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Improving preoperative fasting compliance in children undergoing general anaesthesia using written instructions: a quality improvement project at a single institution in Sabah, East Malaysia

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Abstract

Background: Prolonged preoperative fasting among children is a global concern with adverse effects. This quality improvement (QI) project aimed to determine the preoperative fasting duration among children undergoing elective surgery under general anaesthesia (GA) at Sabah Women and Children Hospital (SWACH) and improve adherence to recommended fasting timeframe.

Methods: This was a single-centre, before-after QI project using the Plan-Do-Study-Act (PDSA) cycle, conducted from May to August 2023. A total of 180 children (93 control; 87 intervention) were recruited. A baseline audit was conducted, followed by an intervention using a dual-language written instruction leaflet. The study assessed preoperative fasting duration and evaluated the intervention's effectiveness.

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Data on safety outcomes were not collected, as the primary focus was on direct measurement of fasting duration and compliance.

Results: The intervention group demonstrated shorter median fasting durations. Significant reductions were observed for solid food/formula milk (median difference = -1.9 hours, $p < 0.001$) and clear fluids (median difference = -3.1 hours, $p < 0.001$). Adherence significantly improved following intervention: for solid food/formula milk, odds of prolonged fasting were reduced by 70% to 75% (relative risk ratio [RRR] range: 0.25 to 0.30, $p \leq 0.002$). Similarly, for clear fluids, odds of fasting ≥ 8 hours were reduced by 81% to 90% (RRR range: 0.10 to 0.19, $p \leq 0.005$).

Conclusions: The dual-language written instruction leaflet was associated with improved compliance, reducing prolonged preoperative fasting. However, excessive fasting remains an issue. Further strategies, such as multidisciplinary involvement, text message reminders, and offering drinks two hours before surgery, are warranted to optimise compliance. Future research should involve multi-site studies to validate effectiveness and broader applicability.

Keywords: fasting, paediatric anaesthesia, quality improvement

Introduction

Preoperative fasting is crucial in minimizing the risk of pulmonary aspiration during general anaesthesia (GA). Traditional fasting guidelines, such as “nil per os (NPO) after midnight” often lead to prolonged preoperative fasting.[1] Prolonged preoperative fasting affects children more compared to adults due to their immature physiology. Extended fasting periods can lead to adverse effects such as hypoglycaemia, electrolyte imbalances, and dehydration.[1,2] Additionally, prolonged fasting can cause emotional distress in children, leading to tantrums, irritability, and mood disturbances.[3]

Recognising these negative implications, the American Society of Anesthesiologists introduced the 6-4-2 fasting guideline for children. It recommends fasting durations of 6 hours for solids, 4 hours for breast milk, and 2 hours for clear fluids before anaesthesia.[4] The guideline allows greater flexibility, ensuring that children are not unnecessarily deprived of fluids and nutrition before surgery while maintaining patient safety. Studies have shown that clear fluids empty from the stomach rapidly and that prolonged fasting does not significantly reduce the risk of aspiration.[5] Since its introduction in 1999, the 6-4-2 guideline has been widely adopted in paediatric anaesthesia globally.[6]

Despite these updated guidelines, prolonged preoperative fasting remains a global issue.[7] Fasting is considered prolonged when it exceeds 8 hours for solids and 6 hours for clear fluids.[8] A study in Stanford, CA, USA, reported a median clear fluid fasting time of 7 hours (interquartile range [IQR] 7.6 hours).[9] Similarly, in developing countries, such as those in Africa, the mean fasting duration for clear fluids was 8 ± 4.8 hours, while for solids, it was 13.9 ± 3.6 hours.[10] In Mumbai, India, the mean fasting times were 6.6 ± 2.12 hours for clear fluids and 9.4 ± 2.89 hours for solids and milk.[11] Common reasons for prolonged preoperative fasting include institutional practice of traditional fasting protocols such as "NPO after midnight", surgical scheduling changes, and communication gaps between healthcare providers and parents/guardians.[9-12]

A scoping review by Dulay *et al.* identified various intervention strategies aimed at reducing prolonged preoperative fasting, which revolve around six key themes. These six themes include changes in facility protocols, technology-based interventions, individualized fasting programmes, improved communication between clinicians, improved communication with parents and families, and staff education. Among these, staff education was the most commonly used intervention, while improving communication with parents and families was the least utilised. However, regardless of the intervention type, most strategies showed promise in reducing preoperative fasting duration among children, with an average improvement of at least 2 hours.[13]

