

*Dissertation on*

**“A PROSPECTIVE AND COMPARITIVE STUDY  
ON EMERGENCY LAPAROTOMY PATHWAY  
QUALITY IMPROVEMENT CARE BUNDLE IN REDUCING  
MORTALITY”**

**BY**

**DR. PRABU PRASANNA N**

**DISSERTATION SUBMITTED FOR THE DEGREE OF  
MASTER OF SURGERY**

**BRANCH-I (GENERAL SURGERY) AT  
MADRAS MEDICAL COLLEGE, CHENNAI.**



**THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY,**

**GUINDY,**

**CHENNAI – 600 032.**

**APRIL - 2018.**

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This is to certify that the dissertation titled “**A PROSPECTIVE AND COMPARITIVE STUDY ON EMERGENCY LAPAROTOMY PATHWAY QUALITY IMPROVEMENT CARE BUNDLE IN REDUCING MORTALITY**” is the bonafide work done by Dr.PRABUPRASANNA.N, during his M.S. General Surgery course 2015-18, under my guidance and supervision in partial fulfillment of the rules and regulations laid down by The Tamil Nadu Dr. M.G.R. Medical University, Chennai for M.S. (Branch-I) general surgery Examination, April 2018

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## **DECLARATION**

I, **Dr. PRABU PRASANNA N**, certainly declare that this dissertation titled, **“A PROSPECTIVE AND COMPARITIVE STUDY ON EMERGENCY LAPAROTOMY PATHWAY QUALITY IMPROVEMENT CARE BUNDLE IN REDUCING MORTALITY”** represents a genuine work of mine. The contributions of any supervisors to the research are consistent with normal supervisory practice and are acknowledged. I also affirm that this bonafide work or part of this work was not submitted by me or any others for any award, degree or diploma to any other university board, either in India or abroad. This is submitted to the Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the rules and regulations for the award of Master of Surgery degree Branch I (General Surgery).

**Dr. PRABU PRASANNA N**

**DATE :**

**PLACE:**

## **ACKNOWLEDGEMENT**

I hereby wish to express my heartfelt gratitude to the following persons without whose help this study would not have been possible. I thank the **Dean Prof. Dr.Narayana Babu MD,DCH**,for allowing me to conduct this study in Rajiv Gandhi Government General Hospital, Chennai.

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My sincere thanks to my chief **Prof. Dr. USHA DORAIRAJAN, M.S., F.R.C.S.(Ed.)**, for her guidance and supervision throughout my career and in carrying out this dissertation.

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**Dr. PRABU PRASANNA N**

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**CERTIFICATE OF APPROVAL**

To  
Dr.Prabu Prasanna.N.  
Post Graduate in MS General Surgery  
Institute of General Surgery  
Madras Medical College  
Chennai 600 003

Dear Dr.Prabu Prasanna.N,

The Institutional Ethics Committee has considered your request and approved your study titled "**PROSPECTIVE AND COMPARATIVE STUDY ON EMERGENCY LAPAROTOMY PATHWAY QUALITY IMPROVEMENT CARE BUNDLE IN REDUCING MORTALITY**" - NO.26012017 (II).

The following members of Ethics Committee were present in the meeting hold on **19.01.2017** conducted at Madras Medical College, Chennai 3

- |  |                     |
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| 13.Tmt.Arnold Saulina, MA.,MSW.,                               | :Social Scientist   |

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

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IMPROVEMENT CARE BUNDLE IN REDUCING MORTALITY”**  
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# **INTRODUCTION**

# INTRODUCTION

‘ There is no failure except in no longer trying ’

- Elbert Green Hubbard (1856-1915)

Emergency laparotomy is the little studied area of a surgical practice. The results of recent international audits and report by royal college of surgeons of England throws light on standard of care delivered to patients admitted for emergency laparotomy.

The first report by the National Emergency Laparotomy Audit (NELA) was published in 2015 .A significant proportion of patients with overt sepsis still do not receive timely antibiotics within one hour of identification of sepsis. Access to emergency theatres is patchy,especially for patients deemed to be category 2a (urgent: surgery within 2 to 6 hours). Fluid resuscitation is carried out in an unscientific way and intensive care unit admission is inconsistent.Consultant (both anaesthetic and surgical) involvement at night and weekends remains poor.

Evidence is now emerging about what strategies might be useful in addressing some of these issues. Two publications highlight the use of a care pathway to improve outcomes.

A study from Denmark on patients undergoing emergency surgery for peptic ulcer perforation found a 30% reduction in mortality whereas Emergency Laparotomy Pathway Quality Improvement Care Bundle project (ELPQuIC) showed a 25% reduction in crude in-hospital mortality. The results of the EPOCH (Enhanced Peri Operative Care for High risk patients ) trial are eagerly awaited, as are the results of a similar study in Sweden.

In England, it is estimated that one in 1100 of the population undergoes an emergency laparotomy each year<sup>2</sup>. Successive National Confidential Enquiry into Patient Outcome and Death analyses have found poor standards of care. In 2010, the Emergency Laparotomy network (ELN) collected data from 35 hospitals and reported a crude 30-day hospital mortality rate of 14.9 (range 3.6–41.7) percent, rising to 24.4 percent in patients aged 80 years and over.

A larger retrospective analysis from the USA of 37 553 patients showed a similarly high mortality rate of 14 percent. Most recently, a large prospective stud

of 4920 patients undergoing emergency laparotomy in Denmark reported a 19.5 percent mortality rate. In the UK there is increasing recognition that outcomes after emergency major general surgery are poor and would benefit from standardization of care.

The ELN report also highlighted wide variation in, and poor delivery of, a number of key process indicators that are supported in evidence-based clinical guidelines. These included lack of surgical and anaesthetic consultant involvement, and the underuse of intraoperative goal-directed fluid therapy and postoperative intensive care.

A care-bundle approach to implementation of key evidence-based components of care was adopted. The care-bundle concept was developed by the Institute for Healthcare Improvement in 2001<sup>11</sup>. Two commonly used and successful applications of this approach are the care bundles developed to reduce central venous catheter-line infection and to reduce ventilator-associated pneumonia. The Surviving Sepsis Campaign has used the care-bundle concept to improve dramatically the outcomes of patients presenting with sepsis.

## **Using care bundles to improve health care quality :**

### **Definition of bundle :**

A small set of evidence based intervention for a defined patient segment /population and care setting, that, when implemented together results in significantly better outcomes than when implemented individually.

### **Bundle design :**

When designing care bundles these guidelines proved helpful

- 1) The bundle has 3 to 5 interventions(elements),with strong clinical agreement
- 2) Each bundle element is relatively independent
- 3) The multidisciplinary care team develops the bundle
- 4) Bundle elements should be descriptive rather than prescriptive, to allow for local customization and appropriate clinical judgement
- 5) Compliance with bundles is measured using all or none measurement with a goal of 95% or greater

## **Development of the bundle :**

Following submission of data from one hospital to ELN, evidence based care bundle was developed for patients undergoing emergency laparotomy. This was based on key recommendations made in the Royal College of Surgeons of England and department of Health Publications recommendations with a strong evidence base were adopted into the care bundle. The elements of the bundle and the evidence on which they are based are

- 1) All emergency admissions have an early warning score assessed on presentation, graded escalation policies for senior clinical and intensive care unit referral (NICE clinical guidelines)
- 2) Broad spectrum antibiotics to be given to all patients with suspicion of peritoneal soiling or with a diagnosis of sepsis ( Surviving Sepsis Campaign)
- 3) Once a decision has been made to carry out laparotomy the patient takes the next available place in the

emergency theatre (or within 6 hours of decision being made)

4) Start resuscitation using goal directed techniques as soon as possible or within 6 hours of admission(NICE recommendation and others)

5) Admit all patients in ICU after emergency laparotomy.

# **AIM AND OBJECTIVES**



## **AIMS AND OBJECTIVES**

To compare risk adjusted 30 day mortality after emergency laparotomy before and after implementation of ELPQuiC bundle (Emergency Laparotomy Pathway Quality Improvement Care Bundle project )

# **REVIEW OF LITERATURE**

## **REVIEW OF LITERATURE**

Laparotomy is a common surgical procedure done by a surgical team. In surgical language, the word laparotomy explains exploration of abdomen and proceed further according to the cause identified.

Elective laparotomy indirectly implies that there is ample time for preoperative assessment and preparation of patient. But emergency laparotomy is a live saving procedure, undertaken mostly in acute cases, without much preparation of the patient. It is commonly performed on with a variety of acute pathological disorders that render these patients dehydrated, hypovolemic, suffering from SIRS(systemic inflammatory response syndrome) often with MODS (multi organ dysfunction syndrome).

Compared to elective surgery, emergency abdominal surgery is associated with higher risk of mortality and morbidity.

