

## Project Title

Benchmarking Towards Surgical Excellence-The Pursuit of Value Driven Colorectal Surgery

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## Organisation(s) Involved

Singapore General Hospital, Duke-NUS Medical School, SingHealth Community Hospitals, Singapore Management University

## Healthcare Family Group(s) Involved in this Project

Medical, Healthcare administration

## Applicable Specialty or Discipline

Colorectal Surgery, Financial analytics

## Project Period

Start date: 2018

Completed date: 2020

## Aim(s)

- Collect data that provides detailed and insightful analysis, allowing hospitals to gauge the quality of their surgical programs with unrivalled precision and improve surgical outcomes.

## **Background**

See poster appended/ below

## **Methods**

See poster appended/ below

## **Results**

See poster appended/ below

## **Conclusion**

See poster appended/ below

## **Project Category**

Applied/ Translational Research

Quantitative research

## **Keywords**

Elective Colorectal Resections, Value Driven Care Programme, Length Of Stay,  
Enhanced Recovery After Surgery (ERAS)

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# Benchmarking Towards Surgical Excellence- The Pursuit of Value Driven Colorectal Surgery

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## Background

SGH has embarked on a value driven care journey in 2018 by submitting to the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) an outcomes based program for colorectal resections, enabling benchmarking procedures against hospitals in America and internationally. Developed by surgeons, ACS NSQIP collects data that provides detailed and insightful analysis, allowing hospitals to gauge the quality of their surgical programs with unrivalled precision and improve surgical outcomes.

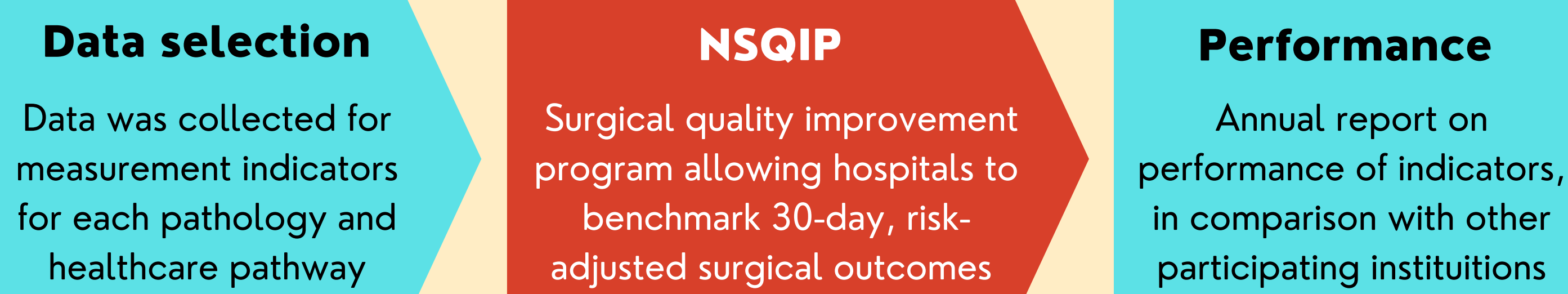
## Objective

- A retrospective study was conducted at SGH to describe the application of a value driven care programme for elective colorectal resections
- Surgical outcomes and cost data collected are utilized to develop and identify initiatives for improvements in value and quality of care
- Outcomes are benchmarked against selected clinical quality indicators
- Value of care is determined by assessing performance of outcomes against cost

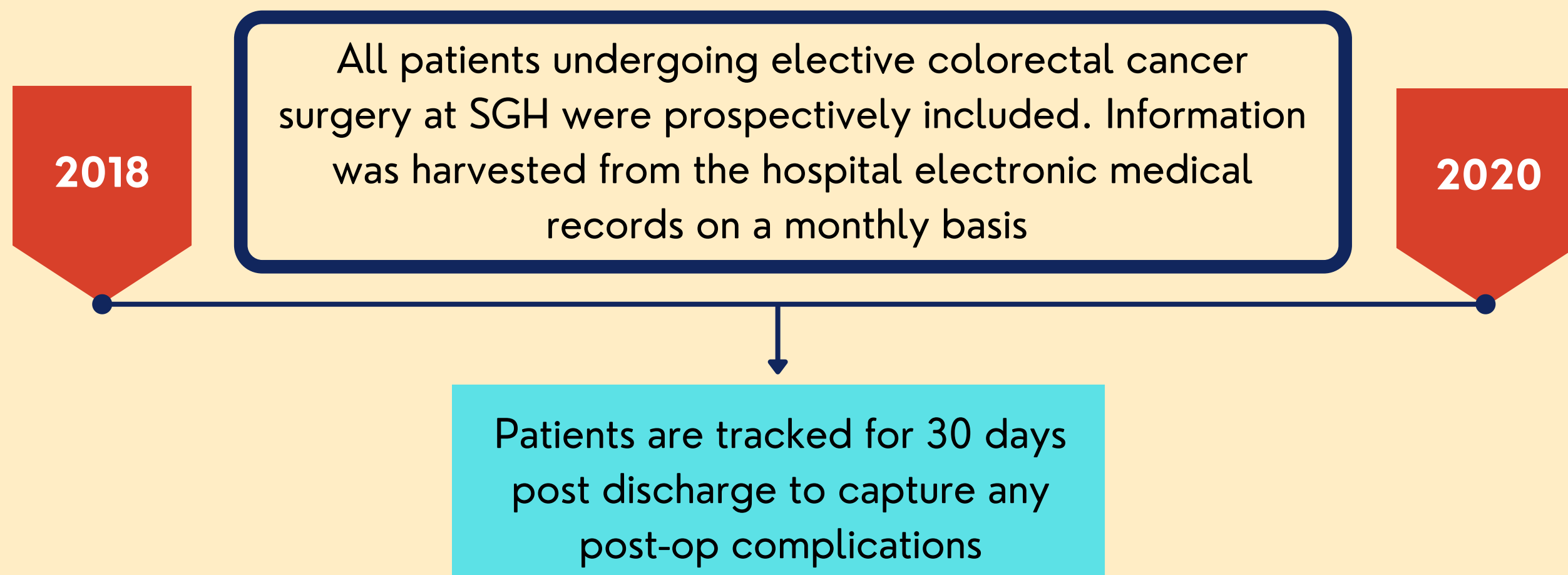
## Methodology

### Standardization of measurement outcomes

Data was collected and submitted to the NSQIP database



### Participants



### Selected Clinical Quality Indicators

- wound occurrences
- cardiac occurrences
- respiratory occurrences
- urinary occurrences
- 30-day readmission rate
- post-op length of stay (< 6 days)
- inpatient mortality rate
- 30-day complication rate
- 30-day return to operating theatre rate
- other occurrences

### Quality measurement

- Clinical Quality Indicator (CQI) scores are computed in an all-or-nothing fashion
- Failure to meet any of the indicator items within the score matrix is considered a fail
- It is a measure of the "perfect" post-operative patient journey or the percentage of patients satisfying all indicator items

### Cost assessment

- disaggregated cost data for patients were harvested from the hospital's finance department for the entire hospitalization journey from surgery to discharge
- consumables
- daily treatment
- investigation
- surgeon

### Evaluation of outcomes

- CQI scores are measured against cost data to assess cost-effectiveness of health services
- Performance gaps are identified to drive initiatives for improvements in quality of care
- Establish best practices amongst surgeons

## Analysis

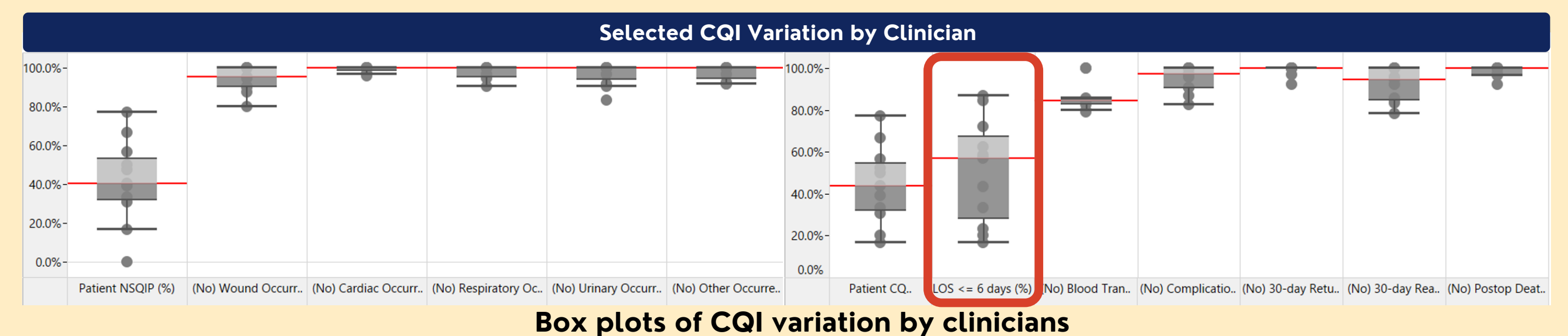
The data tracked was illustrated using an interactive data visualization dashboard with Tableau. Deeper insights could be derived through the analysis of CQI scores, performance variation across surgeons as well as cost effectiveness of surgical outcomes. Key areas for surgical improvements and specific cost drivers could be identified precisely.

### Dashboard overview

Previous Year	Comparison Period: 2020 Q1 - 2020 Q4	Select Start		Select Doctor Department	Select TOSP Code	Surgery Count	Admit Type
		2019	2020 Q1				
No of Cases	173	206	51	64			
No of CQI Not Met Cases	79	102	24	31			
Patient NSQIP (%)	52.0%	49.0%	51.0%	50.0%			
LOS <= 6 days (%)	64.2%	60.7%	56.9%	57.8%			
(No) Blood Transfusion Rate (%)	87.3%	84.0%	82.4%	89.1%			
(No) Complication Rate (%)	94.8%	92.7%	96.1%	92.2%			
(No) 30-day Return to OT Rate (%)	97.7%	99.0%	100.0%	98.4%			
(No) 30-day Readmission Rate (%)	93.1%	89.3%	92.2%	89.1%			
(No) Postop Death Rate (%)	97.1%	98.1%	96.1%	98.4%			
(No) Wound Occurrence Rate (%)	93.6%	93.7%	92.2%	92.2%			
(No) Cardiac Occurrence Rate (%)	99.4%	98.5%	98.0%	100.0%			
(No) Respiratory Occurrence Rate (%)	98.8%	96.1%	98.0%	95.3%			
(No) Urinary Occurrence Rate (%)	100.0%	97.1%	100.0%	100.0%			
(No) Other Occurrence Rate (%)	98.3%	96.6%	94.1%	98.4%			

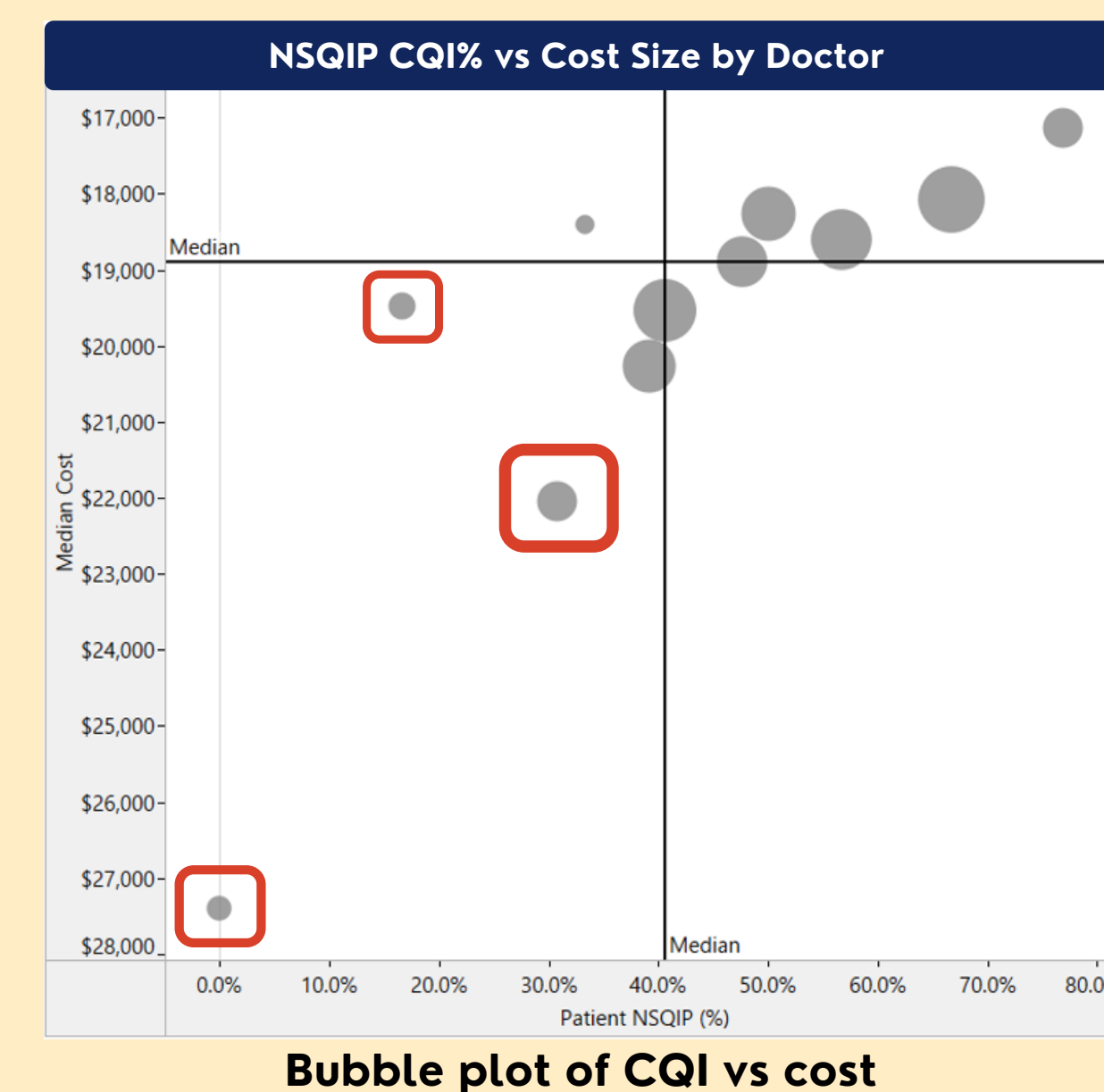
- The dashboard allows for comparison of quality indicator metrics on a yearly and quarterly basis
- Clinical performance was generally exemplary
- Length of stay rubric was identified as an area requiring significant improvement

## Inter-surgeon variation



Each bubble represents a surgeon, while the red line represents the overall surgeons' median performance. The plot allows for comparison of quality indicator performances across surgeons. More granular immediate post-op outcomes are examined. There is considerable variation in quality of care provided amongst surgeons, with the main contributor being length of stay. Outliers below the first quartile are targeted as areas of improvement.

## Cost effective assessment

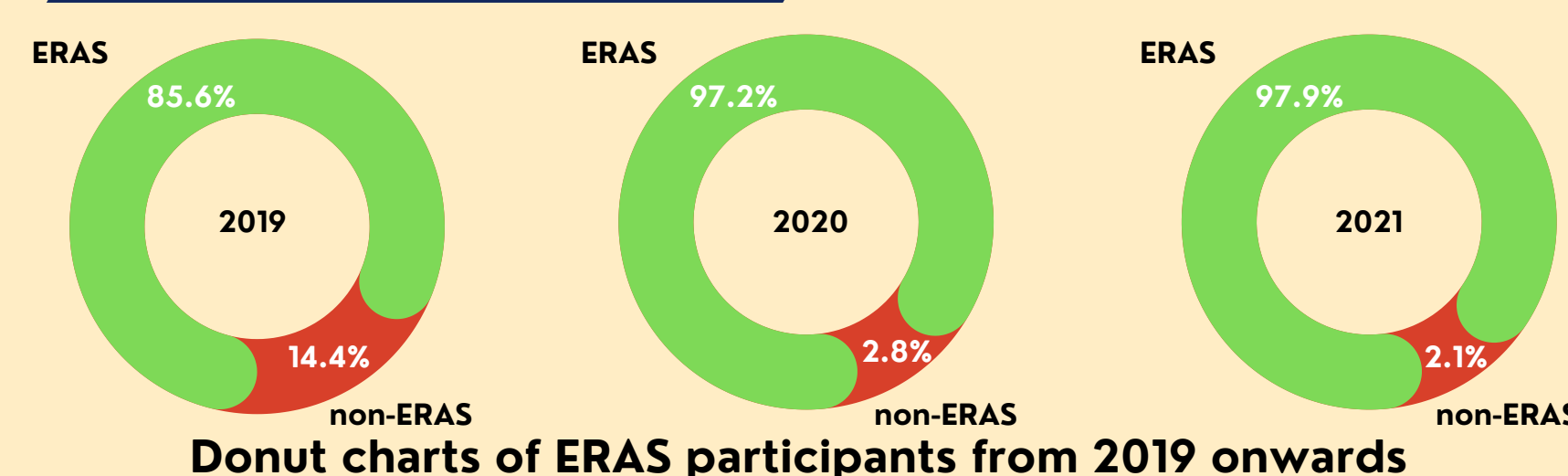


- Bubble plot illustrates each surgeon's relative performance in terms of cost against CQI performance
- Outlying procedures with large costs and poor CQI performance were extensively examined
- Cost drivers were further broken down and examined on a granular level with length of stay and consumables identified as the main contributors, the latter of which showing significant variation amongst surgeons

## ERAS Initiative

To achieve improvements in quality of care, the Enhanced Recovery After Surgery (ERAS) protocol was explored as a method to ensure systemic adherence to recommended processes of care. ERAS is a multimodal perioperative care pathway designed with evidence-based best practices to achieve early recovery for patients undergoing major surgery. With length of stay (LOS) identified as a key area for improvement, the effects of ERAS on post-operative outcomes were investigated in the field of colectomy.

### ERAS Participation



Percentage of patient enrolment for ERAS in colectomy increased yearly since its implementation in 2019

### Improvements from ERAS

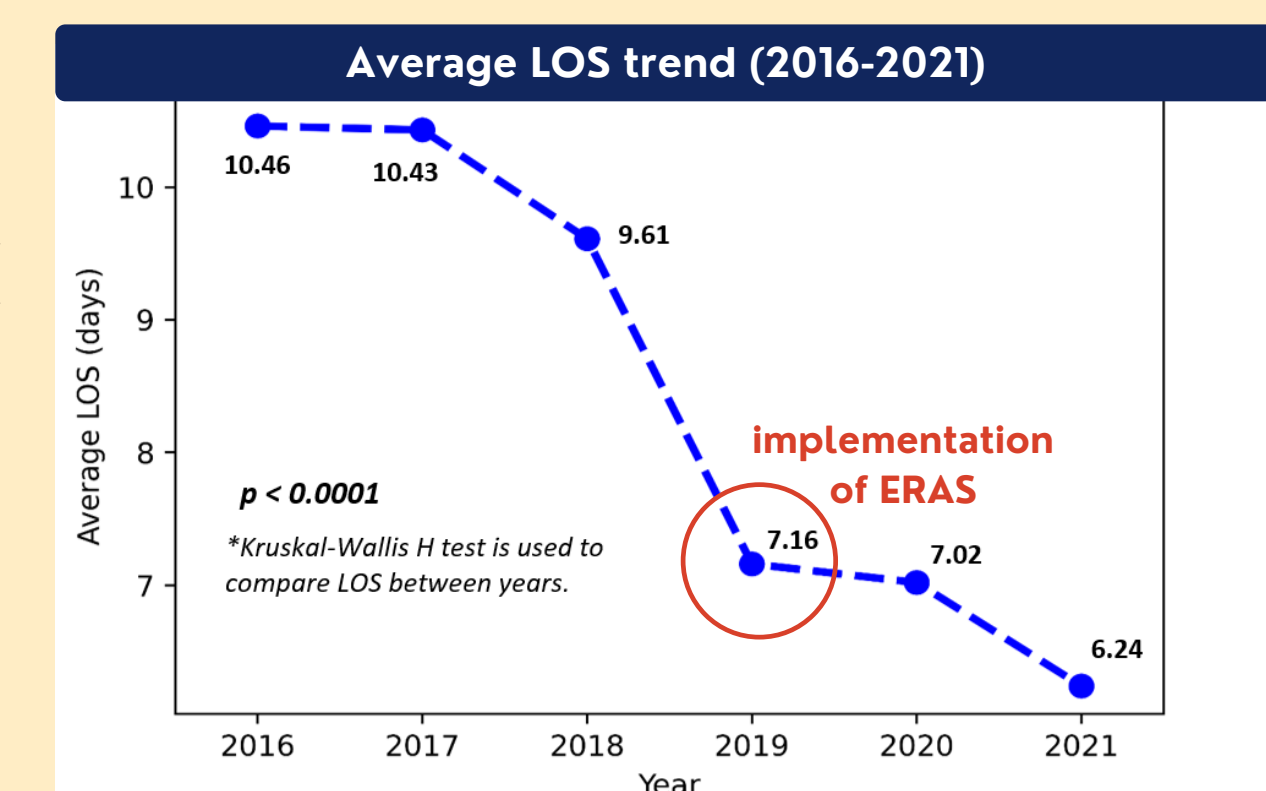
Year	Before ERAS			After ERAS			p-value
	2016	2017	2018	2019	2020	2021	
Median LOS (days)	7	7	6	5	5	5	< 0.0001*
Average LOS (days)	10.46	10.43	9.61	7.16	7.02	6.24	
Reduction in average LOS (with reference from 2018)				2.45	2.59	3.37	
Average bed days saved (2019-2021)				2.45 + 2.59 + 3.37 = 8.41			

There is a clinically & statistically significant reduction in post-operative LOS after ERAS

SGH ward type	A	B1	B2	C
Rates (per day)	508.46	251.45	79	35
Daily treatment fee	242.66 per day for all wards			
Average bed day cost	(508.46 + 251.45 + 79 + 35)/4 = \$461.14			
Cost savings (estimated 2019-2021)	461.14 x 8.41 (bed days saved) x 300 (300 beds) = \$1,163,456			

### Valuation of cost savings

The observed reduction in LOS of our patient cohort would have resulted in cost savings of \$1,163,456 following the implementation of ERAS (at an estimated bed day cost of \$461.14)



## Conclusion

- Standardization of outcome measurements alongside cost assessment allows for concrete determination of value in care
- Data analytics plays a vital role in enhancing quality control and the development of improvement initiatives towards reducing healthcare costs while maintaining standards of healthcare services
- Value driven care programme in surgical oncology is feasible with benchmarking of surgical outcomes allowing for the establishment of best practice protocols