Additionally, two studies demonstrated that providing parents with written information or a leaflet about paediatric anaesthesia was associated with a modest increase in parental knowledge and satisfaction. In the randomized controlled trial by Spencer and Franck, parents who received written information reported improved understanding and satisfaction, regardless of the setting or timing of delivery.[14] Similarly, Bellew *et al.* found in their audit that the introduction of an anaesthesia information leaflet enhanced parental satisfaction, with many parents perceiving that it reduced preoperative anxiety.[15] These findings suggest that appropriately designed written instruction leaflets can serve as a valuable source of information and support parental engagement in their child's care.

To date, there is no record of a quality improvement (QI) project focusing on the optimisation of preoperative fasting duration among children carried out in Sabah Women and Children Hospital (SWACH). Therefore, this QI project aimed to assess the current preoperative fasting durations among paediatric patients undergoing elective surgery under GA at SWACH and improve adherence to the recommended 6-4-2 fasting guidelines through intervention with a dual-language written instruction leaflet to supplement verbal instructions.

Methods

Study design

This was a single-centre QI project using a before-and-after design, structured around the Plan-Do-Study-Act (PDSA) cycle. The study was conducted at SWACH between May 1, 2023 and August 31, 2023. The primary aim was to determine the preoperative fasting duration for solid food/formula milk, breast milk, and clear fluids among children undergoing elective surgery at SWACH. This outcome was selected because it represents the key clinical parameter targeted by the 6-4-2 fasting guidelines. The secondary aim was to assess the improvement in adherence to the recommended fasting guidelines following the implementation of a dual-language written instruction leaflet. This measure was selected to quantify the direct impact of the dual-language written information on the clinical compliance rates. As this was a process-focused QI initiative, safety-related or balancing outcomes were not collected; specifically, data on adverse events such as perioperative hypoglycaemia or aspiration were excluded.

Setting and population

SWACH is a government hospital located in the Likas district of Sabah, specializing in women and children's healthcare, and includes an emergency ward. The study population included children aged 0 to 18 years scheduled for elective surgery under GA at SWACH. Patients were excluded if there was parental refusal, if they were scheduled for surgery under local anaesthesia, or if they had a language barrier preventing comprehension or expression in either Malay or English. Written informed consent was obtained from parents or guardians, and assent was sought from children aged 7 years and above.

Pre-anaesthesia assessment and preoperative fasting instruction

Before study commencement, medical officers responsible for pre-anaesthesia assessment were trained to provide standardized preoperative fasting instructions. The training was delivered by the principal investigator, an anaesthesiologist, using a standardized PowerPoint presentation in a single one-hour session, held just prior to the start of the study. The content of the training included 1) information on the 6-4-2 fasting guidelines, and 2) standardized script to convey the guidelines effectively to parents/guardians.

Patients were approached by medical officers in the ward a day before surgery for the pre-anaesthesia assessment. Following completion of the assessment, the medical officer provided verbal fasting instructions, a session which lasted approximately 10 minutes. These instructions covered 1) the rationale behind preoperative fasting, 2) the risks associated with both inadequate and prolonged fasting, and 3) the recommended fasting time for solid food/formula milk, breast

milk, and clear fluids. Parents/guardians were allocated approximately 10 minutes during the session to process the information, review the dual-language leaflet (if provided), and address any questions. They then confirmed their understanding and acknowledgement by signing an acknowledgement form. Fidelity (adherence to the intended process) was monitored via spot audits conducted by the investigator to ensure the procedure was carried out accordingly.

Intervention

A written fasting instruction leaflet (Appendix 1) was developed based on the 6-4-2 fasting guidelines and adapted from Schmidt *et al.*[9] The leaflet was designed in simple dual language (English and Malay), specifically avoiding medical jargon, and was provided in addition to the standard verbal instructions. To ensure validity, the leaflet underwent face validity assessment by at least two anaesthesia specialists and five laypersons. They rated its simplicity, relevance, clarity, and actionability on a 5-point Likert scale, yielding a high minimum mean acceptance score of 4.2 out of 5.0 across all domains. Following a pilot with three families in both English and Malay, which demonstrated acceptability, no revisions were required. The intervention was implemented over a two-month period (July–August 2023) and involved two PDSA cycles to reinforce the consistent implementation of the written instructions among parents by the medical officers.