## **Improving after emergency Laparotomy outcomes :**

Identify the problem

Quantify the size of the problem

Work out the solution

Implement solution and measure its effects

The future

## ***IDENTIFY THE PROBLEM***

There is a paucity of hard Indian data, and more data about the size of problem were studied by European countries. One such is NCEPOD report of UK, which provides evidence of high mortality in these patients.

### **National Confidential Enquiry into Perioperative Death. NCEPOD.**

First report 1987

Subsequent reports 1991, 1992, 1993, 1994, 1995

‘Who operates when?’ 1996

‘Changing the way we operate.’ 2001

‘Who operates when.’ 2003

‘Emergency admissions. A journey in the right direction?’ 2007

‘Elective and emergency surgery in the elderly’ 2010

‘Perioperative care. Knowing the risk’ 2011.

## **QUANTIFY THE SIZE OF PROBLEM**

**When is death inevitable after emergency laparotomy? Analysis of the American College of Surgeons National QIP database.**

Retrospective data 2005-9

37,553 patients/similar criteria as UK ELN

Overall crude mortality rate at 30 days was 14.1%

Identified highest risk patients over 90 years with significant pre-morbid state and shock 90% mortality rate

**Al Temimi et al. J Am Coll Surg 2012, 215:503-11.**

**High mortality following emergency gastrointestinal surgery: a cohort study.**

Use of Danish national database

4920 patients over 1 year

All cause 30 day mortality 19% (CI 16.9-19.1)

Almost 50% had severe coexisting disease

Only 16% went to ICU

Emergency Laparotomy Network Audit.

**Vester-Andersen et al. eBJA 2014**

## **Emergency Laparotomy Network Audit.**

Data collection 3 months in 2011

37 hospitals submitted data. 1853 patients

Average 30 day mortality rate 14.9%

Mortality range 3.7-41%

Wide variation in:

Consultant Anaesthetic /Surgeon involvement

ICU admission

Goal directed resuscitation.

[www.networks.nhs.uk/nhs-networks/emergency-laparotomy-network](http://www.networks.nhs.uk/nhs-networks/emergency-laparotomy-network)



## **WORK OUT THE SOLUTION**

**Use of a pathway quality improvement care bundle to reduce mortality after emergency laparotomy**

**S.Huddart<sup>1</sup>, C.J.Peden<sup>2</sup>, M.Swart<sup>3</sup>, B.McCormick<sup>4</sup>, M.Dickinson<sup>1</sup>, M. A.Mohammed<sup>5</sup> and N.Quiney<sup>1</sup> on behalf of the ELPQuiCC Collaborator Group**

Four general hospitals in England

Baseline data for 299 patients

Eight month prospective data collection (427 patients)

Use of 'statistical process control' to identify changes

Meet every 4-6 weeks for results/learning

## **Emergency Laparotomy Pathway Quality Improvement**

### **Care Bundle**

Small group developed 'care bundle' ELPQuiC

Five elements

Evidence based, Consisting of

Initial assessment with early warning scores,

Early antibiotics,

Interval between decision and operation <6hrs

Goal-directed fluid therapy

Postoperative intensive care

- All emergency admissions to surgical assessment area have a (M)EWS completed. Outreach to review all patients with (M)EWS of 4 or more.
- Broad spectrum antibiotics to be given to all patients with suspicion of peritoneal soiling or with septic shock.
- Once decision is made to carry out laparotomy patient takes next available slot on emergency list (or within 6 hours of decision made).
- Start resuscitation using goal directed techniques as soon as possible or within 6 hours of admission.
- Admit all patients after emergency laparotomy to ICU.

||



## **Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock: 2012**

R. Phillip Dellinger, MD<sup>1</sup>; Mitchell M. Levy, MD<sup>2</sup>; Andrew Rhodes, MB BS<sup>3</sup>; Djillali Annane, MD<sup>4</sup>; Herwig Gerlach, MD, PhD<sup>5</sup>; Steven M. Opal, MD<sup>6</sup>; Jonathan E. Sevransky, MD<sup>7</sup>; Charles L. Sprung, MD<sup>8</sup>; Ivor S. Douglas, MD<sup>9</sup>; Roman Jaeschke, MD<sup>10</sup>; Tiffany M. Osborn, MD, MPH<sup>11</sup>; Mark E. Nunnally, MD<sup>12</sup>; Sean R. Townsend, MD<sup>13</sup>; Konrad Reinhart, MD<sup>14</sup>; Ruth M. Kleinpell, PhD, RN-CS<sup>15</sup>; Derek C. Angus, MD, MPH<sup>16</sup>; Clifford S. Deutschman, MD, MS<sup>17</sup>; Flavia R. Machado, MD, PhD<sup>18</sup>; Gordon D. Rubenfeld, MD<sup>19</sup>; Steven A. Webb, MB BS, PhD<sup>20</sup>; Richard J. Beale, MB BS<sup>21</sup>; Jean-Louis Vincent, MD, PhD<sup>22</sup>; Rui Moreno, MD, PhD<sup>23</sup>; and the Surviving Sepsis Campaign Guidelines Committee including the Pediatric Subgroup\*

### **Resuscitation bundle (6 hours)**

Measure lactate

Resuscitate (fluids and inotropes)

Blood cultures

Antibiotics

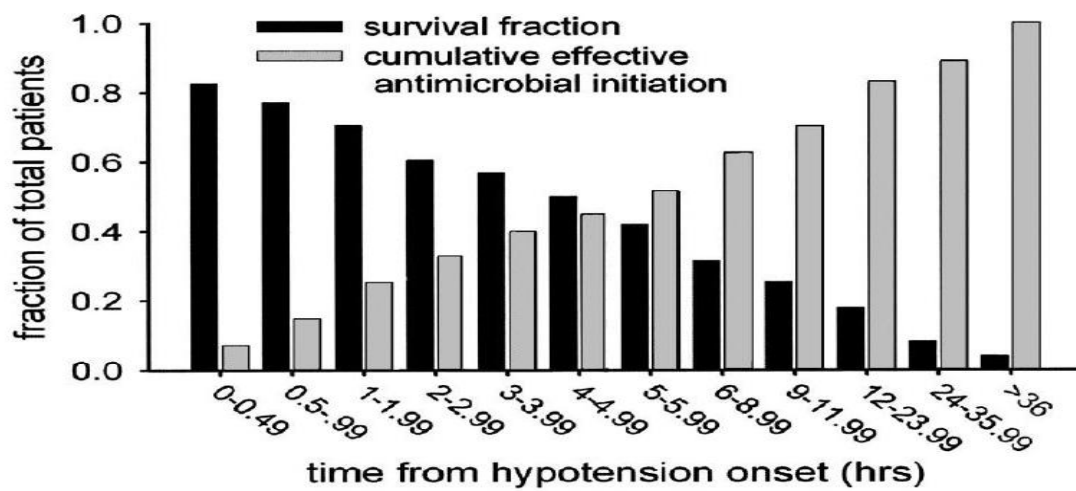
Control source of infection (2004)

**Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock.**

**Kumar et al.**

**Crit Care Med. 2006.**

Royal Surrey County Hospital   
NHS Foundation Trust



**Early goal – directed therapy after major surgery reduces complications and duration of hospital stay. A randomized, controlled trial.**

**Rupert Pearse et al.,**

Critical Care 2005

120 elective surgical patients

Post-operative GDT is associated with reductions in post-operative

complications and duration of hospital stay.

The beneficial effects of GDT may be achieved while avoiding the

difficulties of pre-operative ICU admission.

24% reduction in complications

No difference mortality

3 days reduction LOS

## **“Emergency management of sepsis : the simple stuff saves lives”**

### **Key steps in EGDT protocols:**

- 1) Screening of septic patients
- 2) Identifying and controlling the source of sepsis
- 3) Fluid resuscitation
- 4) Monitoring serum lactate clearance
- 5) Antibiotic administration



## **Surviving Sepsis Campaign: Association Between Performance Metrics and Outcomes in a 7.5-Year Study**

This analysis demonstrates that increased compliance with sepsis performance bundles was associated with a 25% relative risk reduction in mortality rate. Every 10% increase in compliance and additional quarter of participation in the SSC initiative was associated with a significant decrease in the odds ratio for hospital mortality. These results demonstrate that performance metrics can drive change in clinical behavior, improve quality of care, and may decrease mortality in patients with severe sepsis and septic shock.

**Crit Care Med 2014;**

***DETERMINANTS OF LONG TERM SURVIVAL AFTER  
MAJOR SURGERY AND THE ADVERSE EFFECTS OF  
POST OPERATIVE COMPLICATIONS***

‘Independent of preoperative patient risk, the occurrence of a 30-day complication in the total patient group reduced median patient survival by 69%’.

