9	0	71	49	20	0	81	47	21	0
7	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	1	0	0	0
Total responses	106	108	107	105	103	101	110	109	86	75	109
Number of no comments	25	23	24	26	28	30	21	22	45	56	22
Mode	4	4	2	6	6	4	2	6	6	4	2
Range	Max.	6	4	6	6	6	4	8	6	6	4
	Min.	2	2	1	4	2	2	4	4	2	2

fluids. Subsidiary questions were asked about local guidelines, recent changes to these and variation in practice.

The results were tabulated, summarised and analysed descriptively.

Results

One hundred and sixty-three questionnaires were sent out and 131 (80%) replies were received. Twenty-one (13%) of the respondents were no longer practising paediatric anaesthesia and offered no comments, therefore a total of 110 (67%) forms were analysed. Some respondents did not complete all parts of the form if they felt that it was not applicable to their practice; for example some did not anaesthetise neonates.

Table 1 and Figs 1–3 show the results from the survey for the three age groups and four categories of oral intake specified with respect to elective surgery.

In neonates, 82/107 (77%) of respondents allowed clear fluid up until 2 h, 97/108 (90%) breast milk up to 4 h and 72/106 (68%) formula milk up to 4 h before anaesthesia. Solids were not recorded for neonates.

In infants, 73/110 (66%) allowed clear fluids up until 2 h, 79/101 (78%) breast milk up to 4 h. The duration of fasting for formula milk was evenly divided between 4 and 6 h, 51/103 (50%) compared with 49/103 (48%), respectively. Solids were restricted to 6 h by 71/105 (68%).

In children, 70/109 (64%) allowed clear fluids up until 2 h and 53/75 (71%) breast milk up to 4 h before anaesthesia; 47/86 (55%) allowed formula milk and 81/109 (74%) solids up to 6 h before anaesthesia.

The fasting times recommended for urgent surgery were the same as those for elective surgery. In an emergency fasting times were ignored and other manoeuvres such as nasogastric aspiration, the use of H₂ blockers and rapid sequence induction of anaesthesia with the use of

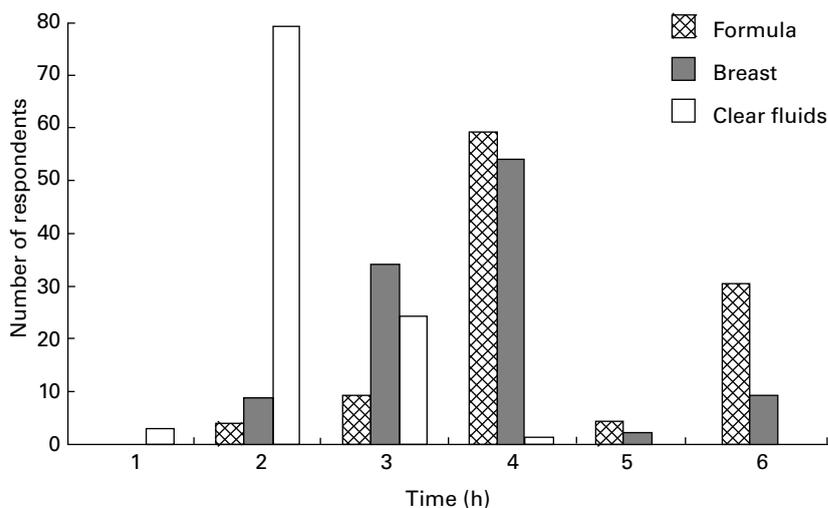


Figure 1 Bar chart of fasting times against number of replies for each feed type in the neonates.