PDSA cycle 1: baseline audit and initial intervention

- Plan (May–June 2023): During the first two months, a baseline audit was performed while patients in the control group received verbal fasting instructions only. Following this audit, factors contributing to prolonged fasting—such as language barriers, poor parental understanding, medical jargon, and information overload—were identified. To address these issues, a simple dual-language written instruction leaflet was developed to standardize and reinforce the fasting guidelines.

- Do (early July 2023): In the first week of July, the intervention was piloted. Parents/guardians and their child received both verbal instructions and the written leaflet, with key fasting times for solid food/formula milk, breast milk, and clear fluids documented on the leaflet.

- Study (early July 2023): Initial process monitoring revealed low reported use among medical officers and suboptimal adherence by the parents, suggesting a potential lack of awareness regarding the intervention.

- Act (mid-July 2023): Based on the findings in the Study phase outlined above, a targeted reminder and brief educational session on the implementation of the written instructions were delivered to all medical officers during the monthly Continuous Medical Education (CME) session in mid-July to reinforce the intervention.

PDSA cycle 2: reinforcement and evaluation

- Do (Cycle 2, late July to August 2023): Following reinforcement during the CME session, the intervention was fully implemented for the remainder of the two-month intervention period. During this phase, all eligible patients and their families continued to receive both verbal instructions and the dual-language written leaflet.
- Study (Cycle 2, late July to August 2023): Detailed data collection was performed, and the fasting durations were subsequently compared against the baseline group to assess the impact of the intervention.
- Act (Cycle 2, September 2023): Based on the final comparative findings, a decision was planned regarding the permanent implementation of the dual-language written instruction leaflet as part of preoperative care.

Ethics approval and informed consent

Ethics approval was obtained from the Medical Research Ethics Committee Ministry of Health, Malaysia (22-02919-NWN). The registration number for this study is NMRR ID-22-02919-NWN.

Sample size

Sample size estimation was calculated using the two independent population means formula. A prior study indicated that the mean preoperative fasting duration for food was 9.4 ± 2.89 in the pre-intervention group and 7.8 ±1.80 in the post-intervention group.[8] Therefore, a minimum sample size of 34 subjects per group was required to reject the null hypothesis with a power (β) of 0.8. The type I error (α) probability associated with this test of null hypothesis is 0.05. With an additional 20% dropout rate, the required sample size was 43 subjects per group, bringing the total required to 86 subjects. However, as this was a QI project, all eligible patients during the study period were included using a universal sampling method, resulting in a final sample size of 180. Allocation to the study group was temporal (pre-intervention then post-intervention):

- Baseline group: All eligible patients during the study period May–June 2023.
- Intervention group: All eligible patients during the period July–August 2023.

The flow of participants and data analysis across study periods, detailing eligible, included, excluded, and analysed cases for each cycle, is presented in Figure 1.