‘The occurrence of a 30-day postoperative complication is more important than preoperative patient risk and intraoperative factors in determining the survival after major surgery in the VA. Quality and process improvement in surgery should be directed toward the prevention of postoperative complications’.

**Khuri et al. Annals Surg 2005;**

**Source control /antimicrobial interaction and survival in septic shock:**

**Antimicrobial initiation Post Shock**

		<3 hours	3-6 hours	>6 hours
Source Control Initia- tion post shock	<6 hours	92% (n=75)	70.3% (n=37)	44.4% (n=63)
	6-24 hours	80% (n=60)	46% (n=50)	19% (n=94)
	>24 hours	69% (n=29)	36% (n=25)	13% (n=100)

*Kumar et al. Interscience Conference on Antimicrobial Agents and Chemotherapy 2004, K 1222.350*

## **Assessing the risk : Scoring system for outcome prediction in emergency laparotomies**

Various scoring systems are available to predict surgical outcomes. The range from general scoring systems to surgery specific scoring systems. While most scoring systems compare postoperative mortality as an outcome parameter, some are also designed to predict morbidity. While American college of Surgeons recommend the Universal ACS NSQIP Surgical Risk Calculator for mortality and morbidity risk assessment for informed consent and facilitate decision making for patients and surgeons, P-POSSUM scoring system was used to assess improved outcomes in patients undergoing emergency laparotomy after the implementation of emergency laparotomy pathway quality improvement care (ELPQuiC) bundle.

While those which can calculate the risk based on preoperative parameters are most useful in prognostication and triage of patients those that need intraoperative data are best utilised for retrospective quality audits. While many scoring systems have been used in emergency laparotomies, till date no specific scoring system has been developed for emergency laparotomies.

## **SURGICAL AUDIT SCORING SYSTEMS**

Copeland et al. first described POSSUM ( Physiological and Operative Severity for the enumeration of mortality and morbidity ) in 1999 as a scoring system for surgical audit.they used logistic regression analysis to predict both morbidity and mortality. However it was found to overpredict death especially amongst the low risk patients.

This led to modification of the logistic regression and development of the Portsmouth POSSUM (P-POSSUM). P-POSSUM used the same physiological and operative scoring methods initially described by Copeland et al. and its predictive mortality matched with the observed mortality. It uses 12 physiological and 6 operative parameters which were divided into 4 grades with exponentially increasing score to calculate the risk of mortality.The minimum score is 12 and the maximum score is 88 with high score predicting high mortality.

POSSUM score has subsequently been modified for application in various types of surgeries,O-POSSUM for orthopaedic surgeries, V-POSSUM for vascular surgeries and Cr-POSSUM for colorectal surgeries

P-POSSUM still remains the scoring system of choice for general surgeries and also for emergency laparotomies. Numerous studies have validated POSSUM in general surgery, laparotomy or in high risk patients.

P-POSSUM has emerged as the most dependable scoring system for audit purposes and for evaluating the impact of quality improvement initiatives in patients undergoing emergency laparotomy. In a recent multicentric study across four National health service (NHS) hospitals, helping bundles brought significant reduction in P-POSSUM in risk adjusted 30 day mortality in patients undergoing emergency laparotomy.

Chieng et al observed P-POSSUM (O:P ratio 0.71) to be a better scoring system compared to POSSUM (O:P ratio 0.366).

## OPERATIVE SCORING

Score	1	2	4	8
Operative severity	Minor	Intermediate	Major	Major+
Number of operations within 30 days	1	—	2	>2
Blood loss per operation (ml)	≤100	101-500	501-999	≥1000
Peritoneal contamination	None	Serous fluid	Local pus	Free bowel content, pus or blood
Presence of malignancy	None	Primary only	Nodal metastases	Distant metastases
Mode of surgery	Elective		Emergency resuscitation of >2 h possible, operation <24 h after admission	Emergency (immediate surgery <2 h needed)

## PHYSIOLOGICAL SCORING

Score	1	2	4	8
Age (years)	≤60	61-70	≥71	
Cardiac signs	Normal	Diuretic, digoxin antianginal or antihypertensive therapy	Peripheral edema, warfarin therapy	Raised jugular venous pressure
Chest radiograph	Normal	—	Borderline cardiomegaly	Cardiomegaly
Respiratory history	Normal	Dyspnea on exertion	Limiting dyspnea (one flight of stairs)	Dyspnea at rest
Chest radiograph	Normal	Mild chronic obstructive airway disease	Moderate COAD	Fibrosis or consolidation
Systolic blood pressure (mmHg)	110-130	131-170	≥171	≤89
Pulse (beats/min)	50-80	81-100	101-120	≥121
Glasgow coma scale	15	12-14	9-11	≤8
Hemoglobin (g/dl)	13-16	11.5-12.9	10-11.4	≤9.9
White cell count (×10 <sup>12</sup> /l)	4-10	16.1-17	17.1-18	≥18.1
Blood urea (mmol/l)	≤7.5	10.1-20	≥20.1	
Sodium (mmol/l)	≥136	3.1-4	≤3	
Potassium (mmol/l)	3.5-5	7.6-10	10.1-15	≥15.1
Electrocardiogram	Normal	131-135	126-130	≤125
		3.2-3.4	2.9-3.1	≤2.8
		5.2-5.3	5.4-5.9	≥6
			Atrial fibrillation (rate 60-90)	Any other change

COAD: Chronic obstructive airway disease

Minimum score : 12

Maximum Score : 88



# **MATERIALS AND METHODS**

## **MATERIALS AND METHODS**

### **STUDY CENTRE:**

Institute of General surgery, Madras Medical College, Rajiv  
Gandhi Government Hospital, Chennai

### **DURATION OF STUDY:**

February 2017 to September 2017

### **STUDY DESIGN:**

Observational study (prospective)

### **INCLUSION CRITERIA:**

Patients above 15 years of age undergoing emergency laparotomy in  
RGGGH, Chennai

## **EXCLUSION CRITERIA:**

Paediatric age group

Pregnant women

Patient not willing to consent for study

**SAMPLE SIZE:** 234

## **METHODS:**

The data set and definitions were agreed before start of the study. Baseline data before the implementation of ELPQuiC for minimum of 3 months collected. The ELPQuiC bundle was introduced and data were collected over 5 months.

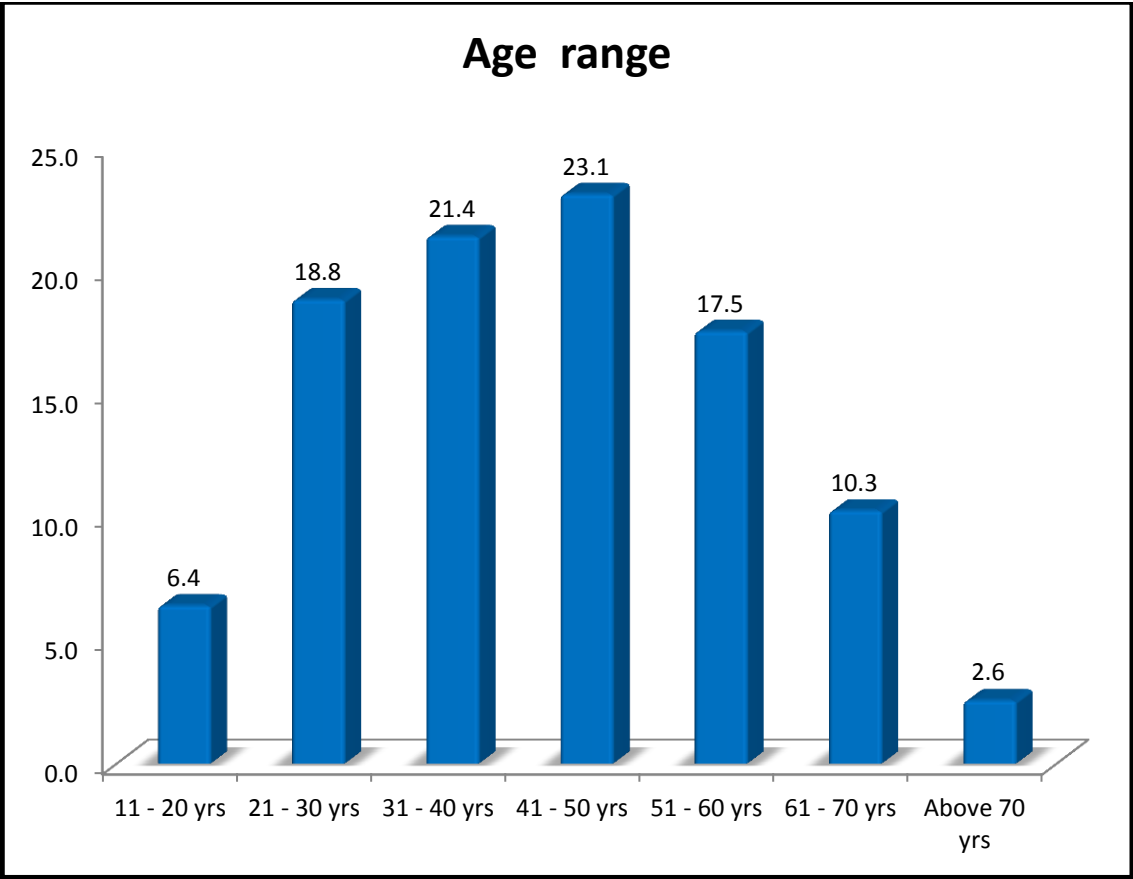
The predicted mortality was estimated for each patient using Porstmouth modification of Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity (P-POSSUM).Data collected included demographics and compliance with bundle elements. The primary outcome was P-POSSUM risk adjusted 30 day mortality.