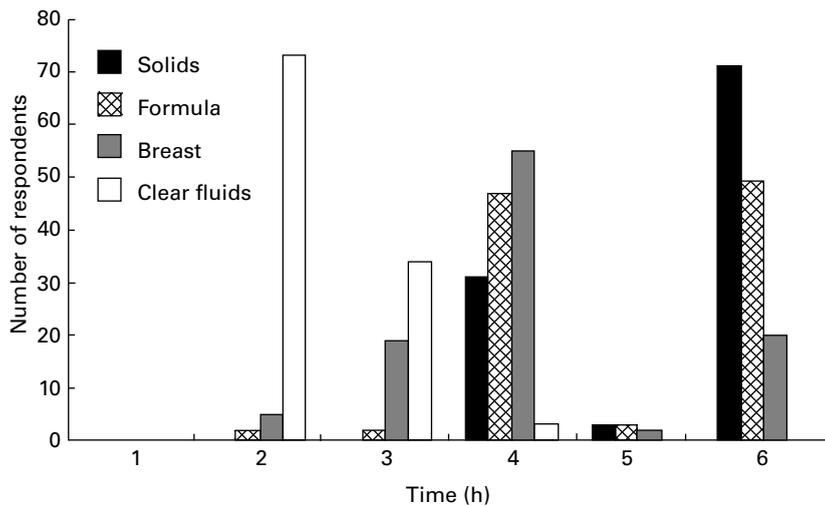


Figure 2 Bar chart of fasting times against number of replies for each feed type in the infants.

cricoid pressure were employed by some respondents to reduce the risk of aspiration of stomach contents.

One hundred and four of 110 (95%) respondents stated that their hospital had guidelines for pre-operative fasting, the rest either had not or were unsure; that is 37 hospitals had guidelines and one did not. Fifty-one of 104 (49%) respondents had recently revised their own guidelines.

Respondents' practice varied from their own departmental guidelines for patients at increased risk of regurgitation, such as those suffering from gastro-oesophageal reflux, obesity or those taking drugs that delayed gastric emptying.

Discussion

The ideal guidelines for pre-operative fasting should minimise the risk of regurgitation and pulmonary aspiration of residual stomach contents yet allow greatest patient comfort with little risk of dehydration or hypoglycaemia. The recommended 6 h fasting following oral intake is

being challenged. Most of the work of relevance to children has examined the change in residual gastric volume after allowing clear fluids [5–8]. It has been assumed that the pH and residual gastric volume are directly related to the risk of regurgitation and aspiration. The findings from these studies suggested that clear fluids allowed up to 2 h before anaesthesia did not increase residual gastric volume or dramatically affect pH. The results of our survey suggest that the majority of practising members of the APA resident in the United Kingdom and Ireland would support the findings of these studies and recommend clear fluid up to 2 h before elective surgery provided that there were no other factors that would increase the risk of regurgitation.

There are far fewer studies looking at the effect of breast milk on residual gastric volume and therefore little scientific evidence to support any guideline [7]. Our survey results suggest a guideline of 4 h for breast-fed babies; this is in agreement with other recommendations [9]. Whilst there may be no scientific evidence to support this, it does

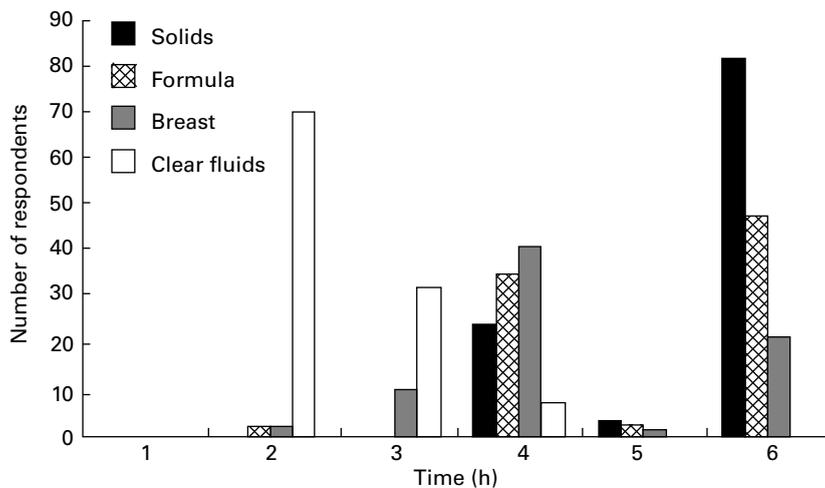


Figure 3 Bar chart of fasting times against number of replies for each feed type in the children.

seem to be a sensible limit; breast-fed babies usually feed every 3–4 h and some more frequently. In addition, if breast-fed babies are fasted for 6 h they may be at increased risk of dehydration and hypoglycaemia because they may not accept any fluid from a bottle. It is interesting that the results of our survey show that respondents generally allowed shorter fasting times in neonates than in infants with breast milk. If an infant will take clear fluid from a bottle or beaker then it is reasonable to encourage clear fluids in preference to milk. However, as already stated, this may be impracticable in young infants who are still only being breast fed.

