APAGBI

HOT TOPIC

Should paediatric patients be allowed to 'sip til send' prior to elective surgery?

November 2025

This article is dedicated to Mark Thomas, Consultant in Paediatric Anaesthesia at Great Ormond Street Hospital and former President of the Association of Paediatric Anaesthetists of Great Britain and Ireland. Mark was instrumental in advancing the shift from a conventional two-hour clear fluid fasting policy to a more progressive one-hour approach. He was driven by a clear vision to ameliorate the burden of unnecessary prolonged preoperative fasting in children and to embed more evidence-informed, child-centred fasting practices into paediatric anaesthesia. This Hot Topic builds on the trajectory he established, by evaluating the current evidence base and implementation considerations for allowing children to drink clear fluids up until call to theatre.

SUMMARY OF KEY POINTS & RECOMMENDATIONS:

KEY POINTS	RECOMMENDATIONS
'Sip Til Send' (STS) refers to the practice of *permitting* clear fluids up until the child is *called to theatre*.	Permit clear fluids at 3 mL/kg/hour up to a maximum of 150 mL/hour until call to theatre
Pulmonary *aspiration* is very *rare* in children; incidence of 0.02% to 0.04% (2–4 cases per 10,000 anaesthetics)	STS is safe for healthy children undergoing elective surgery
> 90% of *paediatric aspiration* events resolve *without* lasting *harm*, or intensive care admission	STS should be implemented via structured pathways with staff training and local governance
STS has been shown to be *non-inferior* to conventional two-hour clear fluid fasting in terms of aspiration risk.	Review institutional fasting guidelines regularly to reflect emerging evidence
STS improves *patient and parent satisfaction*, and is associated with more *favourable* physiological and metabolic parameters	**Individualised assessment:** for children with delayed gastric emptying (including those receiving GLP-1 agonists), significant gastro-oesophageal reflux, severe obesity, neurological impairment, or undergoing emergency surgery may not be suitable for STS and require tailored fasting plans
Individualised assessment remains essential ââ	

AUTHORS:

- Johnny Kenth, Consultant Clinical Academic in Paediatric Anaesthesia and Senior Clinical Lecturer, Royal Manchester Children's Hospital
- Rathai Anandanadesan, Senior clinical fellow, paediatric anaesthesia, Evelina London Children's Hospital
- Catalina Stendall, Consultant anaesthetist in paediatric anaesthesia, Birmingham Childrens' Hospital
- Karen Bartholomew Consultant Anaesthetist at Calderdale and Huddersfield NHS Foundation Trust

ACKNOWLEDGEMENTS:

Sumit Das, Laurence Hulatt, Vimmi Oshan, and Zoe Burton, Mati Stendall and Ben Scholefield

REVIEW OF EVIDENCE

The question of whether children can or should be permitted to drink clear fluids until induction of anaesthesia - a practice commonly referred to as ***'sip till send'*** (STS) - has emerged as a pivotal issue in contemporary debates on perioperative fasting. Recent high quality evidence, most notably the large scale EuroFAST study, supports a more liberal approach by demonstrating that both STS and clear fluid intake up to one hour before induction are statistically non-inferior to conventional two hour fasting strategies with respect to the risk of pulmonary aspiration.[1] In this context, non-inferiority means that these regimens did not increase aspiration risk beyond a prespecified safety margin compared with the traditional approach. This evidence invites a critical discussion as to whether STS should now be regarded as standard practice for elective paediatric cases.

Preoperative fasting prior to general anaesthesia or sedation is a long established intervention intended to mitigate the risk of gastric regurgitation and pulmonary aspiration. Despite the enduring ubiquity of this practice, prolonged fasting remains entrenched within paediatric perioperative care, often far exceeding recommended intervals. Such excessive fasting imposes a wide range of psychosocial and physiological burdens, encompassing dehydration, hypoglycaemia, ketogenesis, irritability, and heightened child and parental dissatisfaction.[2] These sequelae arise largely from systemic and organisational constraints, particularly the unpredictability of theatre scheduling and procedural delays, which can result in fasting for prolonged periods of time (extending to six, eight, or even twelve hours).