# **RESULTS**

# RESULTS

## AGE DISTRIBUTION

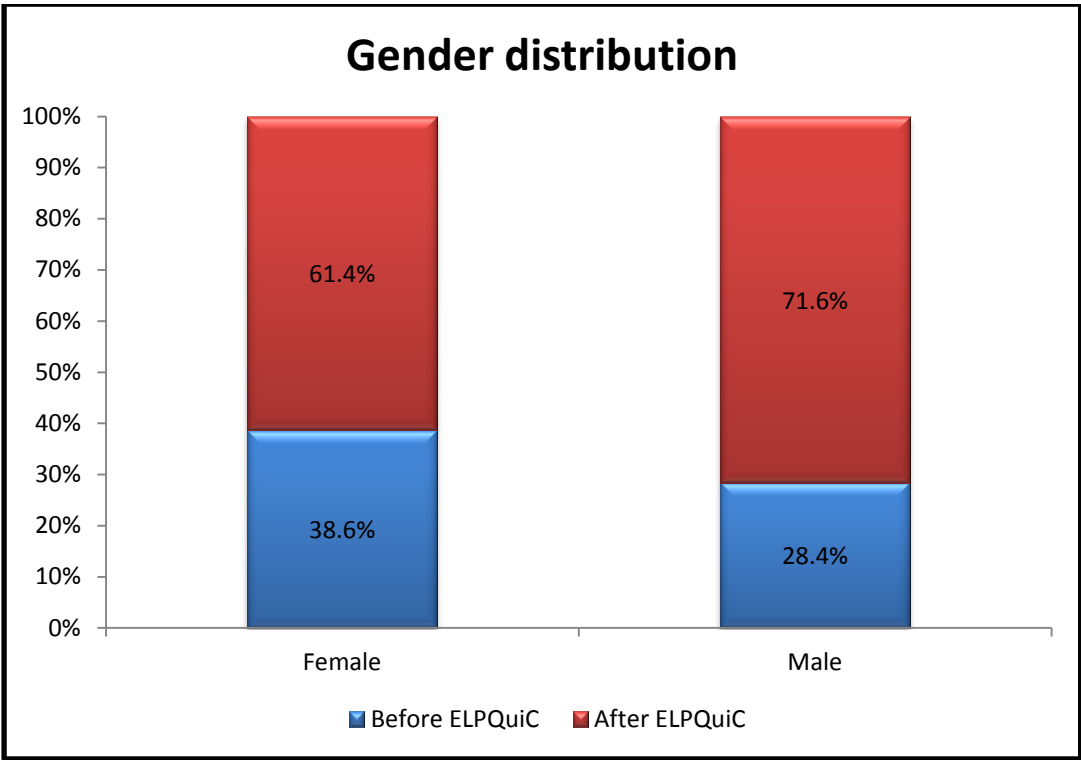
	<b>Frequency</b>	<b>Percent</b>
Valid 11 - 20 yrs	15	6.4
21 - 30 yrs	44	18.8
31 - 40 yrs	50	21.4
41 - 50 yrs	54	23.1
51 - 60 yrs	41	17.5
61 - 70 yrs	24	10.3
Above 70 yrs	6	2.6
Total	234	100.0



## GENDER DISTRIBUTION

**Crosstab**

			Gender		Total
			f	m	
ELPQuiC	Before	Count	17	54	71
	ELPQuiC	%	38.6%	28.4%	30.3%
within Gender					
	After ELPQuiC	Count	27	136	163
		%	61.4%	71.6%	69.7%
within Gender					
Total		Count	44	190	234
		%	100.0%	100.0%	100.0%
within Gender					

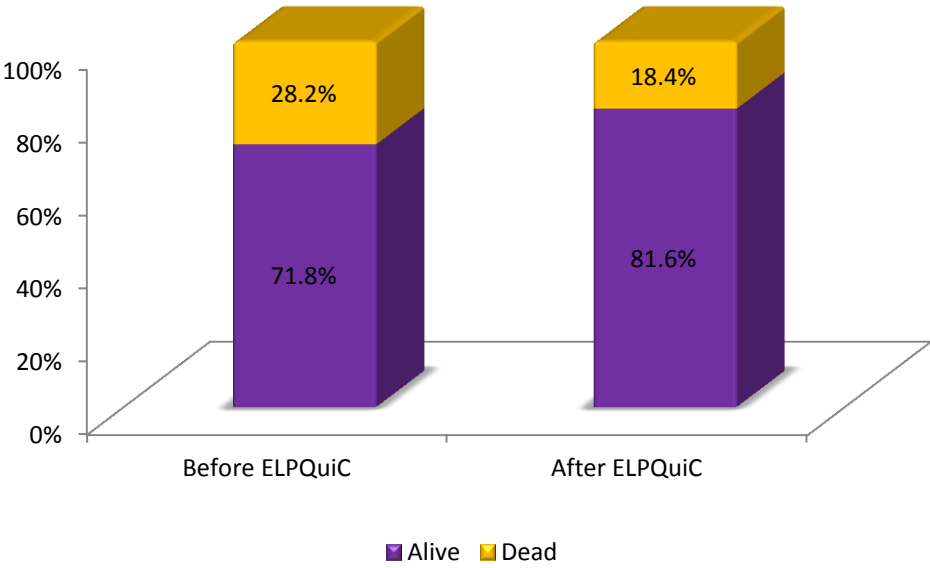




**ELPQuiC \* Mortality Crosstabulation**

			Mortality		Total
			Alive	Dead	
ELPQuiC Before	Count	51	20	71	
	ELPQuiC				
	% within ELPQuiC	71.8%	28.2%	100.0%	
ELPQuiC After	Count	133	30	163	
	ELPQuiC				
	% within ELPQuiC	81.6%	18.4%	100.0%	
Total	Count	184	50	234	
	ELPQuiC				
	% within ELPQuiC	78.6%	21.4%	100.0%	

### ELPQuiC with Mortality



### Case Processing Summary

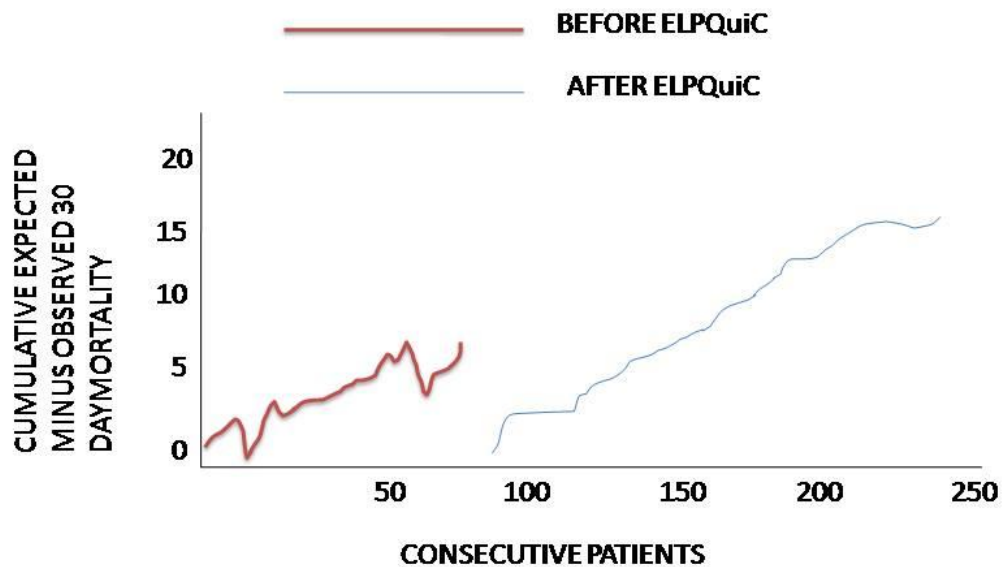
Unweighted Cases <sup>a</sup>		N	Percent
Selected Cases	Included in Analysis	234	100.0
	Missing Cases	0	0.0
	Total	234	100.0
Unselected Cases		0	0.0
Total		234	100.0

a. If weight is in effect, see classification table for the total number of cases.

