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i. Title:

Using Kotter's 8 Steps of Change to Tackle Over-fasting of children attending day surgery

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Data statement:

Data used for this study is not publicly available.

ii. **Abstract/summary**

Over-fasting before surgery can lead to dehydration, irritability, lethargy, nausea, hypoglycaemia, tricky intravenous cannulation and decreased patient satisfaction¹. We used 'Kotter's 8 steps for change' as an approach to tackling the problem of over-fasting in our day surgery unit².

Using a video of a patient's experience with overfasting we created a sense of urgency and need for change (Step1: create urgency). We formed a multi-disciplinary Fasting Improvement Team (FIT) (Step2: form a powerful coalition) and conducted a retrospective data analysis to establish a baseline. We then studied the system thoroughly using Ishikawa charts, process mapping, benchmarking, user surveys and Pareto charts.

Using these findings, we created a vision for our change (Step3: create a vision for change). Within six months we aimed for 90% of patients to have a fluid fasting time of less than two hours and for 90% of afternoon patients to have had breakfast. We communicated this vision to all staff involved in the day surgery (Step4: communicate the vision). Following, we empowered them (Step5: empower action) by asking for their opinions for changes and let them take over various tasks without micromanagement. The Institute for Healthcare

Improvement (IHI) Psychology of Change Framework described a focus on the human side of change, to increase the likelihood that improvement efforts will succeed by activating people's agency³.

Our change ideas were divided into "quick wins", "doable" and "challenging". We focussed on creating short term wins (Step6: create quick wins) and celebrated successes along the way to create initial momentum. We did this in parallel with working on longer term changes. We continued to work on cementing these new ideas (Step7: build on the changes) so that transformation in the day surgery would persist before using the same system to spread the change to the rest of the hospital (Step8: making it stick).

Keywords:

Fasting, children, day surgery

iii. Introduction

The need for pre-operative fasting has been propagated to minimize the risk of pulmonary aspiration since the work published by Mendelson⁴ and the 6-4-2 rule has been widely adapted, (i.e. 6 hours for solid food, 4 hours for breast milk and 2 hours for clear fluid)^{5,6}. Studies have shown that the traditional fasting time of 2 hours for clear fluid often translates to being a much longer fasting time, around 6-7 hours or even up to 15 hours in some cases⁵. Over-fasting in children can have negative psychological, behavioural, physiological and metabolic impacts¹. Clear fluid, which includes sugar containing diluting juice has been demonstrated to empty from the stomach within 30-60 minutes, prompting a new consensus statement by various professional bodies, including the Association of Paediatric Anaesthetists of Great Britain and Ireland (APAGBI), the European Society of Paediatric Anaesthesiology (ESPA) and the Royal College of Anaesthetists (RCoA), of a clear fluid fasting time of 1 hour^{4,5,6}.

Problems with over-fasting are prevalent in our hospital which has resulted in incidences of hypoglycaemia as a more serious consequence. In order to make changes to ensure a shorter fasting time in our children, we employed the Kotter's 8 steps for change as the core framework to this quality improvement project².

Methods

The Royal Hospital for Children, Glasgow has an inpatient capacity of 244 beds and performs approximately a total of 16,500 surgeries in a year. The main focus of our fasting improvement project is in the day surgery unit, where approximately 8,000 patients attend each year.

Our primary aim is to achieve 90% of our day surgery patients to have fluid fasting time of less than two hours and 90% of our afternoon patients to have breakfast.

Our secondary aim is to improve both children and parents' experience when attending for a general anaesthesia and to reduce the incidence of hypoglycaemia.

We used the Kotter's 8 steps for change as the core framework to our fasting improvement project (Figure 1).

Figure 1: Kotter's 8 steps for change model

Step 1: Create urgency

Prior to commencing this initiative, our incident reporting system identified a cluster of hypoglycaemic episodes due to over fasting, particularly in the younger children. To create urgency, and raise awareness, we identified a case in the hospital where the prolonged fasting time resulted in a hypoglycaemic episode, dehydration, difficult behaviour and loss of trust in hospital staff. We recorded a video of the patient's story told by her mother to help spread the word and raise awareness about the problem.

We gathered baseline data to demonstrate that only 7% of day surgery patients had clear fluid fasting time of less than two hours and only 55% of afternoon patients had breakfast.

