Project Title

Improving Outcome of Patients Undergoing Emergency Laparotomy

Project Lead and Members

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Organisation(s) Involved

Ng Teng Fong General Hospital

Healthcare Family Group Involved in this Project

Medical

Applicable Specialty or Discipline

Surgery, Anaesthesiology, Intensive Care Medicine, Infectious Diseases

Project Period

Start date: Jul 2020

Completed date: Dec 2020

Aims

We envisioned for our EL patients to receive consistent and coordinated quality of care throughout their patient journey from pre-to post surgery. Phase 1 project aim was therefore to increase the Clinical Quality Index (CQI), defined as % of EL patients who received all 8 care elements, by at least 5 folds from 4% in 2020 to ≥ 20% by Dec 2022.

Background

See poster appended/ below

Methods

See poster appended/ below

Results

See poster appended/ below

Lessons Learnt

The success of this project has demonstrated that applying “Hard clinical core” + “Soft QI periphery” is an effective improvement model and can transform patient care. The use of this model has spread to other surgical improvement projects such as reducing inappropriate use of antibiotics and reducing surgical site infections.

Conclusion

See poster appended/ below

Project Category

Care & Process Redesign

Value Based Care, Functional Outcome, Safe Care

Keywords

EL, NELA, CQI, Pre Surgery, Post Surgery, Mortality, Intensive Care, Surgery

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IMPROVING OUTCOME OF PATIENTS UNDERGOING EMERGENCY LAPAROTOMY

☑ SAFETY
☑ QUALITY
☑ PT. EXPERIENCE
☐ PRODUCTIVITY
☑ COST

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DEPARTMENTS: [1]MEDICAL AFFAIRS; [2]GENERAL SURGERY; [3]EMERGENCY MEDICINE; [4]ANAESTHESIA; [5]INTENSIVE CARE MEDICINE; [6]QUALITY, INNOVATION & IMPROVEMENT; [7] SPECIALTY OPERATIONS; [8]MEDICAL INFORMATICS

A. Define Problem, Set Aim, Form Team

Define problem - Emergency laparotomy (EL) is a major, high risk surgical procedure with 15% 30-day mortality. A UK-based NELA (National emergency laparotomy audit) initiative has proven that implementing certain care elements (Table 1) can improve the survival rate of EL patients.

Set aim - We envisioned for our EL patients to receive consistent and coordinated quality of care throughout their patient journey from pre- to post- surgery. Phase 1 project aim was therefore to increase the Clinical Quality Index (CQI), defined as % of EL patients who received all 8 care elements, by at least 5 folds from 4% in 2020 to ≥20% by Dec 2022.

Form team – A multidisciplinary team comprised of doctors from departments involved in the care of EL patients, and supportive administrative staff for Ops, MI, data collection, research and project management were recruited.

B. Establish Measure

Type of Measure	Measure	Operational Definition
Outcome	% EL pts receiving all 8 care elements (i.e. Clinical Quality Index, CQI)	Numerator: No. of EL receiving all 8 care elements Denominator: No. of EL pts
Process	% compliance for each of the 8 care elements	Numerator: No. of EL pts receiving the element Denominator: No. of EL pts
Balancing measure	Cost of hospital stay	-
Patient Outcomes	30-day mortality Length of stay	-