### Dependent Variable Encoding

<b>Original Value</b>	<b>Internal Value</b>
Alive	0
Dead	1

**CUMULATIVE SUM ANALYSIS BEFORE AND AFTER  
IMPLEMENTATION OF ELPQuiC BUNDLE**



**INCREASE IN CUSUM    SAVING OF LIVES**

**DECREASE IN CUSUM    LOSS OF LIVES**

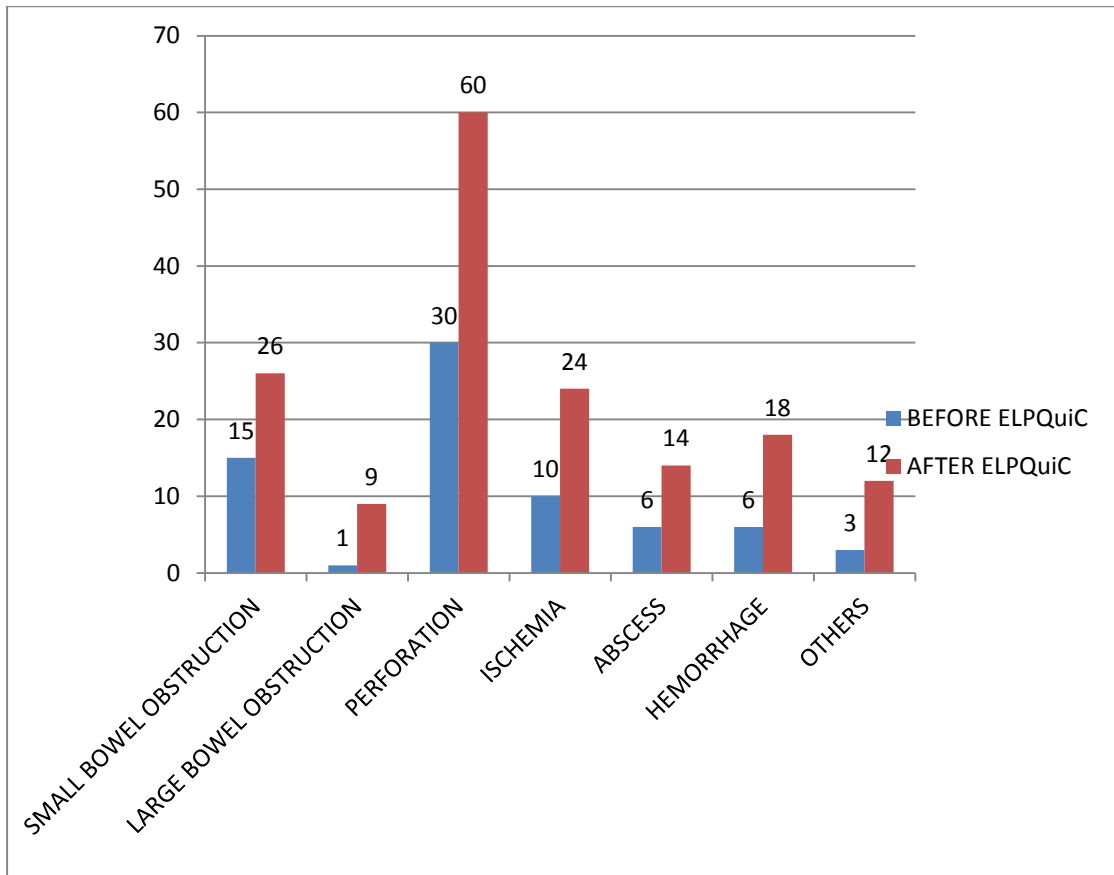
**STABLE CUSUM            NEUTRAL**

**OBSERVED NO.OF DEATHS BEFORE ELPQuiC – 28.2 %**

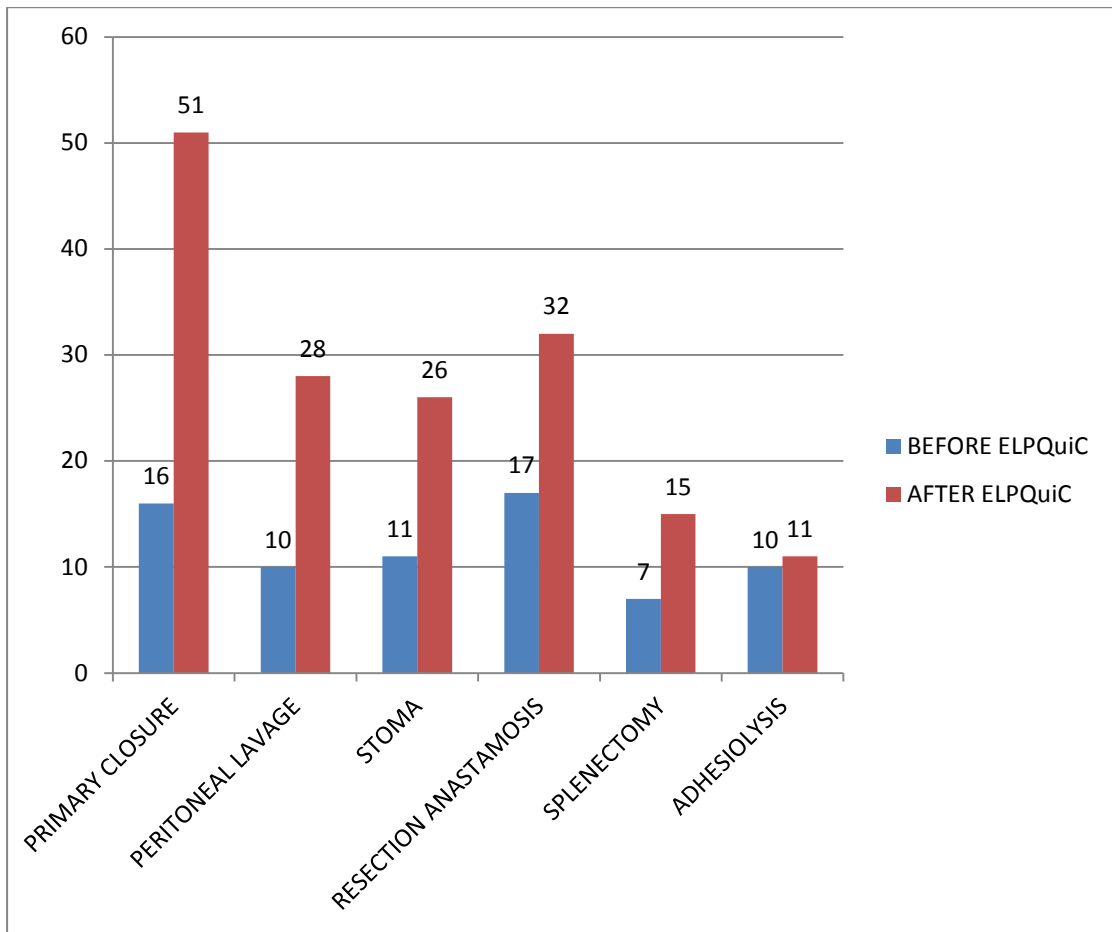
**OBSERVED NO. OF DEATHS AFTER ELPQuiC – 18.4 %**