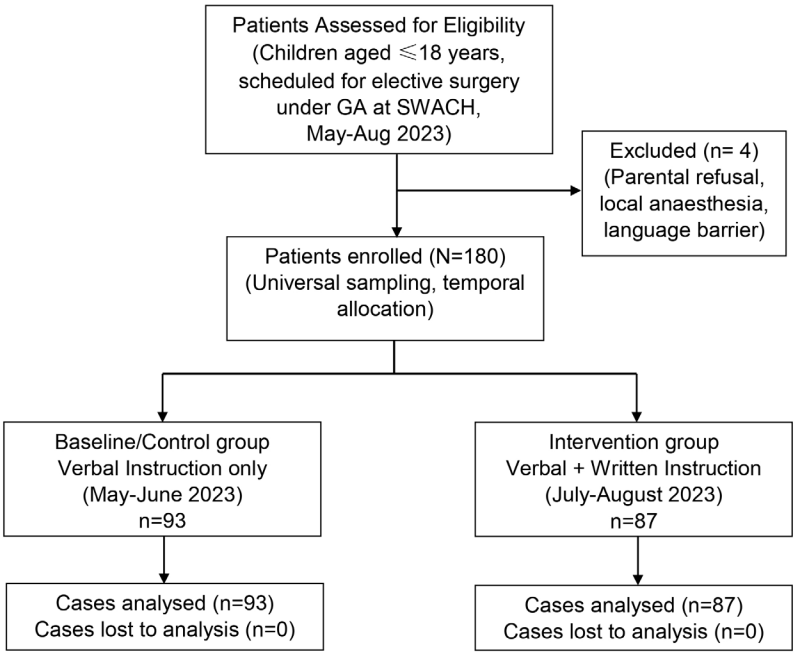

Fig. 1. Flow of participants and data analysis across the study period. All eligible patients during the study period were included using a universal sampling method (N = 180). Allocation to the study group was temporal (pre-intervention then post-intervention). The baseline/control group (n = 93) received verbal instruction (May–June 2023). The intervention group (n = 87) received verbal + written instructions (July–August 2023). Zero cases were lost to final analysis. GA: general anaesthesia; SWACH: Sabah Women and Children's Hospital

Data collection, data quality, and bias mitigation

The following data were collected for all eligible patients in both the baseline and intervention periods: patient demographics, American Society of Anesthesiologists Physical Status Classification, estimated surgical duration, and clinical department responsible for surgery. The primary outcome, NPO durations for solid food/formula milk, breast milk, and clear fluids (defined as the time from last intake to arrival at the operating theatre [OT]), were obtained through in-person interviews with the parents/guardian on the day of surgery. Additionally, the OT call time, anaesthesia induction time, and any rescheduling were documented.

Given that preoperative fasting times were obtained via in-person interviews with parents/guardians, interviews were conducted by the medical officer immediately upon the patient's arrival at the OT, aiming to minimize the time lag between the final intake event and the recollection of the time. Beyond this temporal minimization of lag, no further action was taken to mitigate recall bias. Any missing or inconsistent entry was further checked with the source document (patient's case note) and corrected by the investigator.

Statistical analysis

All data were entered, cleaned, and analysed using Microsoft Excel and Statistical Package for the Social Sciences (SPSS) software (version 25, IBM Corp). Descriptive analysis was performed and reported by median and IQR for continuous variables, and frequency and percentage for categorical variables. Inferential analysis was conducted to compare outcomes between the groups: categorical variables were assessed using the Chi-square test and Fisher's exact test; the primary outcome, fasting duration, was assessed using the Mann-Whitney U test. The simple median difference was calculated, with the 95% confidence interval (CI) of the mean difference serving as a proxy. The effect size for fasting duration was quantified using the rank biserial correlation (r). Adherence categories were analysed using multinomial logistic regression (MLR). To account for the three independent primary comparisons (solid food/formula milk, breast milk and clear fluids), the Bonferroni adjustment was applied, setting the statistical significance level at a p-value of < 0.0167.

Results

During the sixteen-week study duration, 180 children were enrolled. Of these, 93 subjects (51.7%) were allocated to the control group and 87 subjects (48.3%) to the intervention group. Fidelity monitoring, via spot audits of 15 encounters, confirmed that all procedures were done according to protocol. The demographic data for all subjects are presented in Table 1. The majority of participants were male (n = 122, 67.8%), aged 1–5 years (n = 74, 41.1%), with a median weight of 17 kg (IQR 13.0–15.0 kg). Most participants were of Bumiputra Sabah ethnicity (n = 163, 90.1%) and classified as American Society of Anesthesiologists Physical Status Classification 1 (n = 123, 68.3%). An estimated surgical duration was provided for 127 children (70.6%), but only 89 children (49.4%) underwent surgery as scheduled. No statistically significant variations were observed between the groups.