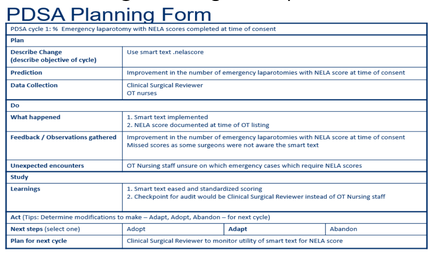
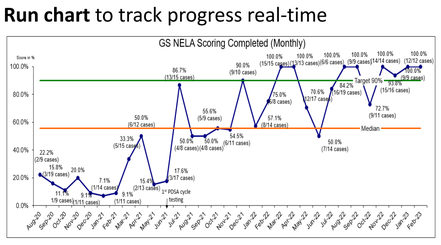
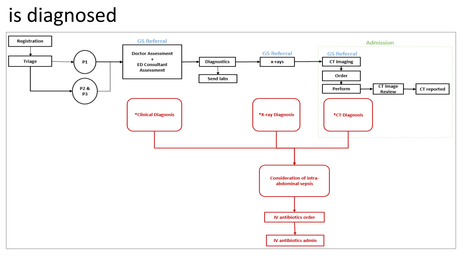
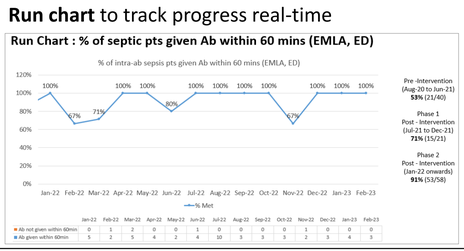
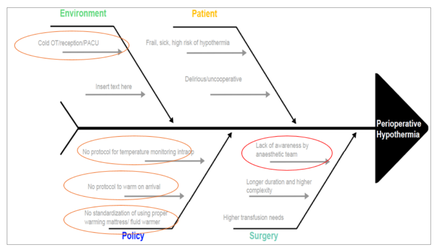
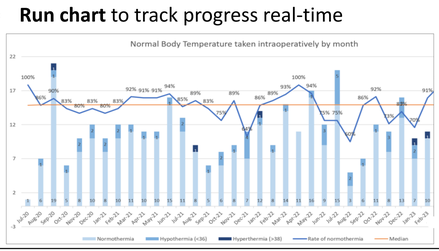
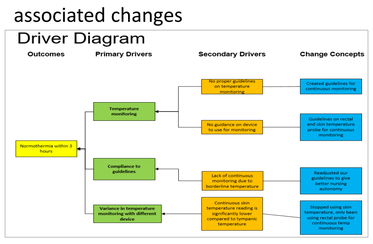
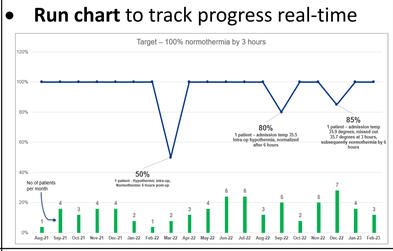
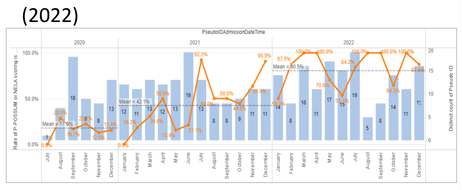
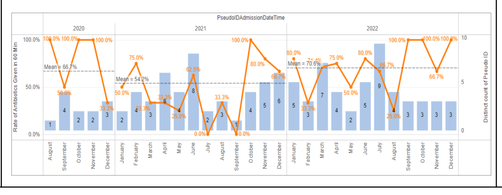
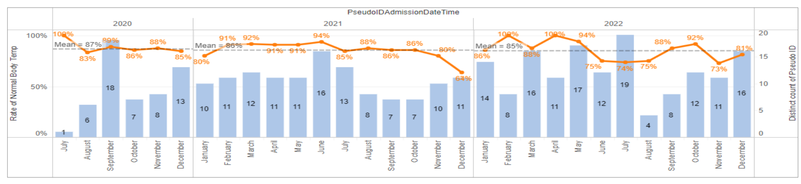
C. Analyse Problem & Select Changes

A data collection plan was set up and baseline data (Jul-Dec 2020) was collected in REDCap. The compliance rates for each of the 8 care elements were computed. Departments responsible, baseline compliance rates, and dependencies between care elements were carefully analyzed in the selection and prioritization of changes for PDSA implementation.

No.	Care elements	Departments Responsible	Baseline (2020) compliance rates	Selection decisions & Reasons behind each decision
1	NELA scoring done (to predict mortality)	GS	18%	**Do first** (phase 1) -Each department was to focus on 1 care element in each phase - Elements with lowest compliance rates were prioritised as they would have the greatest impact in increasing CQI.
2	IV antibiotics given within 60 min from Sepsis diagnosis	ED	67%	
3	Body temperature maintained at normal range (intra-op & post-op)	Anaesthesia / ICM	87%	
4	Post-op care at ICU/HD for cases with mortality ≥5%	ICM / GS	71%	**Do next** (phase 2) - As 4, 5 are only for cases with high mortality so info on NELA score is needed, (i.e. 4, 5 have dependencies on 1). - 5 had higher compliance rate compared to care elements selected for phase 1.
5	Goal-directed therapy administered for cases with mortality ≥5%	Anaesthesia	92%	
6	Decision for surgery made by consultant surgeon	GS	96%	**Do last (phase 3)/ Don't do** - Compliance rates of these elements were already high.
7	Surgery within 1/6 hours for P1/P2 cases respectively	GS	96%	
8	Consultant-level Anesthesiologist & Surgeon present during surgery	GS / Anaesthesia	96%	

Table 1: Analysis & selection of care elements for PDSA implementations

D. Test & Implement Changes

Sub-team	GS	ED	Anaesthesia	ICM
Care element selected	**(1) NELA scoring done**	**(2) IV antibiotics given within 60 min from Sepsis diagnosis**	**(3) Body temperature maintained at normal range (intra-ops & post-ops)**	
Examples of QI tools used	• **PDSA Planning Form** to guide implementation  PDSA Planning Form PDSA cycle 1: % Emergency laparotomy with NELA scores completed at time of consent Plan Describe Change (describe objective of cycle): Use smart text .nelascore Prediction: Improvement in the number of emergency laparotomies with NELA score at time of consent Data Collection: Clinical Surgical Reviewer; OT nurses Do What happened: 1. Smart text implemented; 2. NELA score documented at time of OT listing Feedback / Observations gathered: Improvement in the number of emergency laparotomies with NELA score at time of consent; Missed scores as some surgeons were not aware the smart text Unexpected encounters: OT Nursing staff unsure on which emergency cases which require NELA scores Study Learnings: 1. Smart text eased and standardized scoring; 2. Checkpoint for audit would be Clinical Surgical Reviewer instead of OT Nursing staff Act (Tips: Determine modifications to make – Adapt, Adopt, Abandon – for next cycle) Next steps (select one): Adopt / Adapt / Abandon Plan for next cycle: Clinical Surgical Reviewer to monitor utility of smart text for NELA score • **Run chart** to track progress real-time  GS NELA Scoring Completed (Monthly)	• **Process Map** to guide Drs/ Nrs on when/how sepsis is diagnosed  Registration; Triage; P1; P2 & P3; GS Referral; Doctor Assessment + ED Consultant Assessment; Diagnostics; Send labs; GS Referral; x-rays; Admission; CT Imaging Order; Perform; CT Image Review; CT reported; *Clinical Diagnosis; *X-ray Diagnosis; *CT Diagnosis; Consideration of intra-abdominal sepsis; IV antibiotics order; IV antibiotics admin • **Run chart** to track progress real-time  Run Chart : % of septic pts given Ab within 60 mins (EMLA, ED)	• **Fishbone diagram** for root-cause analysis  Environment; Patient; Cold OT/reception/PACU; Frail, sick, high risk of hypothermia; Insert text here; Delirious/uncooperative; No protocol for temperature monitoring intraop; No protocol to warm on arrival; No standardization of using proper warming mattress/ fluid warmer; Lack of awareness by anaesthetic team; Longer duration and higher complexity; Higher transfusion needs; Perioperative Hypothermia; Policy; Surgery • **Run chart** to track progress real-time  Normal Body Temperature taken intraoperatively by month	• **Driver Diagram** to determine drivers & associated changes  Driver Diagram; Outcomes; Primary Drivers; Secondary Drivers; Change Concepts; Normothermia within 3 hours; Temperature monitoring; Compliance to guidelines; Variance in temperature monitoring with different device; No proper guidelines on temperature monitoring; No guidance on device to use for monitoring; Lack of continuous monitoring due to borderline temperature; Variance in temperature monitoring with different device; Created guidelines for continuous monitoring; Guidelines on rectal and skin temperature probe for continuous monitoring; Readjusted our guidelines to give better nursing autonomy; Stopped using skin temperature, only keen using rectal probe for continuous monitoring • **Run chart** to track progress real-time  Target – 100% normothermia by 3 hours
Other changes implemented	• Smart text (.nelascore) & EMLA preference order sets were used to facilitate NELA score documentation • NELA risk calculator was embedded in EPIC to make NELA score calculation convenient • Cases that did not have a NELA score documented were reviewed at Dept's weekly M&M sessions	• Sepsis diagnosis & treatment was incorporated into MO's onboarding training programme • Roadshows on Sepsis diagnosis & treatment were conducted to create awareness among ED Drs/ Nrs • Cases of non-compliance were reviewed at dept's M&M sessions. Direct feedback was also given to individual clinicians	• Additional warming devices (eg. Bair hugger warming blankets) were purchased to address inadequate supply • Hypothermia prevention & management guidelines was established & shared with the Anesthesiologists and OT nurses • Real-time feedback was given to the consultant-in-charge	• Drs/ Nrs in ICU were alerted of patients with intra-ops hypothermia • Continuous temperature monitoring in ICU was carried out with the aim to achieve normothermia within 3 hours • Rectal temperature probes were used for intubated patients • Warming blankets were used
Results (compliance rate) Ref: https://jhstablvpapp03.nhg.local	• 63% improvement, from 18% (2020) to 81% (2022)  PseudoIDAdmissionDateTime	• 4% improvement, from 67% (2020) to 71% (2022)  PseudoIDAdmissionDateTime	• Standard of care was maintained at a high rate of 85-90%  PseudoIDAdmissionDateTime	

Team members formed sub-teams to work on the care elements assigned to their departments. Team members (from MA) who had formal training in Lean-6σ shared & coached the sub-teams on the use of QI tools as they carried out their root-cause analysis, and multiple PDSA cycles.

The sub-teams monitored their own performance and analysed the reasons for non-compliance monthly. Accountability on the progress of the sub-teams (e.g. PSDA cycles done, results achieved) & discussion on issues/ challenges were done collectively at project team meetings. There were 13 of such meetings carried out.

← Table 2: Sub-teams working on each element selected for change

E. Outcome & Sustainability

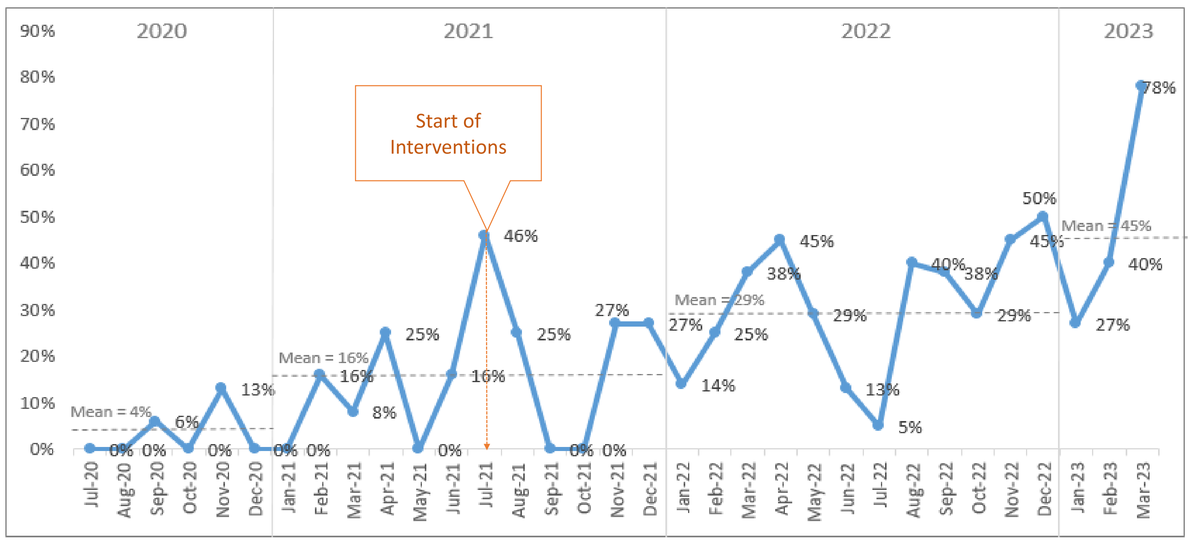


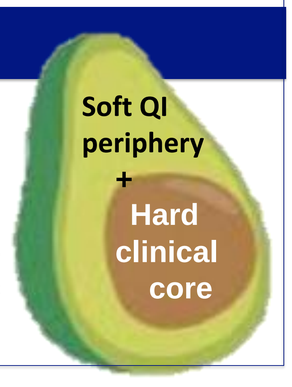
Figure 3: Run chart showing CQI trend

The project has achieved its aim, and the results have been **sustained;** in fact CQI continued to improve to 45% (Jan-Mar 2023). The improvement in CQI and compliance rate of care elements selected for changes meant that NTFGH EL patients are receiving more consistent and better care, from pre to post surgery. This auger well with our clinical aspiration of providing the **right care right, for every patient, every time**.

- **Outcome Measure**: CQI increased by more than 7 folds from 4% (2020) to 29% (2022).
- **Process Measures**: The compliance rates for most of care elements selected for change have increased. (Ref: "Results" row in Table 2)
- **Balancing Measure:** Cost of hospital stay decreased by ~ S$10k per case (from $41k (2020) to $32k (2022) → $2.6M cost avoidance over 2 years.
- **Patient outcome measures:**
  - Compared to 2020, mortality rate decreased by 6% in 2021, & 2% in 2022 → 11 precious lives saved!
  - Length of stay decreased by 2.4 days, from 16.0 days (2020) to 13.6 days (2022)
  - And as emergency laparotomy is a Bellwether procedure, positive outcomes reaped from this project will spill-over to other surgical procedures.

F. Spread Changes, Learning Points

- The project has progressed to phase 2 in 2023 to further increase the CQI by working on the next set of care elements.
- The success of this project has demonstrated that applying "Hard clinical core" + "Soft QI periphery" is an effective improvement model, and can transform patient care. The use of this model has spread to other surgical improvement projects such as reducing inappropriate use of antibiotics, and reducing surgical site infections.



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