Step 2: Form a powerful coalition

We formed a multi-disciplinary Fasting Improvement Team consisting of a food, fluid and nutrition nurse, dietitian, day surgery nurses, pre-assessment nurses, anaesthetic registrars, surgical registrar and consultant anaesthetists. Together,

we set out an aim and explored our system thoroughly using Ishikawa charts, process mapping, bench-marking, user surveys and Pareto charts.

Ishikawa chart

As a team, we brain-stormed some hypotheses to identify the reasons children are over-fasting in our institution using the fish bone diagram or Ishikawa chart (figure 2). Then, we explored our system to identify which hypotheses were most likely. We also mapped out potential changes and how effective this would be in our day surgery unit as each individual unit will face different challenges.

Figure 2: Ishikawa chart

Pareto charts

We surveyed the staff in the day surgery unit to explore the reasons the children are over-fasting from their perspective. Following this, we identified the most likely problems and created a Pareto chart (see figure 3) to show this.

The main reason for children not having breakfast was a perception that 6:45 am was too early to wake children for breakfast. Fluid fasting times were long due to both lack of clarity of instructions, and restricted access to fluids on the Day Surgery Unit.

We used these findings and the experience of the wider team, patient & parents to generate ideas for change.

Figure 3: Pareto chart

User surveys

We surveyed 133 patients attending the day surgery unit over a two-week period for their experience with their fasting time using a six-point facial rating scale.

The survey allowed us to identify that there is a problem with over-fasting affecting the patients' experience where approximately 75% of our patients responded with the three more unhappy faces on the scale.

Process mapping

After identifying the key drivers that would help improve children's fasting time, we created a process map of what happens from the day a child is listed for surgery to the day they come in for their procedure, identifying our potential interventions. Following, we employed Plan-Do-Study-Act (PDSA) cycles to help improve our fasting times with small interventions being tested each time.

Benchmarking

We visited another tertiary paediatrics centre to observe their practice regarding pre-operative fasting and compare our practice against theirs. This centre encourages 'sip until sent for' to ensure all children stay hydrated without having to rely on the anaesthetist's estimation as to when the child will go to theatre. This centre does not have prescribed volume and one issue with this is that some children drink more than just sips when unsupervised, which increases their aspiration risk. We aim to prevent hypoglycaemia in our improvement project without increasing risk of aspiration as a balancing measure. Therefore, it was decided that we would not adopt this approach in our centre as the initial improvement initiative, as we do not have a prescribed volume for our children. However, we will be reviewing this practice constantly with new evidence.

Step 3: Create a vision for change

The Fasting Improvement Team set our vision and goals to 90% of our day surgery afternoon patients should have breakfast and for 90% of all our day surgery patients to have a fluid fasting time of less than two hours by May 2019.

More importantly, we hope that the improvement in fasting times will translate into happier children and more satisfied parents. We also aim to have no further incident reports of hypoglycaemia attributed to over-fasting for theatre.

Step 4: Communicate the vision

Our communication strategies include:

- Setting up a whiteboard in the Day Surgery Unit with information about fasting time to remind staff not to over-fast patients,
- Displaying posters around the Day Surgery Unit encouraging clear fluid up till one hour prior to surgery, reading out parent feedback at staff safety briefs so that staff are aware of the issue and our vision to address the problem with over-fasting.
- Providing a short and concise tutorial for staff on fasting for better understanding of our vision.

Finally, we took advantage of technology and social media to communicate our vision. We sent regular email updates to staff and communicated our initiative on

Twitter. We also created a Fasting Improvement Team WhatsApp group to ensure effective communication amongst the team members.

Step 5: Empower action

By sharing patients' and parents' feedback with our staff and asking their opinions and suggestions for change, we made it known to them that they are a vital part of this change process. We gave them ownership over various tasks such as offering drinks to the patients. Then, we took a step back to allow them to perform their tasks ably without micromanagement.

It was evident that empowering the staff made a big difference in implementing change. The staff took active role in ensuring the changes were implemented, including reminding the anaesthetists to consider giving patients clear fluid if able. They were also proactive in coming up with new ideas on how to improve and implement the changes which has led to better outcomes for the patients.

Step 6: Create short-term wins

As a team, we had many ideas of how to improve fasting times for these children. Some could be easily achieved while others would require more time and work.