Table 1. Patient demographic and clinical characteristics

Variables	Control (WOWI) *n* = 93	Intervention (WWI) *n* = 87	*p-value*[a]
Sex			
Male	64 (68.8)	58 (66.7)	0.758
Female	29 (31.2)	29 (33.3)	
Age			
1-6 months old	3 (3.2)	5 (5.7)	0.115[b]
7-12 months old	3 (3.2)	9 (10.3)	
1-5 years old	45 (48.4)	29 (33.3)	
6-10 years old	29 (31.2)	33 (37.9)	
11-15 years old	13 (14.0)	10 (11.5)	
16-18 years old	0 (0.0)	1 (1.1)	
Ethnicity			
Bumiputera Sabah	85 (91.4)	78 (89.7)	0.928[b]
Chinese	3 (3.2)	4 (4.6)	
Malay	5 (5.4)	5 (5.7)	
Weight (kg)	18.0 [13.70-26.50]	16.8 [11.60-25.00]	0.231[c]
American Society of Anesthesiologists Physical Status Classification			
1	59 (63.4)	64 (73.6)	0.079
2	30 (32.3)	16 (18.4)	
3	4 (4.3)	7 (8.0)	
Tentative surgical duration provided			
No	33 (35.5)	20 (23.0)	0.066
Yes	60 (64.5)	67 (77.0)	
Surgery on schedule (*n* = 127)			
No	16 (26.7)	22 (32.8)	0.448
Yes	44 (73.3)	45 (67.2)	

Variables	Control (WOWI) *n* = 93	Intervention (WWI) *n* = 87	*p-value*[a]
Taking breastmilk			
No	89 (95.7)	79 (90.8)	0.188
Yes	4 (4.3)	8 (9.2)	

WOWI: Without written instructions; WWI: With written instructions
[a] Chi-square test for independence; [b] Fisher's exact test; [c] Mann-Whitney U test
Note: Data is skewed to the right. Data are expressed as frequency (percentage) or median (interquartile range) as appropriate.

Table 2. Comparison of overall pre-operative fasting duration

Overall preoperative fasting duration (hours)	Control (WOWI)	Intervention (WWI)	Median difference (95% CI)	*p-value*[c]	Effect size (*r*)
Solid food/formula milk (*n* = 177)	11.2 [9.20-14.27]	9.3 [7.03-12.20]	-1.9 (-2.8, -0.8)	< 0.001[§]	-0.290
Breast milk (*n* = 12)	5.4 [4.25-7.17]	4.4 [4.17-5.35]	-1.0 (-3.0, 1.4)	0.368	-0.295
Clear fluids (*n* = 180)	7.2 [3.87-10.17]	4.1 [2.92-6.33]	-3.1 (-3.7, -1.6)	< 0.001[§]	-0.336

WOWI: Without written instructions; WWI: With written instructions
[c] Mann-Whitney U test; [§]Statistical significance meets the Bonferroni-adjusted threshold ($p < 0.0167$)
Note: Data is skewed to the right. Data are expressed as median (interquartile range). The 95% CI for median difference is derived from mean difference (independent samples t-test). Three participants under six months old were exclusively breastfed, making them clinically ineligible for the solid food analysis.

Table 2 presents the overall preoperative fasting durations for solid food/formula milk, breast milk, and clear fluids across both groups. The intervention group demonstrated shorter median fasting durations across all categories. Significant reductions in fasting duration were observed for solid food/formula milk (median difference = -1.9 hours, 95% CI: -2.8 to -0.8 hours, $p < 0.001$, $r = 0.290$) and clear fluids (median difference = -3.1 hours, 95% CI: -3.7 to -1.6 hours, $p < 0.001$, $r = -0.336$). Notably, one child in the intervention group had a preoperative fasting duration of 1.4 hour for clear fluids.

Table 3 presents the adherence outcomes. The intervention group showed a higher proportion of subjects with shorter preoperative fasting times for both solid food/formula milk and clear fluids. Specifically, 43.6% of the intervention group fasted for 6–8 hours (the compliant range) compared to only 17.4% in the control group. Likewise, 42.5% of the intervention group had a preoperative fasting duration of 1–3 hours for clear fluids, whereas only 21.5% of the control group fell within this range.

The improvement in adherence was assessed using MLR, focusing on the reduction in odds of patients falling into categories of prolonged fasting (compared to the most compliant category) following the intervention (Table 3). For solid food/formula milk, the intervention significantly improved compliance by reducing the odds of fasting for 9–11 hours by 70% (relative risk ratio [RRR] = 0.30; 95% CI: 0.14, 0.65, $p = 0.002$), and for ≥ 12 hours by a highly significant 75% (RRR = 0.25; 95% CI: 0.12, 0.55, $p < 0.001$). Similarly, the intervention demonstrated significantly improved compliance by reducing the odds of extreme clear fluid fasting periods: the odds of fasting for ≥ 8 hours (compared to the 1–3 hours compliant category) were reduced by 81% to 90% (RRR range: 0.10 to 0.19). These reductions were all statistically significant ($p \leq 0.005$).