National society position statements and professional bodies have sought to align routine practice with contemporary evidence. Prior to EuroFAST, both the Association of Paediatric Anaesthetists of Great Britain and Ireland (2018 position statement) and the European Society of Anaesthesiology and Intensive Care (2022 guideline on preoperative fasting in children) recommended a minimum fasting interval of one hour for clear fluids in healthy elective children.[3,4] For completeness, both the APAGBI and ESAIC guidelines also specify a minimum fasting interval of three hours for breast milk.[3,4] For infant formula, APAGBI recommends a six hour interval for healthy elective children.[3] ESAIC proposed a shorter four hour interval (statement S10), but this did not achieve full Delphi consensus.[4] Consequently, most centres continue to observe six hours for infant formula, while some have adopted four hours under local governance. Nevertheless, adoption of these recommendations remains inconsistent, with institutional protocols demonstrating marked heterogeneity in both policy and application. In light of emerging multicentre evidence on clear fluids (i.e. EuroFAST), there is growing momentum to modernise fasting policy by permitting clear fluids until call to theatre (STS). National work is underway to map current practice and inform an updated APAGBI position statement.

The sip til send (STS) paradigm, whereby children are permitted to consume modest quantities of clear fluids until arrival for induction, has emerged as a pragmatic and physiologically coherent approach to reducing unnecessary fasting. Imaging and observational studies, including the synthesis by Zhang and colleagues, identify **3 mL/kg per hour** as a rational baseline allowance, promoting gastric motility and clearance without contributing to excessive residual gastric content.[2] While some institutional frameworks permit up to 5 mL/kg per hour or cap total intake at 150 mL for larger children, outcome data supporting these higher thresholds remain sparse, and the 3 mL/kg per hour standard continues to predominate.[5] In practice, a ceiling of 150 mL per hour is recommended; some early-adopter centres have safely used 170 mL per hour in adolescents (≈ ≥50 kg), adapted from adult practice, within a documented local protocol.

Debate surrounding liberal fasting policies centres primarily upon gastric residual volume and the theoretical risk of regurgitation or aspiration, concerns which are increasingly challenged by convergent physiological and clinical evidence. Gastric volume alone is a poor surrogate marker of aspiration risk, as emptying kinetics are driven predominantly by the caloric density rather than the absolute volume of ingested fluids.[6] Clear, non-caloric fluids such as water, dilute electrolyte solutions (e.g. Dioralyte™, Pedialyte™), and specifically formulated carbohydrate drinks with rapid gastric clearance (e.g. preOp™) are typically emptied from the stomach within thirty to sixty minutes. In contrast, fluids with higher caloric density such as fruit juices containing pulp, milk based nutritional supplements (e.g. Fortisip, Ensure Plus), or proprietary drinks with increased osmolality may persist in the stomach for up to two hours.[7] These physiological dynamics underpin the rationale for restricting STS protocols exclusively to non-caloric clear fluids, administered within rigorously structured pathways.

Pulmonary aspiration itself remains an uncommon but clinically consequential complication within paediatric anaesthesia, with reported incidences ranging from 0.02% to 0.4% across diverse operative settings.[7,8] Aspiration of clear fluids, when encountered, seldom leads to enduring morbidity in otherwise healthy children, whereas, aspiration of solid material, though considerably rarer, is associated with more severe sequelae.[9] Large scale, prospective studies corroborate the safety of liberal clear fluid regimens. The EuroFAST investigation, encompassing more than 30,000 elective paediatric cases, demonstrated that both STS (permitting fluid intake until arrival for induction) and a one hour fasting interval were statistically non-inferior to the traditional two hour fasting standard with respect to confirmed pulmonary aspiration. The incidence of aspiration was 1.18 per 10,000 cases in the STS group, compared with 1.52 per 10,000 in the one-hour fasting group. Both formed part of the liberal intervention arm. In contrast, the incidence of aspiration was 1.83 per 10,000 in the two-hour control group. The upper limit of the ninety five percent confidence interval for the absolute risk difference remained below the predefined non-inferiority margin (Δ = 0.2%).[1] Epistemologically, rather than seeking to establish superiority, a non-inferiority design assesses whether a novel regimen, in this instance STS or one hour fasting, does not confer an unacceptably greater risk than the established comparator (two hour fasting) beyond a specified boundary. By satisfying this statistical criterion, EuroFAST confirmed that both regimens maintain acceptable safety profiles, permitting greater emphasis on hydration and comfort without increasing aspiration risk.

In EuroFAST, among 420 regurgitation or aspiration cases, recorded risk factors comprised gastrointestinal anatomical pathology (28%), gastrointestinal motility disorder (18%), gastro-oesophageal reflux (15%), neurological disease (7%), light anaesthesia (10%), urgent surgery (9.7%), emergency surgery (8.0%), opioid administration before induction (7%), difficult airway (5%), lithotomy position (3%), and preoperative intensive care (3%). Categories were not mutually exclusive, so percentages do not sum to 100%.[1]

Further corroboration arises from multi-institutional observational cohorts, which consistently document low and statistically indistinguishable incidences of aspiration, regurgitation, and vomiting among children fasted for less than two hours, one hour, or under STS protocols.[8,10] When such events do occur, recovery is generally prompt and rarely necessitates intensive care admission or extended hospitalisation. Collectively, these convergent findings reinforce that within healthy elective paediatric populations, STS constitutes a safe, evidence based strategy to minimise unnecessary fasting while preserving perioperative safety.

Advantages:

The principal advantage of STS is that it delivers shorter fasting without sacrificing safety. EuroFAST demonstrated noninferiority of both STS and a one hour clear fluid interval compared with two hours for confirmed pulmonary aspiration, with very low absolute event rates and the upper confidence bound remaining below the prespecified noninferiority margin. These findings align with national cohort data after adoption of a one hour policy and with earlier multicentre observations that aspiration remains rare.[1,8,10] In everyday practice, nominal one hour policies are frequently undermined by list variability, and clear fluid fasting often extends well beyond target. STS counteracts this drift by allowing ongoing small-volume intake until transfer, thereby constraining actual fasting time rather than relying on schedule predictions. Observational studies show that programmes which operationalise drinking to transfer achieve shorter fasting intervals in routine care.[12] There are coherent physiological and haemodynamic reasons to expect benefit. Gastric emptying kinetics are driven primarily by caloric content rather than absolute volume. Noncaloric clear fluids are typically evacuated within thirty to sixty minutes, whereas caloric liquids empty more slowly. Restricting STS to true clear fluids preserves rapid emptying while maintaining intravascular volume.[6,7] In infants and younger children, optimised preoperative hydration is associated with lower ketone body concentrations and more stable mean arterial pressures at induction; whereas, longer preinduction fasting durations correlate with greater odds of post-induction hypotension.[13,14] These effects are clinically relevant because the youngest patients are the most vulnerable to haemodynamic instability and metabolic stress.

Patient-centred outcomes also improve. Quality-improvement and cohort reports describe higher satisfaction and reduced thirst when children are permitted to drink up until transfer to theatres, with parallel reductions in symptoms consistent with dehydration such as malaise, nausea and vomiting.[11,12] Moreover, prolonged fasting itself is associated with an increased incidence of perioperative adverse events, reinforcing the value of actively limiting fasting time rather than tolerating schedule-driven prolongation.[12]

Considerations

Although liberal fasting strategies improve perioperative hydration and comfort for children, their safe implementation necessitates a deliberate, structured approach. Gastric volume alone is not a reliable surrogate for aspiration risk, as emptying kinetics are governed predominantly by the caloric density of ingested fluids rather than absolute volume.[6,7] Non caloric, truly clear liquids such as water and dilute electrolyte solutions are typically emptied rapidly and therefore form the basis of STS protocols, which restrict permitted intake to modest volumes within clearly defined parameters. Pulmonary aspiration, while rare in healthy paediatric populations, remains the central concern. Accordingly, STS frameworks must incorporate robust screening at preassessment, consistent staff training, and effective communication with parents to prevent misunderstanding, operational delays, or inappropriate cancellations. When these safeguards are observed, the available evidence supports the safe adoption of STS without an associated increase in aspiration or regurgitation risk.

Notwithstanding these benefits, certain patient groups lie outside the validated evidence base and require individualised evaluation.[4,7,9] These include:

- Structural or motility disorders of the gastrointestinal tract
- Symptomatic gastro-oesophageal reflux or large hiatus hernia
- Significant neuro-disability or conditions that impair airway reflexes
- Emergency or urgent surgery
- Anticipated difficult airway
- Obesity (body mass index above the 99.6th centile)
- Current treatment with GLP-1 receptor agonists (e.g., Semaglutide) owing to delayed gastric emptying
- Recent opioid administration before induction
- Procedures that require an empty stomach (e.g., gastroscopy, trans-oesophageal echocardiography)

Special situations

Type 1 diabetes. Children with type 1 diabetes should have an individualised perioperative glucose and fluid plan agreed jointly by paediatric diabetes/endocrinology and anaesthesia. Where insulin or dextrose infusions are required, management should follow local paediatric diabetes protocols with frequent point of care glucose monitoring.

Metabolic disease. Children with inborn errors of metabolism or other complex metabolic conditions require an individualised fasting and infusion plan agreed in advance with the paediatric metabolic team. The plan should specify maximum fasting limits, the timing and concentration of intravenous dextrose or other disease specific infusions, the frequency of glucose and ketone monitoring, and clear escalation thresholds. STS may be used to attenuate catabolism where appropriate, but it does not replace prescribed infusion regimens and must not delay the initiation of intravenous therapy. Examples include disorders of fatty acid oxidation, defects of the urea cycle, mitochondrial disease, and glycogen storage disease.

The integration of STS within clinical practice must therefore be supported by structured screening algorithms to identify exclusions reliably. Additionally, institutional barriers - ranging from apprehension among ward and surgical teams to parental concerns over case cancellation - can be mitigated through systematic education, adoption of standardised protocols, and the use of an opt-out framework in which STS is permitted unless specifically contraindicated by the responsible anaesthetist or surgeon.[11]

Conclusion:

An STS policy for healthy elective paediatric patients undergoing general anaesthesia, which permits the intake of clear fluids up to the point of transfer to theatre, is supported by a robust body of evidence. Large-scale studies, including EuroFAST, have demonstrated that both STS and one-hour clear fluid fasting regimens are statistically non-inferior to the traditional two-hour fast with respect to the incidence of pulmonary aspiration, with aspiration rates remaining very low and no evidence of increased morbidity.[1,8,10] Adopting a more liberal approach to fluid intake can mitigate the physiological and metabolic disturbances associated with prolonged fasting, such as dehydration, hypoglycaemia, ketone body formation, and intraoperative hypotension, while also improving patient comfort, patient satisfaction, and parental satisfaction.[11,13,14]

The challenge is now less about the adequacy of the evidence and more about its consistent application. To deliver the benefits of STS safely and effectively, its implementation should be paired with structured preoperative screening, clear institutional protocols, and education for staff and families, ensuring that exclusions and clinical judgment remain integral to decision-making.

TABLE 1: RECOMMENDED FLUID VOLUMES FOR STS PROTOCOL 3ML/KG/HR, MAXIMUM 150MLS

Weight (kg)	Recommended Volume (3mls/kg/hr)
10	30
20	60
30	90
40	120
50	150

REFERENCES:

1. Frykholm P, Modiri A-R, Klaucane A, Beck CE, Bouvet L, Isserman RS, Stricker PA, et al.; EUROFAST Collaborative Group. Impact of liberal preoperative clear fluid fasting regimens on the risk of pulmonary aspiration in children (EUROFAST): an international prospective cohort study. Br J Anaesth. 2025;135(1):141-147. doi:10.1016/j.bja.2025.03.031
2. Zhang E, Hauser N, Sommerfield A, Sommerfield D, von Ungern-Sternberg BS. A review of pediatric fasting guidelines and strategies to help children manage preoperative fasting. Paediatr Anaesth. 2023 Dec;33(12):1012-1019. doi: 10.1111/pan.14738.
3. Thomas M, Morrison C, Newton R, Schindler E. Consensus statement on clear fluids fasting for elective pediatric general anesthesia. Paediatr Anaesth. 2018;28(5):411-414. doi:10.1111/pan.13370.
4. Frykholm P, Disma N, Andersson H, Beck C, Bouvet L, Cercueil E, Elliott E, Hofmann J, Isserman R, Klaucane A, Kuhn F, de Queiroz Siqueira M, Rosen D, Rudolph D, Schmidt AR, Schmitz A, Stocki D, Sümpelmann R, Stricker PA, Thomas M, Veyckemans F, Afshari A. Pre-operative fasting in children: A guideline from the European Society of Anaesthesiology and Intensive Care. Eur J Anaesthesiol. 2022 Jan 1;39(1):4-25. doi: 10.1097/EJA.0000000000001599.
5. Centre for Perioperative Care. ''Sip Til send'', Royal College of Anaesthetists, April 2015, https://www.cpoc.org.uk/guidelines-and-resources/guidelines-resources/resources/sip-til-send
6. Okabe T, Terashima H, Sakamoto A. Determinants of liquid gastric emptying: comparisons between milk and isocalorically adjusted clear fluids. Br J Anaesth. 2015 Jan;114(1):77-82. doi: 10.1093/bja/aeu338.
7. Rüggeberg A, Meybohm P, Nickel EA. Preoperative fasting and the risk of pulmonary aspiration-a narrative review of historical concepts, physiological effects, and new perspectives. BJA Open. 2024 May 5;10:100282. doi: 10.1016/j.bjao.2024.100282.
8. Schmitz A, Kuhn F, Hofmann J, Habre W, Erb T, Preuss M, Wendel-Garcia PD, Weiss M, Schmidt AR. Incidence of adverse respiratory events after adjustment of clear fluid fasting recommendations to 1 h: a prospective, observational, multi-institutional cohort study. Br J Anaesth. 2024 Jan;132(1):66-75. doi: 10.1016/j.bja.2023.10.009.
9. Frykholm P, Hansen TG, Engelhardt T. Preoperative fasting in children. The evolution of recommendations and guidelines, and the underlying evidence. Best Pract Res Clin Anaesthesiol. 2024 Jun;38(2):103-110. doi: 10.1016/j.bpa.2024.03.003.
10. Beck CE, Rudolph D, Mahn C, Etspüler A, Korf M, Lüthke M, Schindler E, Päukert S, Trapp A, Megens JHAM, Oppitz F, Badelt G, Röher K, Genähr A, Fink G, Müller-Lobeck L, Becke-Jakob K, Wermelt JZ, Boethig D, Eich C, Sümpelmann R. Impact of clear fluid fasting on pulmonary aspiration in children undergoing general anesthesia: Results of the German prospective multicenter observational (NiKs) study. Paediatr Anaesth. 2020 Aug;30(8):892-899. doi: 10.1111/pan.13948.
11. Wiles MD, Macdonald A. The effect of a 'Sip til Send' policy on patient satisfaction: a quality improvement project. Anaesth Rep. 2024 Jan 6;12(1):e12271. doi: 10.1002/anr3.12271.
12. Ricci Z, Colosimo D, Saccarelli L, Pizzo M, Schirru E, Giacalone S, Mancinelli P, Baldini G, Serio P. Preoperative clear fluids fasting times in children: retrospective analysis of actual times and complications after the implementation of 1-h clear fasting. J Anesth Analg Crit Care. 2024 Feb 13;4(1):12. doi: 10.1186/s44158-024-00149-3.
13. Dennhardt N, Beck C, Huber D, Sander B, Boehne M, Boethig D, Leffler A, Sümpelmann R. 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. Paediatr Anaesth. 2016 Aug;26(8):838-43. doi: 10.1111/pan.12943.
14. Simpao AF, Wu L, Nelson O, Gálvez JA, Tan JM, Wasey JO, Muhly WT, Tsui FC, Masino AJ, Stricker PA. Preoperative Fluid Fasting Times and Postinduction Low Blood Pressure in Children: A Retrospective Analysis. Anesthesiology. 2020 Sep;133(3):523-533. doi: 10.1097/ALN.0000000000003343.

NOVEMBER 2025

FASTING GUIDELINES BEFORE A GENERAL ANAESTHETIC

APAGBI
Association of Paediatric Anaesthetists of Great Britain & Ireland

---

FOOD & FORMULA MILK

and other non-clear fluids

UP TO 6 HOURS BEFORE SURGERY

BREAST MILK

UP TO 3 HOURS BEFORE SURGERY

CLEAR FLUIDS

Water
Clear diluted squash
Dilute electrolyte solutions

SIP TIL SEND TO THEATRE

Rate: 3 ml/kg/hr
Max: 150 ml/hr

EXCEPTIONS TO THE RECOMMENDATIONS THAT REQUIRE INDIVIDUAL EVALUATION

- Structural or motility disorder of the gastrointestinal tract e.g. GORD
- Significant neuro disability or conditions that impair airway reflexes
- Emergency or urgent surgery
- Anticipated difficult airway
- Severe Obesity: BMI > 99.6th percentile
- Current treatment with GLP-1 receptor agonists
- Extreme anxiety