As a morale boost, we started off with the simple tasks, or “short-term wins”. This enabled us to give everyone a feeling of achievement from an early stage and positively reinforce their efforts. While introducing these short term wins, we also worked on the interventions that are slightly more time consuming, but possible nonetheless. There are other interventions that we considered to be ideal and likely to contribute significantly to making these changes, however they were deemed unrealistic given the constraints that we have.

“Short-term wins”:

1. Housekeeper offering drinks

The housekeeper in day surgery will go around with a trolley to offer drinks to patients at 7am and 12pm when they first arrive to the day surgery unit.

2. Creating a hydration station

A supervised trolley with water and diluting juice is placed in one of the treatment rooms to encourage eligible patients to keep themselves hydrated before theatre. We advised the children and parents that drinks can only be had at the hydration station to prevent other children who are fasting from getting

upset.

3. "I can drink until" card

Anaesthetists usually have a rough idea of when the child would be going to theatre based on theatre lists order. Previously, we used to give verbal instructions to parents, patients and staff advising when the patient needed to stop drinking. We found this was often ineffective as they would either forget or be too worried that drinking might prevent them from going to theatre later on. Hence, we started giving out "I can drink until" cards to empower parents and patients to keep drinking as well as to serve as a reminder.

4. Re-writing local guidelines

We have re-written our local guideline in 2019 to decrease clear fluid fasting time from two hours to one hour, consistent with the new consensus by various European societies in 2018. Additionally, we changed breakfast time for afternoon patients from 06:45 to 07:30 as afternoon lists do not usually start until 13:30.

5. Poster campaign

We created posters to be placed around day surgery unit to spread the information of the changes to our fasting times. We also ran a poster competition

for the children to co-design posters about staying hydrated. It worked well at engaging patients, parents and staff and to communicate the change. The winner of the poster competition was awarded in the atrium of the hospital to further help spread the word. The award ceremony was attended by various members of staff including some of the fasting improvement team, managers, anaesthetists, nurses as well as parents and children. This event was covered in the local media.

It is worth mentioning that in addition to the benefit of spreading information about our project, engaging the children has been a good way to promote positive experience for them coming to theatre. It was also a truly remarkable and heart-warming story when the winner's family told us how much it meant to her having lost her dominant arm to bone cancer, learning to use her non-dominant arm to write and draw then winning the competition soon after her surgery.

“Intermediate term goals”:

6. Ice lollies available

Although the idea is fairly simple, the logistics of this intervention required more work. We had to first obtain funding for a freezer, then meet appropriate

infection control requirements prior to identifying an appropriate model to fit the available space.

The day surgery staff were asked to choose the model to ensure their support and engagement, empowering them to continue the change. Once the freezer was available, we involved the children in the decision of which flavours to choose and stocked the top three favourite (pineapple, orange and blackcurrant). Our housekeeper ensured that the freezer was stocked with ice lollies.

7. Engaging pre-admission team

We discussed the change of our fasting guidelines with the pre-admission team and encouraged them to help spread the new fasting time guidelines. We introduced a fasting information leaflet to be given out at the pre-admission clinic.

8. Pre-operative flyer

We worked with all the surgical secretaries to re-design the pre-operative flyer sent out to all patients to be clearer and more child-friendly. The information flyers sent out to morning and afternoon patients are distinctly different in colour and have different fasting instructions.

9. Text reminder service

In the future, we aim to start a text reminder service to remind all patients/parents to keep hydrated until arrival to hospital and also reminder to the afternoon patients to have breakfast in the morning. This has yet to be established.

“Longer term goals”:

10. Real time theatre list updates

In an ideal world, we would have a single computer software that would display real time theatre list and updates about when the current case is finishing and when the next case would start so the staff on day surgery unit will be able to tailor children’s fasting time accordingly to prevent over-fasting.

Step 7: Build on the change

We continuously asked for feedback from both staff and children to improve on the changes that we have made so far. Apart from positive subjective comments,

we also had some constructive feedback such as making the hydration station more obvious. We also noticed issues with some anaesthetic staff members not giving out the “I can drink until” card. As a result of this, we have made further changes such as:

1. New colourful and visible “juice station” sign to indicate the location of our hydration station.
2. Placing “I can drink until” card on patients notes to serve as a reminder to the anaesthetists.
3. Ice lolly upgrade and a 12:15 ice lolly run for the afternoon patients.

Step 8: Make it stick

Through the work done in our day surgery unit, we have shown that the new way is better than the old. We celebrated and promoted our success by receiving various nominations for awards (Chairman’s, Scottish Paediatric Anaesthesia Network, Theatre Efficiency). We also reinforce our initiative to every new

employee and so continuing to spread the word to make these changes permanent.

We made our success visible to everyone, including to our hospital management. This ensures support, not just to sustain the changes in day surgery, but also to spread to the rest of the hospital. This is when we start back at step one, recognising that different areas of the hospital work differently.

Results

The mean fluid fasting time decreased from 4h 35 mins in Aug/Sept 2018 to 2h 15 mins by April/May 2019. Additionally, in this same period of time (08/18 – 05/19) the percentage of day surgery patients having a drink less than 2 hours before their procedure increased from 7% to 58%. The percentage of afternoon patients having breakfast increased from 55.4% in Aug/Sept 2018 to 76.3% in April/May 2018. Figures 4 and 5 illustrate the increase in patients having a drink within 2h of going to theatre, and the lowering and stabilisation of food fasting times.

Figure 4: Run chart for fluid: % of patients having a drink <2h pre-op

Figure 5: Run chart for food: Median weekly food fasting times

Discussion

Day surgery ward

Using the Kotter's 8 step for change as our framework and QI methodology, we managed to explore the system to focus on improvements with most impact for staff and patients by engaging staff and empowering patients. Following implementation of changes, we have managed to show sustained improvement in the children's fasting time for both food and clear fluid prior to coming to theatre.

In our institution, we defined clear fluid as water or sugar containing fluid that is non-opaque (we mainly use diluting juice/diluted concentrated squash), non-fizzy and does not contain any bits. We do not have a prescribed volume, rather have the one hour fasting time rule as per guideline. We also do not specify food the children can or cannot have for breakfast as long as they have 6 hours fasting time.

Although we did not do a subgroup analysis of how each step impacted our improvement, we have some data which shows few critical interventions along the way that have contributed to significant and sustained improvement. From the time where the fasting improvement team was formed to increase awareness of the problem, we see a 19% increase of day surgery patients having a drink less than 2 hours pre-operatively. After implementation of the housekeepers offering drinks in day surgery and later the hydration station, we see a further increase of 30%. Following this, other interventions such as a poster campaign, ice lollies and 'I can drink until' card have contributed to a slow but sustained improvement.

Although the intended primary goals of 90% day surgery patients achieving fluid fasting time of less than two hours and 90% of afternoon day surgery patients having breakfast were not reached, there was a marked improvement when comparing the data from before the project to now. We are reassured by our median fasting time which was reduced from 4 hours 35 minutes to 2 hour 15 minutes.

As for the secondary aims, we gathered written and verbal qualitative feedback from parents on the hospital feedback system and on social media. One of the most prominent examples, as discussed previously, reflects the enhanced

positive experience of both a patient and her parents after one of our improvement campaigns (poster design competition). Furthermore, we tracked the incidence reporting system, which showed less cases of hypoglycaemia reported.

There are several potential reasons as to why the ambitious primary goals were not reached. Firstly, the data collected is based on the assumption that all children would want to have a drink at admission to day surgery and have breakfast in the morning. However, there are children who actively refused a drink or breakfast which the data did not take into account and hence we have outliers. We also have parents who are still worried about cancellations and adverse effects of giving their child a drink despite clear written information.

Secondly, despite our best effort to spread the word and educate new staff, there are still some who are unaware of our initiative or new guidelines and therefore inadvertently over-fasting the children. We addressed this by including this in our induction programme (during a presentation and in written information), where new anaesthetic registrars rotate every two months.

Additionally, despite anaesthetists' best intention of not over-fasting the children by filling in the 'I can drink until' card, we are unable to predict the list reliably as it is very dynamic and we may tend to still err on the side of caution in order to prevent problems with aspiration if the child is called sooner than expected. The 'sip until sent for' approach is one which is growing in popularity and which we plan to implement with guidance on volumes that the children are allowed. Clearly specifying the permitted volumes minimises the risk of undesirably large volumes being consumed pre-operatively.

Although, we did not formally collect data for the counter measures such as incidence of aspiration and patient's cancellation, we did not receive any adverse events related to these in our incident reporting system. Therefore, we did not observe that improving our fasting times negatively affected the children in other ways.

These improvement interventions have been trialled in a single area (day surgery) where there are fewer confounding factors to children's fasting times. This is due to the nature of day surgery cases where all the children come in from home into one single area which is the day surgery unit. We are aware that the same

interventions would require a bespoke approach to spreading to other hospital areas. Kotter's 8 Steps of Change provides a useful framework for such spread.

In-patient wards

We collected baseline data for each of ward to create an urgency among staff with regards to the problem and surveyed the staff to find out their main concerns as to why the children are over-fasting on their wards. In addition to bringing in some of the changes from Day Surgery Unit that have been tried and tested, we also introduced other changes which are individualised to the wards such as a fasting hotline to improve direct communication between the ward and theatres. This is currently an ongoing improvement project which has been received well in the hospital.

Following the initial success of spreading some of the changes to elective inpatients, we moved on to tackle the initial problem that was at the start of this project– over-fasting in patients coming for emergency surgery due to the unpredictable nature of emergencies. We know from our incident reports that most over-fasted patients are those awaiting surgery on the emergency lists.

Using the same methodology and approach, we identified the barriers to the problems and implemented changes that are more tailored to the emergency setting. We trialled various interventions including 'drink until called', which allowed the theatre team, who will have a good idea of the list's order, to call the ward and stop a patient from drinking if they are next on the list while we finish the current case. This intervention is currently ongoing.

Conclusion

Using a strategy of exploring the system, building a diverse team, creating urgency and using novel ways to create engagement led to improved fluid and food fasting times and sustainable systemic changes.

Conflict of interest

None

Reflective questions

1. We find that using a framework to guide our quality improvement project has helped to engage our staff, which is the key to improving service provision. Do

you use a framework or structure to guide quality improvement projects in your institution? Do they work well?

2. What other frameworks or quality improvement methodology do you know of?

There are thoughts that Kotter's model is a top-down model and discourages any scope for participation or co-creation, but we managed to use this model to have an inclusive team to implement and spread successful change. Does it depend on how each step is interpreted?

3. This is a step-by-step or "vertical" model, which makes it easy to follow and implement changes. But this also means skipping a step may result in failure.

Thinking of quality improvement projects, would you consider a parallel model to be more suitable or would it just make the process more complicated?

4. To make a significant change, it requires individual and interpersonal changes in thinking, feeling, and acting, along with system level changes in structures, processes, and conditions. Can we adopt the IHI Psychology of Change framework to facilitate significant change in the system?

5. Tackling over-fastening has always been a challenge in both adults and children and will continue to be due to the unpredictable nature of a theatre list. We have yet

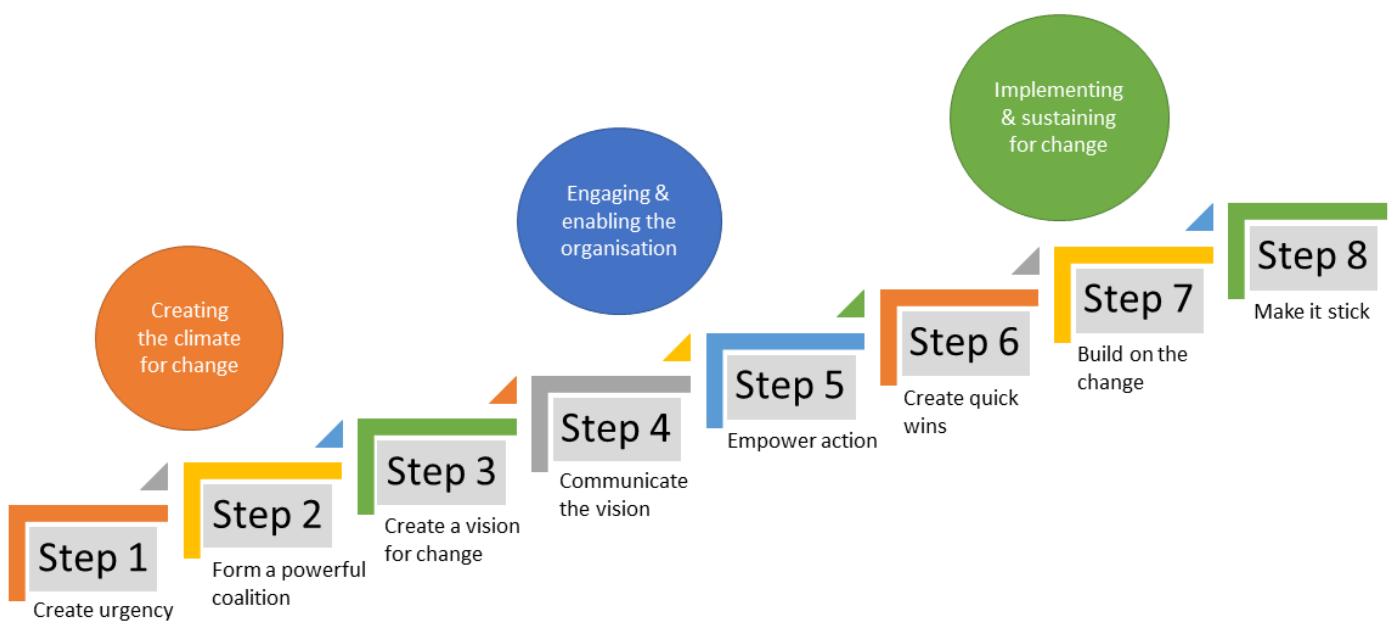
to have an answer to this and we always strive to make it better for the patient.

Do you think technology will help move things forward significantly?

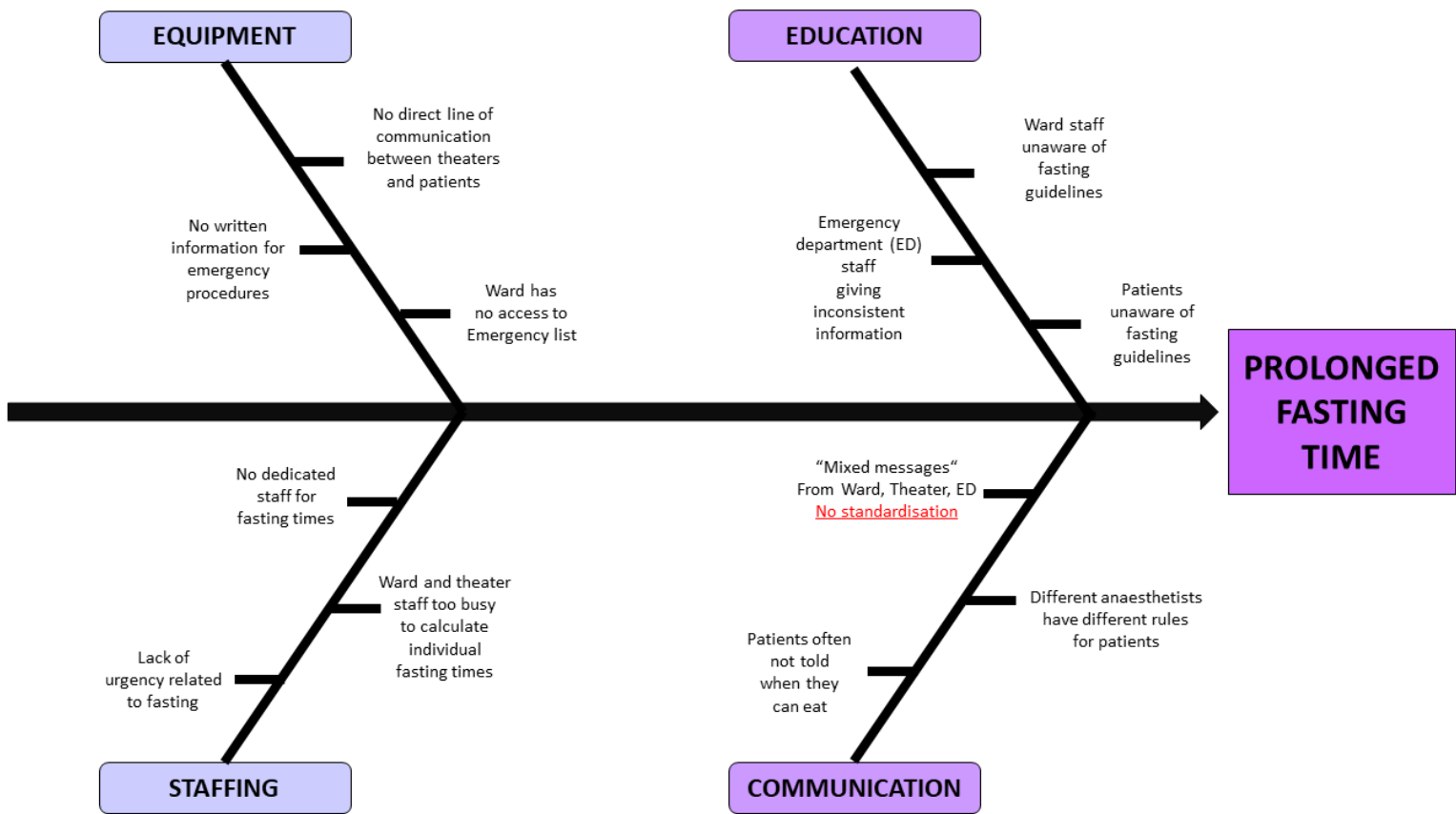
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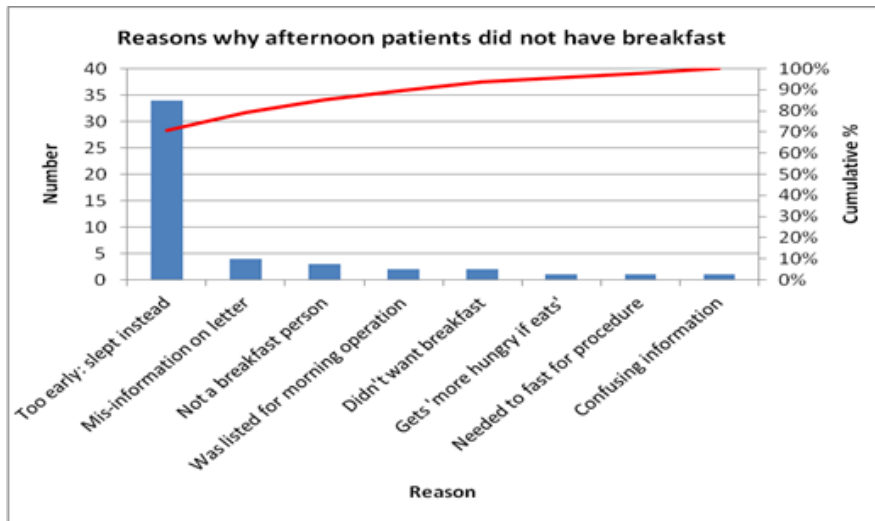
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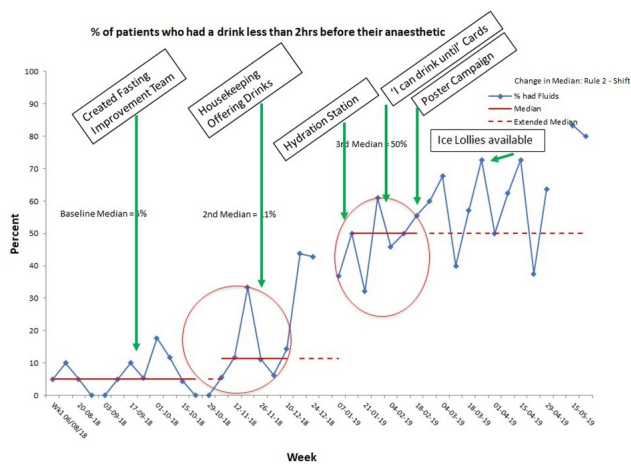
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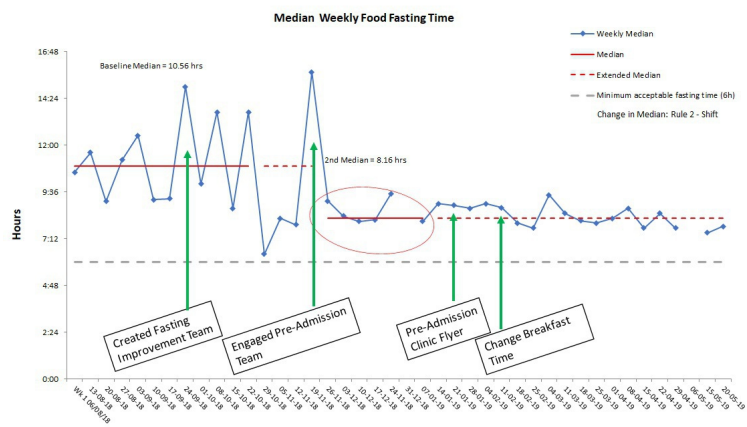
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