Table 3. Comparison of preoperative fasting duration for solid food/ formula milk, breast milk, and clear fluids between the control and intervention groups by adherence category

Preoperative fasting duration (hours)	Control (WOWI)	Intervention (WWI)	Relative risk ratio (95% CI)	*p*-value[d]
Solid food/formula milk (*n* = 177)				
6-8	16 (17.4)	37 (43.6)	1.00 (Reference)	
9-11	33 (35.9)	24 (28.2)	0.30 (0.14, 0.65)	0.002[§]
≥ 12	43 (46.7)	24 (28.2)	0.25 (0.12, 0.55)	< 0.001[§]
Breast milk (*n* = 12)				
4-5	3 (75.0)	7 (87.5)	1.00 (Reference)	
7-8	1 (25.0)	1 (12.5)	0.43 (0.02, 9.35)	0.590
Clear fluids (*n* = 180)				
1-3	20 (21.5)	37 (42.5)	1.00 (Reference)	
4-5	15 (16.1)	17 (19.5)	0.61 (0.25, 1.48)	0.276
6-7	12 (12.9)	20 (23.0)	0.90 (0.37, 2.21)	0.820
8-9	14 (15.1)	5 (5.8)	0.19 (0.06, 0.61)	0.005[§]
10–11	17 (18.3)	3 (3.4)	0.10 (0.03, 0.37)	0.001[§]
≥ 12	15 (16.1)	5 (5.8)	0.18 (0.06, 0.57)	0.003[§]

WOWI: Without written instructions; WWI: With written instructions

[d] Multinomial logistic regression; [§]Statistical significance meets the Bonferroni-adjusted threshold ($p < 0.0167$)

Note: Data are expressed as frequency (percentage). Three participants under 6 months old were exclusively breastfed, making them clinically ineligible for the solid food analysis. The 6-hour category for breast milk fasting duration was omitted from the table because no subjects were recorded in this category in either the control or intervention cohort.

Discussion

The introduction of the written fasting instruction leaflet was associated with reduced preoperative fasting durations for solid food/formula milk and clear fluids among children. This improvement may be attributed to the use of layman's language in a dual-language format, which enhanced comprehension and reinforced the importance of fasting adherence. Studies have shown that providing health information in a patient's preferred language improves understanding and compliance with medical instructions.[16]

Furthermore, reinforcing instructions with clear, visual guidelines helped minimize miscommunication and reduce forgetfulness among parents/guardians. The written fasting instruction leaf*let al*so served as a useful reference for both doctors and parents/guardians, ensuring consistency and reducing the risk of miscommunication. This intervention aligns with the principles of the Health Belief Model, as it strengthens parents' understanding of the rationale behind fasting guidelines, thereby improving compliance.[17]

Similar findings were reported by Li *et al.*, who introduced individualized preoperative fasting education in various formats, including face-to-face oral information, health education brochures, and online Q&A-based health education courses and videos to help parents' understanding. They observed significantly shorter fasting durations in the intervention group, with a mean fasting duration of 5.03 ± 1.08 hours for water and 10.23 ± 2.01 hours for milk, compared to 5.97 ± 0.96 hours and 11.25 ± 2.33 hours, respectively, in the control group.[18] Likewise, Sidik *et al.* demonstrated that providing both verbal and written instructions significantly improved adherence to fasting protocols, reducing prolonged fasting times and associated complications.[19]

Another study by Thomasseau *et al.* reported that despite providing clear oral and written instruction to caregivers, only 33% of children achieved the recommended clear fluid fasting duration of 2–3 hours. However, with the addition of a text message reminder, compliance increased to 92%.[20] These findings suggest that incorporating additional strategies, such as text message reminders, could further improve compliance with fasting guidelines at SWACH, where only 42.5% of children in this study achieved the fasting duration for clear fluids of less than 4 hours.