**% REDUCTION IN DEATH – 34.75 %**

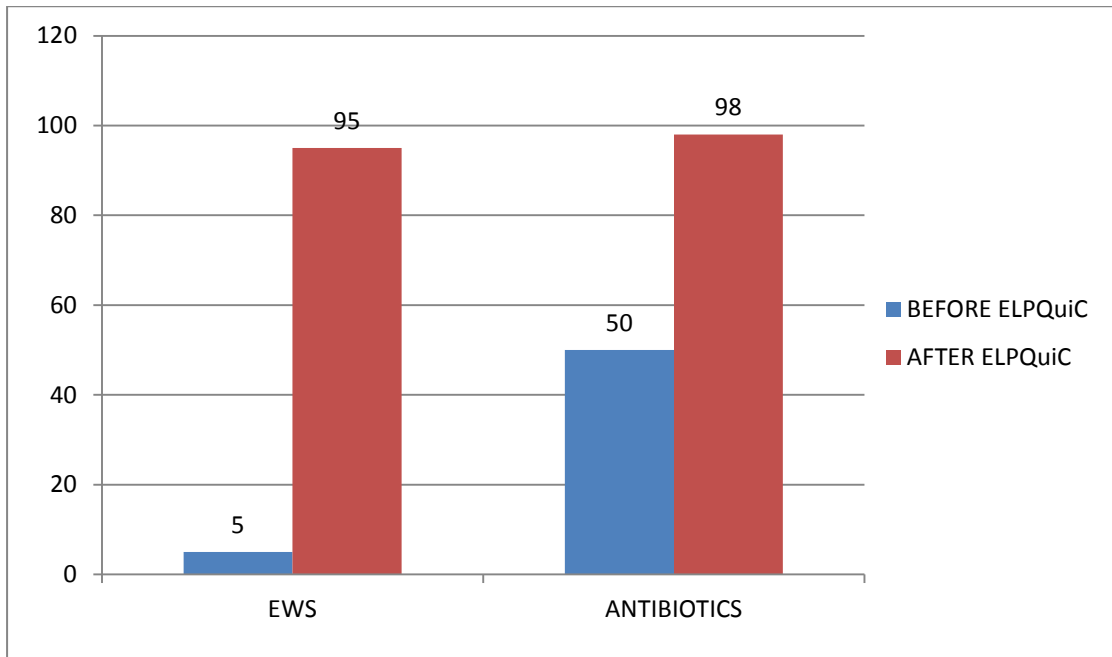
## UNDERLYING PATHOLOGY



## OPERATIVE PROCEDURES

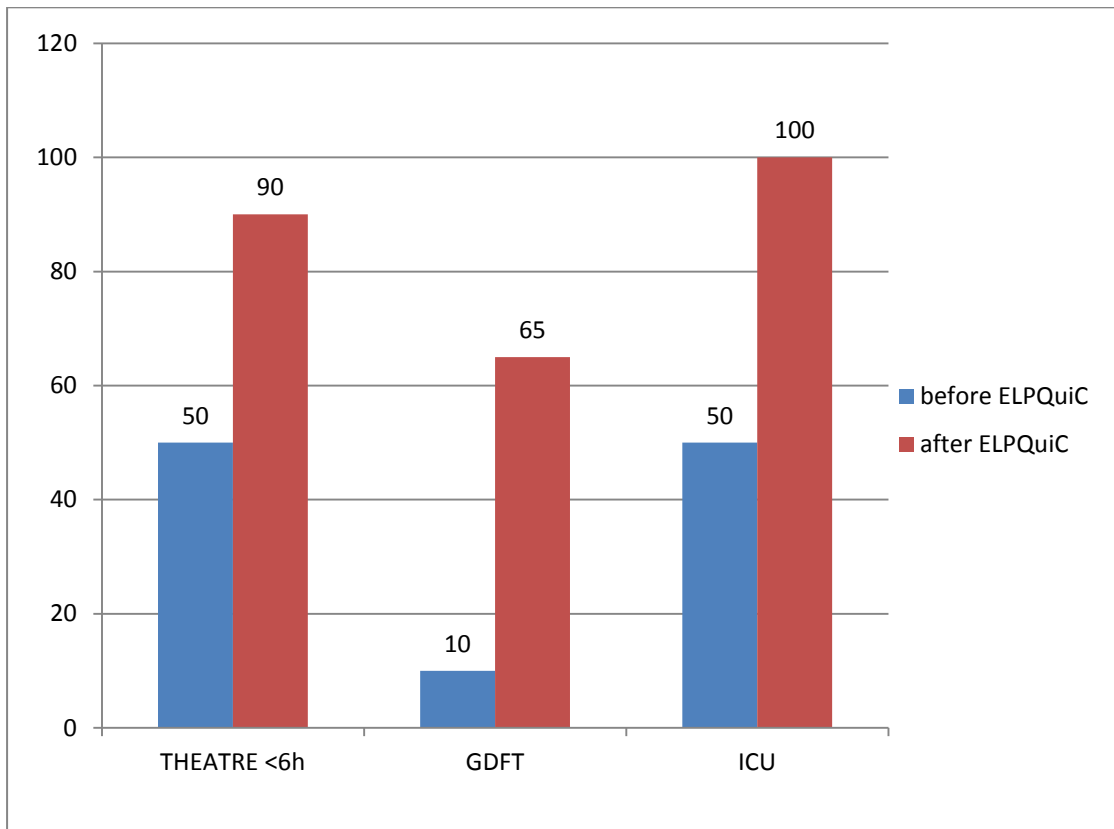


**COMPLIANCE WITH PROCESS OF CARE BEFORE  
AND AFTER IMPLEMENTATION OF ELPQuiC  
BUNDLE**





## EWS – EARLY WARNING SCORE



**GDFT – GOAL DIRECTED FLUID THERAPY**

**ICU – INTENSIVE CARE UNIT**

The overall crude mortality rate decreased from 28.2% to 18.4%. The reduction in percentage of mortality was 34.75%. Mortality outcomes were adjusted for individual patients predicted risk of 30 day mortality. Expected minus observed CUSUM chart showed significant increase in lives saved per 100 patients treated after introduction of ELPQuiC care bundle.

# **DISCUSSION**

## **DISCUSSION**

The introduction of a five-component care bundle, led to a significant reduction in mortality. There is statistically significant improvement in P-POSSUM adjusted CUSUM 30 day mortality rate after bundle implementation. These results were achieved within existing resources, without adversely affecting the length of hospital stay.

High mortality rates have been described after emergency laparotomy and guidelines to improve outcomes have been developed. implementation of the ELPQuiC bundle and demonstration of improved outcomes provides evidence of validity of the use of this approach to reduce mortality after emergency laparotomy.

Measurement alone is known to drive improvement. Transparency and regular audit have been shown to lead to better outcomes in surgery. The regular measurement of outcome and process measures, and understanding the areas for better performance, are likely to have aided improvement in this project and are central to quality improvement methodology.

A standard pathway approach, as used in enhanced recovery programmes, has been shown to be successful in reducing hospital stay and complications when applied to elective surgical procedures. In this study similar standard approaches were applied to emergency setting.

However, length of stay was not reduced in this study because of survival of patients who would not previously have survived surgery and availability of suitable discharge facilities.

There are limitations to this study. The patient groups before implementation of the care bundle were of unequal size and not collected during the same time intervals. There is no contemporary controlled comparisons with other hospitals not involved in the ELPQuiC project.

However, the findings are suggestive of a credible underlying link between observed improvements in process of care and subsequent mortality.



# **CONCLUSION**

**CONCLUSION**



*‘ Every day you make progress.  
Every step may be fruitful.  
Yet they will stretch out before you,  
an ever lengthening, ever ascending  
ever improving path.  
You know that you ’ll never get to the  
end of the journey. But this is so far from  
discouraging, only adds to the joy and glory of the climb ’*

*-Winston Churchill*

The use of ELPQuiC bundle was associated with a significant reduction in the risk of death following emergency laparotomy.

Introduction of the ELPQuiC bundle showed improvements in patient assessment, referral and treatment in the emergency department and surgical assessment areas.

This simple bundle care implementation will also aid in improvement in prioritization of imaging(CT scanning and reporting), theatre access, intra operative fluid management and intensive care and will standardize key aspects of peri operative care in reducing mortality .

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# **ANNEXURE**

# **PROFORMA**

NAME

AGE

SEX

IP NO.

DATE OF ADMISSION

DATE OF SURGERY

DATE OF DISCHARGE

DIAGNOSIS

PROCEDURE DONE

## **PHYSIOLOGICAL SCORING**

-AGE

-CARDIAC SIGNS

-CHEST RADIOGRAPH

-RESPIRATORY HISTORY

-SYSTOLIC BP

-PULSE

-GCS

-HEMOGLOBIN

-WBC

-BLOOD UREA

-SODIUM

-POTASSIUM

-ECG

## **OPERATIVE SCORING**

-OPERATIVE SEVERITY

-NO.OF OPERATIONS WITHIN 30 DAYS

-BLOOD LOSS PER OPERATION

-PERITONEAL CONTAMINATION

-PRESENCE OF MALIGNANCY

-MODE OF SURGERY

**BEFORE ELPQuIC**

IP Number	Age	Sex	Disease	Procedure Done	Post OP Status
11958	40	m	ruptured liver abscess	peritoneal lavage	discharge
12423	54	m	ascending colon perforation	stoma	discharge
12715	17	m	duodenal perforation	primary closure	discharge
12993	38	m	duodenal perforation	primary closure	discharge
737	20	m	duodenal perforation	Resection and anastomosis	Death
817	30	m	duodenal perforation	primary closure	discharge
467	70	m	Bowel obstruction	Resection and anastomosis	discharge
13622	16	m	jejunal perforation	Resection and anastomosis	discharge
14760	45	m	sealed perforation jejunum	peritoneal lavage	discharge
19869	55	m	ileal PERFORATION	stoma	discharge
15290	60	f	pelvic abscess	peritoneal lavage	discharge
15914	30	m	Splenic injury/hemorrhage	Organ removal/ splenectomy	discharge
16434	45	m	Splenic injury/hemorrhage	Organ removal/ splenectomy	discharge
817	30	m	duodenal perforation	primary closure	discharge
15941	42	m	Small bowel Ischemia	stoma	discharge
1778	38	m	ilopsoas abscess	peritoneal lavage	death
16478	46	m	jejunal perforation	Resection and anastomosis	discharge
1081	22	m	jejunal perforation	primary closure	death
20312	22	m	Splenic injury/hemorrhage	Organ removal/ splenectomy	discharge
14760	45	m	duodenal perforation	primary closure	discharge
20140	25	m	gastric perforation	Resection and anastomosis	death
21634	50	m	small bowel obstruction	peritoneal lavage	discharge
22979	45	m	small bowel obstruction	adhesiolysis	discharge
5734	75	f	large bowel perforation	primary closure	Death
23558	45	f	large bowel perforation	stoma	Death
21711	45	f	gastric perforation	primary closure	Death
22128	60	m	duodenal perforation	primary closure	Death
22778	60	m	abscess	peritoneal lavage	death
22127	50	m	gastric perforation	Resection and anastomosis	Death
26362	65	f	Small bowel Ischemia	Resection and anastomosis	discharge
26813	31	m	Gangrenous appendicitis/ischemia	appendectomy / peritoneal lavage	discharge
27260	70	f	Small bowel Ischemia	stoma	discharge
27654	43	m	duodenal perforation	primary closure	discharge
27786	60	f	small bowel obstruction	adhesiolysis	discharge

71655	40	m	large bowel perforation	stoma	discharge
28060	70	m	large bowel ischemia	stoma	death
24779	52	m	gastric perforation	primary closure	discharge
25309	40	m	duodenal perforation	primary closure	discharge
1777	35	m	traumatic small bowel perforation	Resection and anastomosis	death
20686	70	m	large bowel obstruction	adhesiolysis	death
22128	60	m	duodenal perforation	primary closure	death
20772	65	m	gastric perforation	Resection and anastomosis	Death
22179	45	m	small bowel obstruction	adhesiolysis	discharge
1791	42	f	small bowel obstruction	Resection and anastomosis	discharge
26362	65	f	small bowel ischemia	Resection and anastomosis	discharge
26823	31	m	Gangrenous appendicitis/ischemia	appendectomy / peritoneal lavage	discharge
26260	70	f	Small bowel obstruction	stoma	discharge
27786	70	f	small bowel ischemia	Resection and anastomosis	discharge
28786	60	f	small bowel obstruction	adhesiolysis	discharge
27875	40	m	small bowel obstruction	stoma	Death
18663	66	m	small bowel obstruction	adhesiolysis	discharge
18885	60	f	abscess	peritoneal lavage	discharge
29480	58	f	small bowel ischemia	Resection and anastomosis	Death
30581	22	m	splenic injury/hemorrhage	Organ removal/ splenectomy	Death
30587	65	f	small bowel obstruction	adhesiolysis	discharge
31223	53	m	ileal. PERFORATION	Resection and anastomosis	discharge
31533	22	m	Splenic injury/hemorrhage	Organ removal/ splenectomy	discharge
31762	42	m	ileal. PERFORATION	stoma	discharge
32609	38	m	Splenic injury/hemorrhage	Organ removal/ splenectomy	discharge
32088	78	f	small bowel obstruction	Resection and anastomosis	discharge
33434	31	m	ileal. PERFORATION	primary closure	discharge
34840	42	m	small bowewl ischemia	stoma	Death
37005	39	f	Ruptured ectopic gestation	organ removal/salpingectomy	death
38580	45	m	ruptured liver abscess	peritoneal lavage	discharge
36533	37	m	small bowel obstruction	adhesiolysis	discharge
41047	57	m	small bowel obstruction	adhesiolysis	discharge
40888	18	m	small bowel obstruction	Resection and anastomosis	discharge
101916	23	m	ileal. PERFORATION	primary closure	discharge
39083	25	m	duodenal perforation	primary closure	discharge
36060	21	m	small bowel obstruction	adhesiolysis	discharge
35260	24	m	small bowel obstruction	Resection and anastomosis	discharge

**AFTER ELPQuIC**

IP Number	Age	Sex	Disease	Procedure Done	Post OP Status
55741	29	m	duodenal perforation	primary closure	discharge
56711	27	m	Small Bowel Obstruction	resection and anastomosis	discharge
57134	35	m	Splenic injury/Hemorrhage	Organ Removal/ Splenectomy	Discharge
57138	67	m	Small Bowel Obstruction	Stoma	Death
72572	50	m	Caecal Perforation	resection and anastomosis	discharge
72957	39	m	Traumatic ileal perforation	Stoma	Death
58381	34	f	Traumatic bladder injury/hemorrhage	primary closure	discharge
58932	49	m	duodenal perforation	primary closure	discharge
59152	50	m	traumatic jejunal perforation	primary closure	death
61545	25	m	Splenic injury/Hemorrhage	Organ Removal/ Splenectomy	discharge
63395	35	m	traumatic bladder injury/hemorrhage	primary closure	discharge
64447	60	f	Splenic injury/Hemorrhage	Organ Removal/ Splenectomy	discharge
64706	28	m	Small Bowel Obstruction	resection and anastomosis	discharge
658381	45	m	Traumatic ileal perforation	primary closure	death
66434	47	m	ileal perforation	primary closure	discharge
43674	22	m	duodenal perforation	primary closure	discharge
44221	17	m	traumatic diaphragmatic injury	primary closure	discharge
44237	50	m	stab injury/hemorrhage	Peritoneal Lavage	discharge
44627	61	f	Small Bowel Obstruction	adhesiolysis	discharge
44462	18	m	Splenic injury/Hemorrhage	Organ Removal/ Splenectomy	discharge
46649	34	f	Large bowel obstruction	Stoma	discharge
47107	74	m	Small bowel ischemia	resection and anastomosis	discharge
48401	60	m	Small Bowel Obstruction	resection and anastomosis	discharge
49008	54	f	Splenic abscess	Organ Removal/ Splenectomy	discharge
2003	55	m	duodenal perforation	primary closure	death
49295	50	m	Small bowel ischemia	resection and anastomosis	discharge
49989	30	m	duodenal perforation	primary closure	death
50224	40	f	Appendicular Mass	Peritoneal Lavage	discharge
56724	27	m	traumatic duodenal perforation	primary closure	death
65611	32	m	Small Bowel Obstruction	adhesiolysis	discharge
70321	44	f	Small Bowel Obstruction	adhesiolysis	discharge
63855	35	m	duodenal perforation	primary closure	discharge
61474	21	m	duodenal perforation	primary closure	discharge
55990	54	m	Appendicular Mass	Peritoneal Lavage	discharge
56103	45	m	abscess	Peritoneal Lavage	discharge
45814	50	m	Small bowel ischemia	stoma	discharge



44011	60	m	Small Bowel Obstruction	resection and anastomosis	discharge
44998	33	m	Small Bowel Obstruction	resection and anastomosis	discharge
43798	44	m	duodenal perforation	primary closure	discharge
66675	56	f	gastric perforation	primary closure	discharge
68847	47	m	Small Bowel Obstruction	adhesiolysis	discharge
69340	24	m	Traumatic ileal perforation	Stoma	Death
69959	45	m	Small bowel ischemia	resection and anastomosis	Death
70489	22	f	ruptured ectopic pregnancy	salpingectomy peritoneal lavage	discharge
70282	65	m	Small bowel ischemia	resection and anastomosis	Death
70789	23	m	appendicular abscess	Peritoneal Lavage	discharge
71359	34	m	Small Bowel Obstruction	adhesiolysis	discharge
71712	65	m	Small bowel ischemia	resection and anastomosis	discharge
72703	48	m	small bowel ischemia	resection and anastomosis	Death
73011	34	m	sigmoid colon perforation	primary closure	Death
73601	57	m	appendicular abscess	Peritoneal Lavage	discharge
73636	21	f	traumatic retroperitoneal hemorrhage	Peritoneal Lavage	Death
74119	25	m	traumatic splenic injury/hemorrhage	Organ Removal/ Splenectomy	Death
74667	50	m	Small Bowel Obstruction	adhesiolysis	discharge
74639	42	m	traumatic splenic injury/hemorrhage	Organ Removal/ Splenectomy	Death
74677	36	m	Small bowel ischemia	Stoma	discharge
78620	33	m	traumatic bowel ischemia	resection and anastomosis	discharge
76205	24	m	appendicular abscess	Peritoneal Lavage	Death
77632	32	f	gastric perforation	primary closure	death
77004	47	f	sigmoid colon perforation	Stoma	Death
77852	27	m	appendicular mass	Peritoneal Lavage	discharge
78944	51	m	Small bowel ischemia	stoma	discharge
78956	52	m	Small bowel ischemia	Stoma	discharge
79868	65	f	Small bowel ischemia	resection and anastomosis	discharge
79851	36	m	appendicular abscess	Peritoneal Lavage	discharge
79970	68	m	jejunal perforation	resection and anastomosis	discharge
80013	25	m	Traumatic bladder injury/hemorrhage	primary closure	discharge
80439	55	m	traumatic splenic injury/hemorrhage	Organ Removal/ Splenectomy	discharge
80942	33	m	Small bowel ischemia	resection and anastomosis	Death
81338	50	m	traumatic liver hemorrhage/jejunal perforation	primary closure	Death
81307	19	m	traumatic splenic injury/hemorrhage	Organ Removal/ Splenectomy	discharge
81507	72	m	Traumatic bladder injury/hemorrhage	primary closure	discharge
81630	38	m	Small Bowel Obstruction	resection and anastomosis	Death
81765	64	m	appendicular abscess	Peritoneal Lavage	discharge

82821	50	m	Small bowel ischemia	Stoma	Stoma	Death
82836	17	m	Large bowel obstruction	Stoma	Stoma	discharge
83323	40	m	traumatic splenic injury/hemorrhage	Organ Removal/ Splenectomy	Organ Removal/ Splenectomy	discharge
82271	49	m	Small bowel ischemia	resection and anastomosis	resection and anastomosis	discharge
82455	35	m	sigmoid volvulus/ischemia	resection and anastomosis	resection and anastomosis	discharge
82877	21	m	traumatic splenic injury/hemorrhage	Organ Removal/ Splenectomy	Organ Removal/ Splenectomy	discharge
85332	39	f	gastric perforation	primary closure	primary closure	discharge
85675	24	m	Traumatic ileal perforation	primary closure	primary closure	discharge
86769	52	m	jejunal perforation	Stoma	Stoma	discharge
83833	20	m	duodenal perforation	primary closure	primary closure	discharge
88056	45	m	gastric perforation	primary closure	primary closure	discharge
88078	52	f	transverse colon perforation	Stoma	Stoma	Death
89743	55	f	ileal perforation	primary closure	primary closure	discharge
89254	25	f	Small bowel ischemia	resection and anastomosis	resection and anastomosis	discharge
89589	40	m	Traumatic ileal perforation	primary closure	primary closure	discharge
89232	40	m	appendicular abscess	Peritoneal Lavage	Peritoneal Lavage	discharge
91524	49	m	Small bowel ischemia	resection and anastomosis	resection and anastomosis	discharge
89232	40	m	appendicular abscess	Peritoneal Lavage	Peritoneal Lavage	discharge
89188	21	m	Small Bowel Obstruction	resection and anastomosis	resection and anastomosis	discharge
85655	50	m	traumatic sigmoid colon perforation	Stoma	Stoma	discharge
88204	23	m	duodenal perforation	primary closure	primary closure	discharge
86677	40	m	appendicular gangrene/ischemia	Peritoneal Lavage	Peritoneal Lavage	discharge
87573	25	m	appendicular abscess	Peritoneal Lavage	Peritoneal Lavage	discharge
86385	45	m	Large bowel obstruction	resection and anastomosis	resection and anastomosis	discharge
85920	21	m	transverse colon perforation	primary closure	primary closure	discharge
85740	40	m	duodenal perforation	primary closure	primary closure	discharge
76068	50	m	Small Bowel Obstruction	Stoma	Stoma	discharge
103165	31	m	appendicular abscess	Peritoneal Lavage	Peritoneal Lavage	discharge
103271	38	m	duodenal perforation	primary closure	primary closure	discharge
82134	45	m	appendicular abscess	Peritoneal Lavage	Peritoneal Lavage	discharge
81355	36	m	appendicular abscess	Peritoneal Lavage	Peritoneal Lavage	discharge
77852	27	m	ileal perforation	resection and anastomosis	resection and anastomosis	discharge
74671	36	m	large bowel ischemia	Stoma	Stoma	discharge
78479	44	m	duodenal perforation	primary closure	primary closure	discharge
77566	48	m	ileal perforation	resection and anastomosis	resection and anastomosis	discharge
76201	21	m	appendicular abscess	Peritoneal Lavage	Peritoneal Lavage	discharge
74667	50	m	Small Bowel Obstruction	resection and anastomosis	resection and anastomosis	discharge
75493	45	m	duodenal perforation	primary closure	primary closure	discharge

73919						appendicular abscess	Peritoneal Lavage	discharge
72703	37	m	Small Bowel Obstruction	resection and anastomosis	discharge			discharge
71359	45	m	Small Bowel Obstruction	adhesiolysis	discharge			discharge
72001	34	m	appendicular perforation	Peritoneal Lavage	discharge			discharge
69160	42	m	duodenal perforation	primary closure	discharge			discharge
71163	57	m	appendicular perforation	Peritoneal Lavage	discharge			discharge
90415	20	m	gall bladder perforation	cholecystectomy/peritoneal lavage	discharge			discharge
90992	58	f	duodenal perforation	primary closure	discharge			discharge
94832	30	f	duodenal perforation	primary closure	discharge			discharge
96901	58	m	traumatic ileal perforation	primary closure	discharge			discharge
94202	19	m	duodenal perforation	primary closure	discharge			discharge
98460	32	m	duodenal perforation	primary closure	discharge			discharge
90660	40	m	traumatic ileal perforation	Stoma	Death			Death
90511	24	m	duodenal perforation	primary closure	discharge			discharge
98438	40	m	duodenal perforation	primary closure	discharge			discharge
93343	60	f	duodenal perforation	primary closure	Death			Death
107624	28	m	duodenal perforation	primary closure	discharge			discharge
98863	44	m	duodenal perforation	primary closure	discharge			discharge
99566	61	m	duodenal perforation	primary closure	discharge			discharge
107254	75	f	duodenal perforation	primary closure	discharge			discharge
96907	44	m	traumatic splenic injury/hemorrhage	primary closure	discharge			discharge
104919	19	m	traumatic splenic injury/hemorrhage	Organ Removal/ Splenectomy	discharge			discharge
101754	21	m	traumatic splenic injury/hemorrhage	Organ Removal/ Splenectomy	discharge			discharge
108973	30	m	traumatic splenic injury/hemorrhage	Organ Removal/ Splenectomy	discharge			discharge
93368	40	m	abscess	Peritoneal Lavage	discharge			discharge
96855	57	m	traumatic Small bowel ischemia	resection and anastomosis	discharge			discharge
99469	63	m	Small bowel ischemia	Stoma	discharge			discharge
101139	50	m	small bowel obstruction	adhesiolysis	Death			Death
101142	19	m	Traumatic bladder injury/hemorrhage	primary closure	discharge			discharge
90454	82	f	abscess	Peritoneal Lavage	Death			Death
98531	60	f	small bowel ischemia	Stoma	discharge			discharge
99740	55	f	Large bowel obstruction	Stoma	discharge			discharge
99780	52	m	gastric perforation	primary closure	discharge			discharge
99473	34	f	Large bowel obstruction	Stoma	Death			Death
99459	50	m	Small Bowel Obstruction	resection and anastomosis	discharge			discharge
92170	65	f	Large Bowel Obstruction	Stoma	discharge			discharge
97419	55	m	traumatic jejunal perforation	Stoma	discharge			discharge
94967	55	m	small bowel obstruction	primary closure	discharge			discharge
	49	m	small bowel obstruction	Stoma	discharge			discharge

95831	15	m	Small Bowel Obstruction	adhesiolysis	discharge
104832	58	m	appendicular perforation	Peritoneal Lavage	discharge
88535	27	m	Large bowel obstruction	Stoma	discharge
95281	54	m	abscess	Peritoneal Lavage	Death
93594	62	m	gastric perforation	primary closure	discharge
92321	20	m	traumatic splenic injury/hemorrhage	Organ Removal/ Splenectomy	discharge
96269	24	m	sigmoid volvulus/ischemia	resection and anastomosis	discharge
93366	70	m	duodenal perforation	primary closure	Death
89717	41	m	Small Bowel Obstruction	adhesiolysis	discharge
104280	66	m	Small Bowel Obstruction	resection and anastomosis	discharge
102693	35	f	Large bowel obstruction	stoma	discharge
94657	55	m	Small Bowel Obstruction	adhesiolysis	discharge
108973	52	m	Small Bowel Obstruction	resection and anastomosis	discharge