There is also a paucity of studies assessing the effect of formula milk on residual gastric volume [7]. The respondents in our survey tended to be more cautious with this milk compared with breast milk; the majority recommended 4 h or more. It is again interesting that it seems acceptable to allow neonates formula milk up to 4 h before surgery, whereas most recommend 6 h in infants. The rationale for this is presumably to counter the increased risk of hypoglycaemia in neonates compared with infants. The problem of the bottle-fed infant accepting other forms of liquid from a bottle is likely to be less than compared with breast-fed babies.

The emptying half-life of breast milk from the stomach is about 25 min and that of formula milk 51 min [10]. This would support the longer fasting time of 6 h in formula-fed babies compared with 4 h for breast-fed babies.

It was an oversight on our part to keep milk divided into breast and formula for children; the majority of children over 1 year old will have progressed to cow's milk. Most children should also be able to take clear fluids from a beaker. A number of forms were returned without this part of the questionnaire completed; of those who did respond the majority would allow breast milk up to 4 h and formula milk up to 6 h pre-operatively. We can only assume that the majority would have allowed 6 h for cow's milk in children.

One study has looked at the effect of eating one or two biscuits 2–4 h before anaesthesia [11]. This study reported the presence of food particles in 13/32 who ate biscuits 2–4 h beforehand, but none in those fasted for over 6 h. Biscuits are not necessarily representative of the sort of food that children may consume when their parents' or nursing staff's backs are turned. The results of our survey suggest a 6-h threshold for solid food, although 31/105 (30%) were prepared to accept 4 h in infants and 24/109 (22%) accept 4 h in children. With regard to children and infants it would seem sensible to accept the same 6-h recommendation that currently exists for adults.

Some would argue that if one is too liberal about shortening fasting times, it may reduce the ability of the clinician to alter the order of the operating list at short

notice. In practice it seems that this is unlikely to be a problem; recent audits looking at actual fasting times in children's hospitals found that most patients had still been fasted for unacceptably prolonged periods [12, 13]. With careful organisation of operating theatre lists this problem should not arise. Prescription of clear fluids by the anaesthetist may be the solution to prolonged liquid deprivation.

The recommendations for pre-operative fasting are founded on the premise that residual gastric volume greater than 0.4 ml.kg^{-1} , a pH less than 2.5 and presence of particulate matter puts the patient at risk of aspiration pneumonia. These values are based upon work done in animals which has never been published [14]. In the clinical situation it is unlikely that aspiration of stomach contents would be as complete as in the experimental animal model of lung damage and also unlikely that the entire residual gastric contents would enter the lungs [1]. Thus studies using residual gastric volume as a predictor of risk may be flawed; this includes most of the work undertaken in both children and adults. In the clinical situation it is perhaps more relevant to audit patients in whom morbidity actually occurred from aspiration of stomach contents. If the guidelines that are suggested from our survey were to be introduced, an audit of such morbidity should be undertaken. If it was found that these guidelines were safe it might be considered acceptable to reduce judiciously the recommended times and then re-audit. This may allow us eventually to produce guidelines that approach our concept of optimum fasting times and lead to further patient comfort without increasing risk of morbidity.

In conclusion our survey shows that, of a substantial body of paediatric anaesthetists, most would suggest the following pre-anaesthetic fasting times – neonates: 2 h for clear fluids, 4 h for breast and formula milk; infants: 2 h for clear fluids, 4 h for breast milk, 6 h for formula milk and solids; children: 2 h for clear fluid, 6 h for milk and solids. Although there is little evidence available to support these times, they should allow acceptable patient safety whilst promoting patient comfort. We suggest these times are used as pre-anaesthetic fasting guidelines for paediatric patients and that practice be audited for both length of fast and occurrence of pulmonary aspiration.

Acknowledgments

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Appendix 1

Regarding pre-operative fasting

Question 1

How long do you ask to keep children nil by mouth?

	Elective				Emergency			
	Solids	Milk		Clear fluids	Solids	Milk		Clear fluids
Formula		Breast	Formula			Breast		
Neonates < 44/52 post conceptional age								
Infants < 1 year								
Child > 1 year								

Question 2

Is there a local guideline?

Question 3

Is this as stated in question 1?
If not please state below or attach a copy.

Question 4

Has this changed recently?
If yes please comment why below.

Question 5

Does your practice vary from these guidelines?
If yes please write why below.

Question 6

Are there any other comments you would like to make?