The results of the MLR, interpreted using the Bonferroni method, provided valuable insights into the impact of the intervention on adherence to the 6-4-2 fasting guidelines. The intervention was effective in reducing the odds of prolonged fasting durations for both the solid food/formula milk and clear fluids group. A

similar finding was reported by Denhardt *et al.*, who implemented a multi-professional programme alongside written instructions, reporting a decrease in mean fasting time from 8.5 hours to 6 hours. Their findings also showed a reduction of "deviation from the guideline > 2 hours" from 70% to 8%, which led to a more stable metabolic and haemodynamic condition during induction of anaesthesia in children younger than 36 months.[21] Similarly, in a study by Dulay *et al.*, the implementation of a three-stage intervention and a comprehensive, multimodal education strategy targeting bedside nurses and theatre coordinators resulted in a reduction in mean fasting duration in all post-intervention time points compared to the pre-intervention period.[1] They also reported that good adherence to guidelines (measured by a clear fluid fasting duration of 1–2 hours pre-anaesthesia) increase from 9.1% pre-intervention to approximately 15% post-intervention. Concurrently, a decrease in poor adherence (measured by a fasting duration greater than 6 hours) was observed across all post-implementation phases.[1]

Despite the improved outcome, a significant number of participants remained in the prolonged fasting category. This persistent issue could be attributed to various factors, such as inconsistencies in fasting instructions among anaesthetists and nurses, surgical scheduling changes, and parents/guardians' reluctance to wake their sleeping child.[12, 22-23] To address inconsistencies in fasting instructions, the responsibility for optimising preoperative fasting duration can be expanded to include anaesthesiologists, surgeons, paediatricians, nurses, and nutritionists.[24]

Furthermore, approximately one-third of the children (35.5%) did not have an estimated surgical duration, making it difficult to provide precise fasting instructions and often leading to unnecessarily prolonged fasting duration. Including surgeons in the process can help mitigate this issue by improving surgical scheduling and coordination. Additionally, prolonged surgeries resulted in half of the procedures not proceeding as scheduled. While opening an additional OT for elective surgeries could help reduce delays, this is rarely feasible due to staff shortages.

A practical alternative is to implement a protocol in which ward nurses offer children a drink two hours before the surgery to prevent excessive fasting.[18] The "Countdown to Theatre" intervention, which empowered bedside nurses to proactively offer clear fluids regularly, ensured that patients had controlled access to clear fluids at least every two hours and successfully reduced the duration of preoperative fasting.[1] Another example of this is the "Think Drink" initiative which allowed patients to continue taking sips of water until they were called to the OT. This significantly reduced median fasting times from over 7 hours to approximately 2 hours without increasing the risk of aspiration or regurgitation.[25] It is also important to note that the success of this initiative was sustained through

continuous staff education, regular audits, and reinforcement.[1,25] Hence, given the effectiveness of the dual-language written instruction leaflet in this study, it will be formally integrated into the standard preoperative assessment for all paediatric surgeries involving general anaesthesia in SWACH. Re-audit will be conducted 6 months after the permanent implementation of the written instructions.

Interestingly, one child with a clear fluid fasting time of 1.4 hours had their operation postponed. This instance highlights a critical gap in the adoption of current evidence-based guidelines within the local clinical setting. The European Society of Anaesthesiology and Intensive Care Guidelines (2022) reduced the recommended preoperative fasting duration for clear fluid from two hours to one hour.[26] This recommendation is based on studies indicating that shorter fasting times do not increase gastric content volume or acidity, thereby not elevating aspiration risk. However, the decision to postpone suggests that our local institution have yet to formally align its protocol with this revised international standard. Consequently, this contributes to unnecessary operational delays, even in cases where the patient technically meets the minimum threshold indicated by the most recent international consensus.

No significant difference in fasting duration was observed among breastfed children, primarily due to the limited number of recruited subjects in this group, which limits the ability to detect significant differences. Additionally, neonates and infants are typically scheduled as the first cases of the day, minimizing their risk of prolonged fasting. Since breastfeeding mothers naturally feed their children at regular intervals, the concern of excessive fasting in this group is minimal.

This study has several limitations. Methodologically, the temporal, before-and-after study design and universal sampling method introduce susceptibility to time-dependent confounding, including secular trends or seasonal variation in surgical caseload or staff availability. Furthermore, the CME reminder delivered during the first PDSA cycle acts as a concurrent intervention, making it difficult to isolate the effect of the dual-language leafl*et alo*ne. Next, the small sample size for breastfed children limited the statistical power required to detect significant differences in subgroup analysis. Additionally, the study was restricted to a single centre in Borneo and focused only on elective surgery patients; consequently, the findings may not be generalisable to other clinical settings or to emergency surgeries, where fasting durations are typically more variable due to unpredictable scheduling. Finally, although an overall improvement in adherence to recommended fasting durations for solid food/formula milk and clear fluids was observed, over 50% of patients still experienced prolonged fasting. These occurrences were likely influenced by factors not explored in this study. Future research should investigate these contributing factors to further enhance compliance.

In conclusion, this QI project successfully demonstrated that the introduction of the dual-language written instruction leaflet was associated with improved compliance with the 6-4-2 fasting guideline, reducing the odds of prolonged preoperative fasting for both solid food/formula milk and clear fluids in children at SWACH. The introduction of a dual-language written fasting instruction leaf*let alo*ngside standard verbal communication significantly reduced preoperative fasting duration, with a median difference of -1.9 hours for solid food/formula milk and median difference of -3.1 hours for clear fluids. This initiative highlights that simple, low-cost interventions can effectively enhance guideline adherence, potentially improving patient outcomes and experiences. Future efforts could explore more proactive interventions, such as text message reminders and multidisciplinary collaboration, to further optimise compliance to latest fasting recommendation (up to one-hour prior to surgery/anaesthesia). Additionally, expanding the study to include more study sites may further validate its effectiveness and broader applicability of the intervention.

Declarations

Ethics approval and informed consent
Ethics approval was obtained from the Medical Research Ethics Committee Ministry of Health, Malaysia (22-02919-NWN). The registration number for this study is NMRR ID-22-02919-NWN. Written informed consent was obtained from parents or guardians, and assent was sought from children aged 7 years and above.

Competing interests
None to declare.

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Gemini was used for language editing assistance, specifically to check and correct grammar, improve sentence structure, and ensure consistent tense usage.

Data availability

The dataset generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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Appendix

Written fasting instruction leaflet (English version)

SABAH WOMEN AND CHILDREN HOSPITAL
FASTING GUIDELINES BEFORE SURGERY

Fasting your child is required prior to operation.

Our instructions are designed to ensure that your child's stomach is empty before surgery, keep your child as safe as possible throughout surgery and to minimize your child's hunger and thirst.

If the guidelines are not followed, your child's surgery may be postponed or cancelled.

However, some children might receive different instructions.

1. Stop all food (solid or soft diet), formula milk at **6 hours before surgery**.
2. Stop breast milk **4 hours before surgery** (if applicable).
3. Stop all clear fluids (water) **2 hours before surgery.**

RN:
Ward (Discipline):
Operation Date:

Counseled by: Acknowledged by:

Written fasting instruction leaflet (Malay version)

HOSPITAL WANITA DAN KANAK-KANAK SABAH
GARIS PANDUAN BERPUASA SEBELUM PEMBEDAHAN

Anak anda diwajibkan berpuasa sebelum pembedahan.

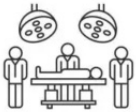
Garis panduan ini direka untuk memastikan perut anak anda kosong sebelum pembedahan, memastikan anak anda selamat sepanjang pembedahan dan untuk mengurangkan rasa lapar dan dahaga anak anda.

Jika garis panduan tidak dipatuhi, pembedahan anak anda mungkin ditangguhkan atau dibatalkan.

Sesetengah kanak-kanak mungkin menerima arahan yang berbeza.

1. Berhenti mengambil susu formula, makanan (pejal ataupun lembut, makanan pelengkap) **6 jam sebelum** pembedahan.
2. Berhenti penyusuan susu ibu **4 jam sebelum** pembedahan (jika berkenaan).
3. Berhenti mengambil air masak **2 jam sebelum** pembedahan.

RN:
Wad (Disiplin):
Tarikh Pembedahan:

JAM		Berhenti mengambil susu formula dan makanan (pejal ataupun lembut, makanan pelengkap)	
JAM		Berhenti penyusuan susu ibu (jika berkenaan)	
JAM		Berhenti mengambil air masak	
JAM			

Dikaunsel oleh: Saya memahami: