RETROSPECTIVE STUDY ON PATIENTS UNDERGOING LAPAROTOMY TO ASSESS THE RISK FACTORS OF RE-LAPAROTOMY

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In partial fulfillment for
The degree of Master of Surgery in GENERAL SURGERY

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MAY 2018
ENDORSEMENT BY THE HOD, DEAN/ HEAD OF INSTITUTION

This is to certify that this dissertation entitled “RETROSPECTIVE STUDY ON PATIENTS UNDERGOING LAPAROTOMY TO ASSESS THE RISK FACTORS OF RE-LAPAROTOMY” is a record of Bonafide research work done by Dr. J. Vaishnavi, under the guidance of Dr. S. Rajesh Kumar, in the Department of General Surgery, PSG Institution of Medical Sciences and Research, Coimbatore – 641 004.

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DECLARATION

I, Dr. J. Vaishnavi, solemnly declare that this dissertation “RETROSPECTIVE STUDY ON PATIENTS UNDERGOING LAPAROTOMY TO ASSESS THE RISK FACTORS OF RE-LAPAROTOMY” is a Bonafide record of work done by me in the Department of General Surgery, PSG institute of Medical Sciences & Research, Coimbatore, under the guidance of Dr. S. Rajesh Kumar, Professor of General Surgery.

This dissertation is submitted to The Tamilnadu Dr.M.G.R. Medical University, Chennai, in partial fulfilment of the University regulations for the award of MS Degree (General Surgery) Branch-I, Examination to be held in April 2018.

Place: Coimbatore
Date: Dr. J. Vaishnavi
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It is my privilege to express my thankfulness to my revered Teachers and Colleagues of my department for helping me at various stages to complete this thesis.

My heartfelt gratitude always goes to my Parents, Dr. Pollachi. V. Jayaraman, Mrs. J. Bagyalakshmi who shape my life with utmost care and affection.

Dr. J. Vaishnavi
To
Dr J Vaishnavi
Postgraduate
Department of General Surgery
Guide: Dr S Rajesh Kumar
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Ref: Project No 15/440

Date: December 29, 2015

Dear Dr Vaishnavi,

Institutional Human Ethics Committee, PSG IMS& R reviewed and discussed your application dated 28.12.2015 to conduct the research study entitled “Retrospective study on patients undergoing laparotomy to assess the risk of re-laparotomy” during the IHEC meeting held on 29.12.2015.

The following documents were reviewed and approved:

1. Project Submission form
2. Study protocol (Version 1 dated 28.12.2015)
3. Confidentiality statement
4. Application for waiver of consent
5. Data collection tool (Version 1 dated 28.12.2015)
6. Current CVs of Principal investigator, Co-investigators
7. Budget

The following members of the Institutional Human Ethics Committee (IHEC) were present at the meeting held on 29.12.2015 at IHEC Secretariat, PSG IMS & R between 10.00 am and 11.00 am:

| Sl. No. | Name of the Member of IHEC | Qualification | Area of Expertise | Gender | Affiliation to the Institution Yes/No | Present at the meeting Yes/No |
|---------|-----------------------------|---------------|-------------------|--------|-------------------------------------|-----------------------------|
| 1       | Dr P. Nandakumar            | Ret. Lt      | Medical Expert, Chairman | Male   | No                                  | Yes                         |
| 2       | Dr S. Shanthi Kumari        | MD            | Pathology, Ethicist | Female | Yes                                 | Yes                         |
| 3       | Dr Sudha Ramalingam         | MD            | Ethicist, Epidemiologist | Female | Yes                                 | Yes                         |
| 4       | Mrs P Rama                  | M Pharm       | Member             | Female | Yes                                 | Yes                         |

The study is approved in its presented form. The decision was arrived at through consensus. Neither PI nor any of proposed study team members were present during the decision making of the IHEC. The IHEC functions in accordance with the ICH-GCP/ICMR/Schedule Y guidelines. The approval is valid until one year from the date of sanction. You may make a written request for renewal / extension of the validity, along with the submission of status report as decided by the IHEC.
Following points must be noted:

1. IHEC should be informed of the date of initiation of the study
2. Status report of the study should be submitted to the IHEC every 12 months
3. PI and other investigators should co-operate fully with IHEC, who will monitor the trial from time to time
4. At the time of PI’s retirement/intention to leave the institute, study responsibility should be transferred to a colleague after obtaining clearance from HOD. Status report, including accounts, details should be submitted to IHEC and extramural sponsors
5. In case of any new information or any SAE, which could affect any study, must be informed to IHEC and sponsors. The PI should report SAEs occurred for IHEC approved studies within 7 days of the occurrence of the SAE. If the SAE is ‘Death’, the IHEC Secretariat will receive the SAE reporting form within 24 hours of the occurrence
6. In the event of any protocol amendments, IHEC must be informed and the amendments should be highlighted in clear terms as follows:
   a. The exact alteration/amendment should be specified and indicated where the amendment occurred in the original project. (Page no. Clause no. etc.)
   b. Alteration in the budgetary status should be clearly indicated and the revised budget form should be submitted
   c. If the amendments require a change in the consent form, the copy of revised Consent Form should be submitted to Ethics Committee for approval
   d. If the amendment demands a re-look at the toxicity or side effects to patients, the same should be documented
   e. If there are any amendments in the trial design, these must be incorporated in the protocol, and other study documents. These revised documents should be submitted for approval of the IHEC and only then can they be implemented
   f. Any deviation Violation/waiver in the protocol must be informed to the IHEC within the stipulated period for review
7. Final report along with summary of findings and presentations/publications if any on closure of the study should be submitted to IHEC

Kindly note this approval is subject to ratification in the forthcoming full board review meeting of the IHEC.

Thanking You,

Yours Sincerely,

[Signature]

Dr S Bhuveneshwari
Member - Secretary
Institutional Human Ethics Committee

Page 2 of 2
delayed surgery and thus it is unlikely to have severe intra-abdominal sepsis at initial laparotomy itself. Operations to eliminate the source of infection and multidisciplinary approach in the intensive care unit is given. A large number of abdominal operative procedures are performed in a tertiary referral general surgical unit and abdominal re-exploration forms a significant contribution to mortality and mortality rate. There are multiple causes for re-exploration. In intra-abdominal sepsis we aim at source control, the treatment for peritonitis under General Anaesthesia was first performed in the year 1846 by McIndoe[1], who introduced the management of peritonitis by operating, controlling sepsis and by giving lavage. Over years improvisation has taken place. A surgeon should aim at controlling the source of sepsis, give peritoneal lavage(s) and support the sick patient, these simple measures help improve the outcome of the sick patient. The primary objective of this study is to better define those patients who require further surgical intervention. It is often very difficult to
eventually intensive care for a prolonged period. Re-laparotomy:
Re-laparotomy refers to operations performed within the period of hospitalization related to initial surgery. Depending upon its goal and nature of urgency, re-laparotomy can be classified into early or late, radical or palliative, planned or unplanned[4]. Recognition of patients at high risk of re-laparotomy after initial surgery has significant patient outcome. The basic steps of laparotomy is to give a peritoneal lavage to drain abscesses or fluid collections, debride necrotic tissues and address the primary issue and close
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INTRODUCTION

Laparotomy is the surgical incision into the abdominal cavity, for diagnosis or in preparation for major surgery.

Evolution of laparotomy:
The first time when the abdomen was opened at an elective surgery, the pathology was excised and the patient made a smooth recovery. It was not performed in some famous university hospital in the British isles or mainland Europe but in a private house in the backwoods of Kentucky in 1807.

A large number of patients undergo various operative procedures every day, out of which laparotomy forms a major proportion. Abdominal surgery that has to be re-done in association with initial surgery is referred to as re-laparotomy.

Sometimes laparotomy has to be re-done because the primary pathology associated with re-laparotomy are multiple, hence a high index of suspicion is required to detect a correctable intra-abdominal pathology after initial laparotomy. Redo laparotomy are called On demand if laparotomy has to be redone because of patient condition and called planned if the second laparotomy is decided upon during the course of first surgery itself. Re-laparotomy is associated with increased morbidity and mortality. Therefore it’s the final choice of surgery.
Whenever re laparotomy is necessary, mortality increases to as high as 22% to 51%.  

Laparotomy has to be re done due to complications like biliary peritonitis, faecal fistula, anastamotic leak, burst abdomen etc of these post operative peritonitis and intra abdominal sepsis\(^{(10)}\) are the most common cause. The surgical treatment is primarily aimed at eliminating the source. Patient characteristics like demographics, co morbidities, pre operative, intra operative and post op characteristics has to be analysed to identify the factors leading to re laparotomy.

Prognosis and outcome of these patients depend upon early diagnosis and timely intervention. Clinical and haematological parameters and radiological evidence form the basis of re laparotomy.

1) Laparotomy:

In the developing nations, intra-abdominal sepsis is associated with delayed presentation and delayed surgery and thus it is unlikely to have severe intra-abdominal sepsis at initial laparotomy itself, operations to eliminate the source of infection and multidisciplinary approach in the intensive care unit is given.

A large number of abdominal operative procedures are performed in a tertiary referral general surgery unit and abdominal re-exploration forms a significant contribution to morbidity and mortality rate. There are multiple causes for re exploration.
In intra-abdominal sepsis we aim at source control, the treatment for peritonitis under General Anaesthesia was first performed in the year 1846 by Mickulikz, who introduced the management of peritonitis by operating, controlling sepsis and by giving lavage. Over years improvisation has taken place. A surgeon should aim at controlling the source of sepsis, give peritoneal lavage and support the sick patient, these simple measures help improve the outcome of the sick patient. The primary objective of this study is to better define those patients who require further surgical management. It is often very difficult to decide which patient need operative intervention and which need careful observation on an already operated patient who has developed sepsis or SIRS eventually in intensive care for a prolonged period.

2) *Re-laprotomy:*

Relaparotomy refers to operations performed within the period of hospitalization related to initial surgery. Depending upon time, its goal and nature of urgency, re-laparotomy can be classified into early or late, radical or palliative, planned or unplanned. Recognition of patients at high risk of relaparotomy after initial surgery has significant patient outcome. The basic steps of laparotomy is to give a peritoneal lavage to drain abscesses or fluid collections, debride necrotic tissues and address the primary issue and close the abdomen or leave it open as laparostomy or bring a diversion like stoma. Relaparotomy is often required as a result
of various complications following primary intra-abdominal operation. Despite the developments in surgical techniques, anesthesia, intensive care monitoring and antibiotic therapy re-laparotomies continue to be a problem in general surgery. They carry high morbidity and mortality. In order to overcome the ill effects a well-arranged primary surgery and efficient time management in handling the postoperative complications is much needed. Nevertheless, if needed at the correct time laparotomy could be life saving. When not performed it could also lead to death in spite of correctable hidden cause. To identify the risk group patients emphasis was placed on preoperative and intraoperative variables that would be available to the surgeon before abdominal closure of the initial laparotomy

3) **Why do we need:**

The reasons for re laparotomy are first laparotomy, incision, technique, competence of surgeon, patient co-morbidities, delay in assessment of time interval between the development of complication and relaparotomy and unjustifiable time delay in reaching correct diagnosis. Apparently, these factors increases the morbidity and mortality of the patient which makes relaparotomy the final choice. With the advent of additional methods of diagnosis of post op complications the fatality after re laparotomy can be reduced. CT proved to be accurate in detecting postop inflammatory lesion and percutaneous drainage can be done if
needed. The pathophysiology after a redo surgery is to trigger inflammatory response such as the release of cytokines like IL 6 leading to hypotension and inotropic support, multiple redo surgery have a cumulative effect resulting in SIRS which will worsen the prognosis this is one reason to avoid redo\textsuperscript{14}. The other effects of redo surgery includes alteration of coagulation profile by destruction of coagulation factors by proteolytic enzymes, renal failure and also multiple organ dysfunction\textsuperscript{16}.

4) On Demand

Redo laparotomies are called on demand if the laparotomy has to be redone because of the patient's condition\textsuperscript{5}. The aim in the on-demand strategy is to perform reoperation only in those patients who are likely to benefit from this surgery, such as those with clinical deterioration or persistent lack of improvement. On-demand strategy harbors the risk of a potentially harmful delay in the detection of ongoing infectious Sources.

5) Planned Re Do:

A relaparotomy is called Planned if the second laparotomy is decided upon during the course of the first surgery itself\textsuperscript{6} like in case of severe intra abdominal sepsis or post damage limitation surgery. The planned strategy may lead to early detection of persistent peritonitis or a new infectious focus but harbors the risk of potentially unnecessary re-explorations in critically ill patients. The causes for re-explorations following emergency or elective laparotomy are obstruction, wound
Dehiscence, fistula, anastomotic leak, hemorrhage, post op peritonitis, perforation, circumscribed and diffuse peritonitis without perforation and suture line insufficiency due to necrosis of pancreas and biliary peritonitis.  

Opening of abdomen has its own consequences like adhesions, injury to blood vessel and hollow organs, ileus, wound dehiscence and malnutrition. Incidence of relaparotomy differs according to patient characteristics, initial surgery and post op care.

6) **Surgeon Factor:**

Due to the hesitation to decide on second surgery, relaparotomy used to be conducted to a less degree and the focus was on conservative treatment. All the operations should be performed or supervised by a qualified surgeon. Despite developments in preoperative and postoperative care, surgical materials, and techniques, vigilant and vigorous management could help reduce the rate of redo laparotomies. However when how and what depends upon the individual surgeons dilemma.
AIM:
To find out the incidence of re-laparotomy.
To identify the risk factors/predictors of re-laparotomy in patients undergoing general surgery operations.

OBJECTIVES:
The objective of the study are to find the incidence of revision among laparotomy cases.
To identify the predictors of re-laparotomy.
To develop a scoring system to assess patients at risk for re-laparotomy.
NEED FOR THE STUDY

The aim of this study was to find out the incidence and investigate the reasons for relaparotomies by retrospectively evaluating patients who underwent laparotomy. A study was necessary to help come up with a protocol as this will surely make it easier to decide whether to re open or not. Thus Standardization in the approach to patients will help in making diagnosis, to take resuscitative measures and to rush to operating room.
MATERIALS AND METHODS

This study was based on patients undergoing laparotomy in the department of general surgery at PSG IMSR Hospitals. It is an observational study and the results are based on retrospective analysis. The study participants were divided into two groups laparotomy and revision laparotomy group according to inclusion and exclusion criteria. 100 consecutive laparotomies performed in between the year 2014 to 2015 were taken out of which the variables were entered in a datasheet and analysed. The variables were selected in accordance with similar studies, the variables included were pre op, intra op and post op characteristics.

PRE-OP characteristics:

In pre op characteristics patient demographics, co morbids, personal habits, pre anesthetic assessment in which ASA( American Society of Anesthesiologist-physical status classification) class were taken into consideration. Laboratory values like serum potassium and albumin were included

INTRA-OP characteristics:

Intra operative characteristics like intra op findings, duration of surgery (<2 hours, 2 to 4 hours, >4 hours), intra op blood loss (<500ml, 500-1000ml, >1000ml), inotropic support, site of pathology (forgut, midgut,
hindgut, multiple site), contamination of wound whether its clean, clean contaminated, contaminated or dirty.

**POST-OP characteristics:**

Post op variables include post op inotropic support, ventilator support, number of days in intensive care, days spent in hospital, and complications relating to surgery like local and systemic complications.

Factors like the type of incision, the ranking of operating surgeon and type of incision used were also included.

All these variables were retrospectively collected from hospital information system and entered in data sheet, the data sheet was designed from similar studies in which new variables were included as per study requirements. The data was initially entered into a Microsoft excel datasheet. This was subsequently imported into SPSS 22 statistical software. Simple descriptive statistics were used for percentages. Univariate analysis were used to define the relationship between certain measured variables, Chi square test was used to find significant p value. The demographic details like age, sex were expressed in descriptive statistics. The incidence of laparotomy/relaprotomy is expressed as percentage. Relaprotomy is dependent variable. All the other variables are independent variable. The risk factors associated with re laparotomy was found
out by subjecting them to univariant analysis, each variable was tested using test of significance using chi square test to look for significant p value.

**Methodology of the study:**

Laparatomy cases in the department of General Surgery

Does the case match inclusion criteria

Yes

No

- Data collection tool
- Exclusion criteria
- Data organization
- Statistical analysis
- Significance and test analysis
- Interpretation of test

Results

**Study Design:** RETROSPECTIVE STUDY.

**Sample size:** 100

**Duration:** 1½ Year, 1st Jan 2016 – 1st June 2017

**Statistical Analysis:**

- Data analysed using SPSS 22.
• Results were expressed in percentage
• Associations were analysed using chi-square or ‘t’ test depending on outcome variables

**Inclusion Criteria**

• Age more than 18 years
• Patients requiring laparotomy
• Both general and trauma surgery

**Exclusion Criteria**

• Patient with initial laparostomy, only flank drain placement.
• Laparotomies during colostomy / ileostomy closure.
• Initial laparoscopic procedure.
• Minimal invasive procedure like ultrasound guided drainage etc

**Pre OP and Intra OP Characteristics**

| Patient Characteristics | 1st laparotomy | 2nd laparotomy |
|-------------------------|----------------|----------------|
| Age                     |                |                |
| Sex                     |                |                |
| BMI                     |                |                |
| ASA CLASS               |                |                |
| CO MORBIDITIES : SHT, DM, CAD, COPD, PVD, MALIGNANCY, TOBACCO & ALCOGOL ABUSE | | |
| LAB VALUES: serum albumin, potassium | | |
| OPERATING TIME: < 2 hours | | |
| Patient Characteristics |
|-------------------------|
| POST OPERATIVE PRESSOR SUPPORT |
| POST OPERATIVE RETURN OF BOWEL SOUND |
| DAYS ON VENTILATOR |
| DAYS IN ICU |
| DAYS IN HOSPITAL |
| POSTOPERATIVE COMPLICATIONS |
| WOUND INFECTION |
| WOUND DEHISCENCE |
| ABSCESS |
| Condition                      |
|-------------------------------|
| BLEEDING                      |
| FISTULA                       |
| TRACHEOSTOMY                 |
| PULMONARY EMBOLUS             |
| DEEP VEIN THROMBOSUS          |
| VENTILATOR PNEUMONIA          |
| URINARY TRACT INFECTION       |
| ACUTE RENAL FAILURE           |
| STROKE                        |
| ACUTE MI                      |
| DISCHARGE                     |
| - HOME                        |
| - AMA                         |
| - LTAC (long term asst care)  |
| - death                       |
An exploratory laparotomy is a procedure performed with the objective of obtaining information by direct approach into the abdomen via an incision through the skin, to visualize the internal organs, which helps provide information about the pathology that is usually not available by means of clinical and diagnostic methods. It is usually indicated in patients with acute or unexplained abdominal pain, abdominal trauma and occasionally in patients where medical management can no longer provide a curative management and definite surgical intervention for damage control and also in patients with malignancy for staging the disease. The term laparotomy gets its origin from Greek where “lapara” means flank and “tomy” means open. An exploratory laparotomy is an operative procedure usually involving a large incision to gain access into the abdominal cavity. Laparotomy is done in case of elective or emergency circumstances. Exploratory laparotomy is done when the nature of the disease is unknown, it also called diagnostic laparotomy when it is done in anticipation of diagnosis. The clinical state of the patient has to be kept in mind since hasty exploration may lead to a re-laparotomy. In the laparoscopic era with the increasing availability of laparoscopy a minimally invasive technique for inspecting or staging the abdomen called diagnostic laparoscopy, has reduced the need for exploratory laparotomy. Nevertheless exploratory laparotomy is a rapid and cost-
effective means of managing acute abdominal conditions and trauma. The evolution of damage control resuscitation whether “to cut or not cut” is the primary decision which is a diagnostic dilemma and has to be decided by the operating surgeon.

The word “re-laparotomy” means the surgical procedure in which the abdominal cavity is re-explored to resolve the complications of the disease or initial surgery, within 60 days of initial surgery. Studies reveal that more the number of laparotomies the poorer the patient outcome. Re do laparotomies increase the patient mortality and morbidity. The incidence of re do laparotomy varies depending upon patient factor and complications due to primary surgery. Multiple factors may lead to a re-laparotomy yet a vigilant and vigorous management could help to reduce the rate of re-laparotomies.

SURGICAL STEPS AND CONSIDERATIONS IN LAPAROTOMY:

In the advancing laparoscopic era with the upcoming robotic surgery the necessity for laparotomy depends upon patient condition and the type of disease. There are many causes leading to re-laparotomy namely intra-abdominal abscess, perforation, peritonitis, anastomotic leak etc. Usual steps involve a vertical midline incision (other incisions used depends on the surgeon’s decision based on clinical status of the patient and with the provisional diagnosis and better surgical approach towards dealing with the pathology as corroborated by radiologic and laboratory investigations) extending up to or beyond the level of the umbilicus to enter the abdominal cavity and thorough examination of hollow viscous organs and solid organs, to
note for evidence of faecal contamination or abscess, bleeding, visceral tear or other pathologies etc.

**Other incisions used in laparotomy**

*Steps of Examination of Intra-abdominal organs in an Exploratory laparotomy*
Once the decision to re exploration has been made without any hesitation and time delay the operating surgeon should be ready with a operative strategy coupled with radiological images and anaesthetist support. Many options and techniques are available but each has a specific indication. The doctrine of each surgery is to do little harm as possible and give maximum benefit to the patient, the decision whether to cut or not to cut is upto the surgeon but certain interventions which are taught to be safe in healthy abdomen are not appropriate in septic abdomen.

The following strategies can be used as and when indicated in patients requiring re laparotomy:

- Open abdomen and temporary abdominal closure
- High volume lavage and continuous post-operative lavage
- Controlled fistulae and diversion

There is no consensus regarding:
- The place of re anastomosis in case of leak
- Course of antibiotics
- The role of laparoscopy in the event of revision laparotomy

THE OPEN ABDOMEN AND TEMPORARY CLOSURE:

Until 1980s it was not considered safe to leave the abdomen open, only then the method of temporary abdomen closure using opsite was introduced and it was considered to be feasible and safe. This method is usually indicated in patients with intraabdominal collection, sepsis and in andomen compartment syndrome etc.

There are many ways to treat a patient with laparostomy and this will prevent the occurrence of early complications like enterocutaneous fistula and burst abdomen. Newer development techniques like vacuum dressing are also used.

ABDOMINAL LAVAGE:

A remarkable cornerstone was made in the management of intra abdominal sepsis by giving peritoneal lavage. The idea is to give a good abdomen wash and remove all the exudative fluid and place a flank drain this is one of the basic principle using in damage control surgery. The quantity of fluid used varies from each centre and trials have been conducted in how much lavage is necessary and whether postoperative lavage has any benefit.

NO LEAK SAFETY MEASURES:

Anatamotic leak is the major cause of re exploration in this study and in several other studies. A vigilant decision making is required in the event of index surgery itself, a surgeon should not attempt anatamosis in the event of
contaminated and dirty wound, proximal GIT may be repaired but distal leak must be diverted, diversions can be made in the form of loop or brought out as stoma, re anastomosis in patients with secondary peritonitis is usually not recommended.

**SCORING SYSTEMS:**

A revision laparotomy should be seen as a double edged sword as harms as well as it helps. The clinical course of the patient post surgery has to be periodically assessed. A high index of suspicion is required. Several scoring systems are used but nothing is specific for relook surgeries like in appendix which has a specific scoring system.

There are studies done using scoring systems like

ARPI index

Sepsis related criteria

APACHE -II

SOFA score

MODS score page

The Mannheim Peritonitis Index

ARPI index – The Abdominal Re operation Index it includes clinical, physiological and organ function parameters which puts together to form a predictive tool. This helps identify those patients who are in need for revision laparotomy. This scoring system consists of 8 variables and they are listed below
| Variables                              | Score |
|---------------------------------------|-------|
| Emergency surgery                     | 3     |
| Respiratory failure                   | 2     |
| Renal failure                         | 2     |
| Ileus                                 | 2     |
| Abdominal pain                        | 5     |
| Wound infection                       | 8     |
| Consciousness alteration s            | 2     |
| Symptoms from 4 th day post op        | 6     |

A score of more than 10 suggests that there is increased chance for revision laparotomy.

Sepsis related criteria

This scoring was used in ‘Surviving sepsis guidelines’ which is used for the diagnosis and treatment of sepsis. It includes clinical and laboratory parameters with high sensitivity and specificity\(^{46}\). The following criteria are included in this scoring system:

- Pyrexia (<36 or > 38 degree celcius)
- Tachycardia (>90 betas per minute)
- High or low white cell count (<4000 cells/mm\(^3\) or >12000 cells/mm\(^3\))
- Falling platelet count
- Rising C-reactive protein
- Increased Insulin requirements to maintain normoglycemia
- Elevated procalcitonin
Metabolic acidosis

**MPI scoring system:**

The Mannheim Peritonitis index is a scoring system used for post op patients with peritonitis, the higher the score, the greater the predicted mortality for patients\(^1\). This scoring system is not useful for trauma patients.

| Risk factors                                      | Score |
|--------------------------------------------------|-------|
| AGE> 50                                          | 5     |
| FEMALE SEX                                       | 5     |
| ORGAN FAILURE                                    | 7     |
| MALIGNANCY                                       | 4     |
| Pre op duration of peritonitis>24 hrs            | 4     |
| Origin of sepsis not colonic                    | 4     |
| Diffuse generalised peritonitis                  | 6     |
| EXUDATE                                          |       |
| Clear                                            | 0     |
| Cloudy, purulent                                 | 6     |
| Faecal                                           | 12    |

**SOFA SCORING SYSTEM:**

A scoring system should help to assess periodically a patient in ICU post laparotomy which would bring out significant change in a patient in that way another scoring system called SOFA scoring system\(^47\) (Sepsisremated Organ Failure Assessment) is available and which includes the following 5 variables the cardiovascular, respiratory, renal, haematological and nervous system,
scoring is done daily basis with a minimum score of 0 and a maximum score of 20.

A high index of suspicion is required to pick up clinical signs indicating revision laparotomy, many scoring systems are available to detect the outcome of patients after laparotomy, Oddeke Van ruler et al in his study found the failure of the available scoring systems in patients with abdominal sepsis after initial emergency laparotomy, He comaored APACHE-II score, SAPS-II score, Mannheim Peritonitis Index (MPI), MODS and SOFA score, the author concluded by saying that none of the used scoring system to predict the outcome in critically ill patients are of significance in assessing the patients requiring re laparotomy. He also suggested that there is a necessity to develop more specific scoring system that would help the surgeon to monitor the patient daily and identify thereal one in need of revision laparotomy.

Several other authors have conducted studies in re laparotomy and also studies basedon relaparotomy which is quiet supporting and contributatory to this study. The study and their outcomes have been discussed below

1) In an observational study conducted at Gujarat, all patients irrespective of age and sex, who underwent re-exploration of the abdomen during the period of hospitalization after the first operation were included. It was most common in age group of 31 to 40 years; with mean age of 39.25 years, incidence of re-laparotomy was 2.84%. The most common indication of re-laparotomy was leak from an anastomotic site (29 patients) or from perforation (5 patients). The mean duration between
first Laparotomy and re-laparotomy was 6.85 days. The mortality was 34.72% (25 patients). Mean number of days spent in ICU or the patient who required continuous close monitoring was 4.01 days; mean days of hospitalization was 25.72 days. The author concluded saying that re-laparotomy was a lifesaving procedure for patients. Incidence of re-laparotomy was 2.84% in this study, whereas in other studies it varies, the author justifies by saying that patient characteristics and indications are different for each patient and management varies in each hospital. Incidence of re-laparotomy depends on expertise of personnel involved in primary surgery, proper surgical technique and prevention of post-operative infection. Leak from anastomotic site was the most common indication for re-laparotomy.

2) A prospective study conducted in Nepal sought to identify the main causes of a repeat laparotomy. The authors found that the most common cause was burst abdomen (22.5%), followed by intra-abdominal collection and abscess (17.5%), faecalperitonitis (15%) and biliary peritonitis (12.5%). The mean duration between first laparotomy and Redo laparotomies was 9.42+/− 7.56 days and the mean duration of hospitalization was 26.98 +/-12.50 days. They concluded that urgent re-laparotomies were associated with an increased mortality rate. 12.5% for patients required 2 or more re-laparotomies. 62.5% of these patients were operated in the emergency and 35% had comorbid conditions. The mortality rate in the study was 35% which was consistent with the
findings of other such studies as reviewed by the authors. The mortality rate also increased with the number of repeat laparotomies.

3) A study titled “Re-do laparotomies: reasons, morbidity and outcome” was done by R.Koirola et al at Turkey from 1.1.2009 to 31.12.2009. Re-do surgery was performed in 40 patients (1.99 %), mean age was 31.99 with male: female ratio of 4:3. The indication of re do surgeries were burst abdomen(22.5%), intra abdominal collection and abscess (17.5%), etc . The mean duration between between laparotomy and 1st re laparotomy was 9.42 +/- 7.56 days. The mean duration of hospital stay was 26.98 +/-12.50 days . Multiple factors leads to re do surgeries and are associated with high rates of post operative complications like wound infection (32.5%), wound dehiscence (17.5%), pulmonary complications (10%), septicemia( 4%), cardiovascular complications (6%), dyselectremia(4%) and etc . All these factors seems to be consistent with our study. Thus post op complications rate is higher when associated with exploratory laparotomy. Mortality in re do for upper GI surgeries was 50% (p value 0.048) whereas in lower GI surgeries were 17.39% .

4) A recent study conducted in Turkey was aimed at identifying the predictive factors affecting the mortality rate in re-laparotomies. The author studied several factors such as demographics, duration of hospital stay, transfusions, presence of shock, etc. The sample was divided into those that underwent early stage re-laparotomy (i.e. within 21 days of
the primary surgery) and late stage re-laparotomy (i.e. after the 21 completed days of the primary surgery). 69.9% were males, the mean age was 55.5±17.22 years. The mean duration of hospital stay was 25.82±19.86 (1-90) days. The most common systemic disease was hypertension, which was observed in 20.4%. There was malignancy in 8.5% patients undergoing re-laparotomy. The mean duration between first operation and re-laparotomy was 7.17±6.97 (0-60) days. The authors found that the most common causes of an early stage re-laparotomy were associated with the complications arising from the primary surgery such as peritonitis, evisceration and bleeding; whereas the most common cause of late stage re-laparotomies was intestinal obstruction with adhesion. In this study, the most mortal cause of re-laparotomy was intra-abdominal abscess. Other studies showed other causes such as anastomotic leakage and intestinal necrosis. The authors concluded that adequate precautions must be taken in the primary surgery to decrease the need for a re-laparotomy.

5) In a prospective study conducted by BFK Odimba et al at a tertiary care hospital at Zambia all patients who underwent re-laparotomy were included over a period of one year, patient characteristics were entered in an evaluation data sheet and were followed 6 weeks post op. Among the laparotomies conducted incidence of re-laparotomies was 9% and 60% of re-laparotomies were due to anastomotic leak. Anastomotic leak was not the cause of re-exploration in patients who underwent re-
laparotomies in not more than 7 days. After the study looking at the
individual patients the author followed standardized approach and
recommended to treat the patients in suspicion of another re-laparotomy
which included diagnostic dilemma, resuscitative measures and rush to
operate immediately. Henceforth, the author concluded that in view of
undergoing re-laparotomies, the patient must be adequately prepared
with all necessary relevant investigations and if, limited investigation
facilities are made, the decision to go back should be made as soon as
suspicions are raised of complications based on clinical findings.

6) In a study conducted by Haluk et Al in Turkey, published in 2006, Early
UAR was performed in 81 out of 4410 cases (1.8%). Average patient
age was 50.46 (13–81) years with a male-to-female ratio of 60/21. Fifty
one (62.96%) patients had infection, 41 (50.61%) of them had an
accompanying serious disease, 24 (29.62%) of them had various
tumours and 57 (70.37%) Patients were operated under emergency
conditions during first operation. Causes of urgent abdominal re-
explorations leakage from intestinal repair site or from anastomosis
(n:34; 41.97%), hemorrhage (n:15; 18.51%), intestinal perforation (n:8;
9.87%), intraabdominal infection or abscess (n:8;9.87%), progressive
intestinal necrosis (n:7; 8.64%), stomal complications (n:5; 6.17%) and
postoperative ileus (n:4; 4.93%). Two or more UARs were performed in
18 (22.22%) cases, and overall mortality was 34.97% (n:30). Interval
between the first laparotomy and UAR averaged as 6.95 (1–20) days,
and average hospitalization period was 27.1 (3–78) days. Mortality rate was found to be higher among the patients who received multiple UARs. The most common (55.5%) cause of mortality was sepsis and multiple organ failure (MOF). The rates for common mortality and sepsis/MOF-dependent mortality that occurred following re laparotomy were significantly higher in patients who received Gastrointestinal tract surgery than in those who received other types of surgeries (p=0.000 and 0.010, respectively). Hence the author concluded that UARs that are performed following complicated abdominal surgeries have high mortality rates. In particular, UARs have higher mortality rates following Gastrointestinal tract surgeries or when infectious complications occur. The possibility of efficiently lowering these high rates depends on the success of the first operations that the patient had received.

7) In an 18-month study done in South Africa, a need for repeat laparotomy is associated with an increased risk of mortality and morbidity in comparison to those who do not need one. Re-laparotomy rate was 24%. Furthermore, the higher the number of surgeries that were needed following the initial surgery the poorer the prognosis associated. In this study, average age was 38 years with a male predominance (70%), Non-trauma patients accounted for 72% while trauma patients accounted for 28%, appendicitis and trauma cases were most commonly in need of a repeat laparotomy. Need for intensive care unit admission
and morbidity rate (64%) were both high and overall mortality rate was 14%. The authors also concluded that abdominal sepsis posed with increased mortality and morbidity, and given that delayed control of sepsis increases the risk of mortality, although a repeat laparotomy does not offer much benefit, it may be unavoidable in view of the clinical status of the patient.

8) This randomized trial study conducted by Odedeke Van Ruler et al involving 232 patients (116 on-demand and 116 planned) found that compared with planned re-laparotomy, the on-demand strategy did not result in statistically significant reductions in the primary outcomes of death or major peritonitis-related morbidity but showed significant reductions in the secondary outcomes of health care utilization, including the number of re-laparotomies, the use of percutaneous drainage, hospital and ICU stay. A 12 month follow up was done in patients who had undergone index laparotomy which included all cause of mortality and major disease related morbidity. A major morbidity end point in survivors was counted only if a pre specified major disease-related morbidity led to a surgical re-intervention during index admission or readmission during the 12-month follow-up (with or without the need of surgical intervention). Additional outcomes included healthcare utilization and direct medical costs during 12-month follow-up. The author observed that patients treated with the planned strategy had longer ICU stays and had a longer overall hospital stay. The
duration of mechanical ventilation was significantly longer for the planned treatment patients. The author likes to conclude that On demand re-laparotomy may therefore be considered the preferred surgical strategy in patients with severe peritonitis as the results are better in terms of secondary outcomes.

9) Urgent abdominal re-explorations (UARs) following complicated abdominal surgeries are generally known as "final-choice operations" with high mortality and morbidity rates. In a retrospective study conducted by Haider Abdulhussein Ahmed et al on Re-laparotomies in Abdominal Trauma included all trauma victims who sustained laparatomies and re-laparatomies. A review of the case files of these patients had been done to identify the various circumstances of trauma cases and the detailed operative findings and definitive causes of re-laparatomies. Male to female ratio of about (3:1) was found in re-laparotomy cases. The overall re-laparotomy rate was 8.6% (i.e) 21 cases out of 244, which included second look operation for Bleeding 11 patients (52%), anastomosis leak in 5 patients (24%) , small bowel obstruction in 1 patient (5%), Intra-abdominal collections (abscess) in 2 patients (9.5%) and prolonged ileus in 2 patients (9.5%) . Overall mortality in the re-explored patients was (38%). Incidence of missed injuries were 24% which accounted for reoperation and 1.6% of total trauma cases. Missed injury in the context of major trauma remains a persistent problem, both from a clinical and medico-legal point of view,
and its incidence is variable but may be as high as 38% referred to other studies. Missed intra-abdominal injuries continue to cause preventable deaths. Uncontrolled post-traumatic bleeding is the leading cause of potentially preventable death among trauma patients. The author has highlighted that many patients can be saved from repeat laparotomy by avoiding missed injuries. The main reason for immediate re-exploration in the study was bleeding and late re-exploration was peritonitis and sepsis.

10) In Houston, a study was conducted towards the identification of predictors of re-laparotomy, after non-trauma emergency surgeries with initial fascial closure. Demographics, comorbidities, intraoperative findings, morbidity, and mortality were analysed. The authors concluded that those who underwent fascial closure at the time of primary surgery had a poorer outcome following a re-laparotomy. This retrospective study through multivariate analysis have identified preoperative and intraoperative predictors that may help identify patients at high risk of on-demand re-laparotomy. The following predictors Peripheral vascular disease (P -0.04), COPD (P-0.01), alcohol abuse (P -0.02), body mass index of 29 kg/sq. m or greater (P -0.04), the finding of any ischemic bowel (P -0.02) and operating room latency of 60 hours or longer (P -0.01) were taken into account. Patients with 2 or more of these predictors had a 55% risk of re-laparotomy whereas patients with fewer than 2 of these predictors had a 9% risk of re-laparotomy.
An early study conducted between the year 1977 to 1983 reveals the factors contributing for re-lap which includes intra-abdominal sepsis, burst abdomen, mechanical obstruction, peritonitis and anastomotic leak, 22 of 1065 bowel operations (2.1%) resulted in re-exploration. The re-exploration was undertaken from the first to the 23rd postoperative day (the mean being 7.6 days). Wound dehiscence occurred in 13 patients with an overall incidence of 0.3%. The study evaluated the number of patients needing re-laparotomy depending upon the site of primary surgery. In Gastro-duodenal 15/464 (3.4%), Biliary 9/1256 (0.7%), Bowel 22/1065 (2.1%), Appendix 3/536 (0.5%) are the number of patients requiring re-laparotomy. Equally re-exploration should be avoided if a satisfactory outcome can be achieved by conservative means by thus knowing which abdomen should be re-explored. The authors believed that the decision to re-operate should be undertaken by experienced surgeon, diagnosis depends upon the ability to distinguish the clinical symptoms and signs of developing complication from the clinical features following abdominal surgery. The key features lie in an awareness of the potential complications, careful and repeated clinical assessment of the abdomen as well as the patient's general condition will decide appropriately when re-exploration is necessary. Plain radiographs of the abdomen reveal gas-filled loops of both small and large bowel. An absence of colonic gas strongly suggests that the diagnosis is one of mechanical obstruction.
rather than adynamic ileus. The authors’ observations on these patients lead us to conclude that paralytic ileus is a clinical state and should not be considered to be a diagnosis in itself. It is important to seek out and correct its underlying cause. After abdominal surgery a period of normal recovery followed by distension of small bowel suggests the presence of mechanical small bowel obstruction or intra-abdominal sepsis. These two complications may present with atypical symptoms which may result in delayed diagnosis and increased mortality. Progressive small bowel distension with paucity of colonic gas on plain radiograph suggests a mechanical obstruction and is an indication for re-exploration. Intra-abdominal abscess remains a potent cause of postoperative morbidity. Successful management depends on accurate localisation and early drainage. The availability of new localising imaging techniques should not be allowed to result in delayed drainage.

12) A long study was conducted over a period of 22 years (1989-2010) by BoykoKoroukov et al for treatment of diffuse purulent peritonitis using aggressive methods - laparotomy and planned re-laparotomy. The “aggressive” methods of treatment of diffuse purulent peritonitis were applied in 228 patients admitted at the Clinic of Surgery of the “TsaritsaYoanna - ISUL” University Hospital. 61 patients (26.75%) were subject to prospective analysis, and 167 patients (73.25%) were subjected to retrospective analysis, 143 (62.72%) of them were male
and 85 (37.28%) were female patients. The number of performed planned re-laparotomies were at an interval of 24 hours - 23%, 48 hours - 51%, 72 hours - 21%, 96 hours - 5% respectively. The average total hospital stay was 23.38 days for patients with planned re-laparotomy and 27.33 days for patients with laparotomy. The mortality rate in both aggressive methods was 30.70% (70 patients), 24.18% (37 patients) in cases with planned re-laparotomy and 44% (33 patients) with laparotomy. The cause of death was multiple organ failure in 37 patients (52.86%), two organ system failure in 22 patients (31.43%) and single organ system failure in 11 patients (15.71%). This study compared two types of treatment modalities which includes elective re-laparotomy and laparotomy for diffuse purulent peritonitis. The author likes to conclude by saying that an interdisciplinary support is essential as the implementation of aggressive methods of treatment for peritonitis is imperative.

13) A study titled “An assessment of the accuracy of decision criteria used to determine the need for relook laparotomy in ICU patients post emergency laparotomy” was conducted by Dean Laurence Lutrin et al which included 30 patients, a case was defined as a patient who had relook while in ICU and control as defined as those who did not have any relook after ICU admission. 22 patients were classified as case and 8 were control of which a significant p value of 0.01 was obtained when patients were admitted in ICU had more likelihood of atleast one chance
of relook, consultant was present in the first laparotomy for 16/30 cases and for 14/30 cases only registrar performed. There was no correlation between mortality and the presence of consultant at the index surgery. The median ICU stay was 3.5 days and hospital stay was 26.5 days. There was no significance in hospital stay between those who had relaparotomy and those who did not. The indications for relook are anastamotic leak 13, localized septic collection 14 and negative relook was 32, where n=80.

14) Another retrospective study was conducted in the Obstetrics and Gynaecology department in a hospital in Lucknow, was aimed at identifying the causes and outcomes of re-laparotomies. In this study hemorrhage was the most common cause, followed by burst abdomen and bowel injury. The authors also found that for a burst abdomen case, obstructed labour was the primary indication of surgery and for hemorrhage, PPH was the primary indication. Several other factors such as duration of hospital stay, blood transfusions, etc were also studied. The authors concluded that precautions taken to ensure hemostasis and asepsis decreased the incidence of re-laparotomy. A similar study was done in the O&G department in a hospital in Telengana, and the findings were consistent with the study done in Lucknow as corroborated by the authors.
We can gather from the above studies conducted that the incidence of re-laparotomies varies from 1.9%\(^{(5)}\) to as high as 24%\(^{(4)}\). The causes for relaparotomy from the above mentioned studies were found to be anastamotic leak, intra-abdominal sepsis, burst abdomen, mechanical obstruction, peritonitis. The incidence in our study is found to be 7% with anastamotic leak and burst abdomen being the major cause for re exploration. Co morbidities like Systemic hypertension, Diabetes mellitus, COPD, Coronary artery disease, pre existing malignancy were analysed and CAD\(^{7}\) was found to have significance in a similar study which was found to be significant in our study as well, there are also new found co morbid factors like COPD and SHT which have gained significance in this study. The patient in laparotomy group had all types of midline incisions whereas 5/7 in the re laparotomy group predominantly had extended mid line incision which will be dealt here. This study has highlighted the post op variables with significant p value such as wound infection, wound dehiscence and intra abdominal abscess. The lab values like serum potassium and albumin were studied which did not show any significance. The factors like ICU dependancy, prolonged hospital stay were consistent with various studies mentioned here. The site of pathology contributing for laparotomy was also studied it did not show any significant p value but a similar study conducted by Koirala et al showed that mortality rate increased in patients who got operated for upper GI tract when compared to lower GI tract. The condition of patient at the time of discharge were studied to know the outcome of patient in terms of discharge to home or needing Long
term assistance care or left against medical advice and even death. No matter whoever the surgeon may be it did not show any influence in patient morbidity and mortality in any study. Study conducted by R.Koirola et al showed that reexploration rate for fistula and wound dehiscence had low mortality rate whereas our study has significant p value for wound dehiscence and infection. But the author said that wound infection, wound dehiscence, pulmonary complications and septicaemia were the next common complications following any laparotomy.
RESULTS

This is an observational study conducted in department of general surgery PSG hospitals Coimbatore. This is a retrospective analysis and the study period was 2015 to 2016. It was decided to take 100 laparotomies during the period of study. The following acute abdomen cases were included and the indications for re-laparotomy are shown in table. The 100 samples were selected according to inclusion criteria.

The demographic details like age, sex were expressed in descriptive statistics. The incidence of laparotomy/ relaparotomy is expressed as percentage. Relaparotomy is dependent variable. All the other variables are independent variable. The risk factors associated with re laparotomy was found out by subjecting them to univariant analysis, each variable was tested using test of significance using chi square test to look for significant p value.

Of these 100 laprotomies totally 7 underwent relaparotomy. Thus the incidence of relaprotomy was 7% with 95% CI and one in those 7 patients under went a 2nd re-laparotomy. The incidence of 2nd relaprotomy was 1% 95%CI

| Total no of cases | Underwent relaprotomy | Incidence with 95%CI |
|-------------------|-----------------------|----------------------|
| 100               | 7                     | 7% (2 to 12%)        |
The 2nd revision the incidence is shown in the following table

| Total no of cases | Underwent relaprotomy | Incidence               |
|-------------------|------------------------|-------------------------|
| 100               | 1                      | 1% (-0.05% to 2.95%)    |

The revision was done and the major cause of that is the anastomotic leak and burst abdomen.

| LAPAROTOMY                      | RE-LAPAROTOMY 1         | RE-LAPAROTOMY 2         |
|---------------------------------|-------------------------|-------------------------|
| JEJUNUM OMENTAL BAND            | BURST ABDOMEN           |                         |
| GASTRIC ULCER PERF             | ANASTAMOTIC LEAK        |                         |
| MID JENUNAL PERF               | ANASTAMOTIC LEAK        |                         |
| MASSIVE HEMOPERITONEUM         | PANCREATIC INJURY       | BURST ABDOMEN           |
| RUPTURED URACHAL CYST+APPENDICITIS | BLADDER INJURY        |                         |
| ANASTAMOTIC LEAK (s/P TOTAL ASTRECTOMY +ESOPHAGOJEJUNOTOMY+JEJUNOJENUNOSTOMY) | NEGATIVE |                         |
| CARCINOMA COLON+METASTASIS     | BURST ABDOMEN           |                         |

List of variables and the their significance are as follows
AGE

The age range was between 15 to 85 and the mean age was 49.6.

The male to female ratio was 7:3 showing male predominance.

Male participants were more in both group when compared to women and this is shown in pie diagram.
Among them the number/percentage of them underwntrelaprotomy is shown in table. Majority of male participants have undergone relaparatomy.

**Table 1: Percentage of Relaprotomy in both sexes**

| Lapstatus   | Male | Female | Total |
|-------------|------|--------|-------|
| No revision | 68   | 25     | 93    |
| Revision    | 5    | 2      | 7     |
| Total       | 73   | 27     | 100   |
The ASA anaesthesia classification is an important variable and this was analysed which showed that the patients in the relaparotomy group mostly belonged to ASA class 3, 5/7 patients belonged to this class.

Whereas patient in laparotomy group belonged to ASA class 2 (42/93) and patients in relaparotomy group actively belong to ASA class 3.
The following bar chart shows the distribution of ASA categories between the groups.

The other characteristics of the participants were 26% of participants were hypertensives.

| Systemic Hypertension | Frequency | Percent |
|------------------------|-----------|---------|
| No                     | 74        | 74.0    |
| Yes                    | 26        | 26.0    |
| Total                  | 100       | 100.0   |
21% were diabetic as shown in the following table

| Diabetes Mellitus | Frequency | Percent |
|-------------------|-----------|---------|
| No                | 79        | 79.0    |
| Yes               | 21        | 21.0    |
| Total             | 100       | 100.0   |

The CAD patients were 12%

| CAD    | Frequency | Percent |
|--------|-----------|---------|
| No     | 88        | 88.0    |
| Yes    | 12        | 12.0    |
| Total  | 100       | 100.0   |

The COPD was found 11%

| COPD   | Frequency | Percent |
|--------|-----------|---------|
| No     | 89        | 89.0    |
| Yes    | 11        | 11.0    |
| Total  | 100       | 100.0   |

PVD was just 1%

| PVD    | Frequency | Percent |
|--------|-----------|---------|
| No     | 99        | 99.0    |
| Yes    | 1         | 1.0     |
| Total  | 100       | 100.0   |

Malignant patients were 16%

| Malignancy | Frequency | Percent |
|------------|-----------|---------|
| No         | 84        | 84.0    |
| Yes        | 16        | 16.0    |
| Total      | 100       | 100.0   |
2% were undergoing radio therapy

| Radiotheraphy | Frequency | Percent |
|---------------|-----------|---------|
| No            | 98        | 98.0    |
| Yes           | 2         | 2.0     |
| Total         | 100       | 100.0   |

The co morbiidities included were DM, SHT, COPD, CAD, PVD, malignancy. chisquare test was performed to find significant association. Among the co morbidities SHT, CAD and COPD showed significant p value (0.012, 0.036, 0.028) respectively.

**Systemic hypertension vs Laprotonmy status**

|           | Lapstatus | P value | Odds ratio | 95% Confidence Interval |
|-----------|-----------|---------|------------|-------------------------|
|           | No        |         |            |                         |
|           | Revision  |         |            |                         |
| Total     | No        | 72      | 2          | 74                      | .012 | 8.571 | 1.550 | 47.408 |
|           | Yes       | 21      | 5          | 26                      |      |       |       |        |
|           | Total     | 93      | 7          | 100                     |      |       |       |        |
|          | No revision | Revision | Total | p value | OR    | 95% Confidence Interval |
|----------|-------------|----------|-------|---------|-------|-------------------------|
| DM No    | 75          | 4        | 79    | .159    | 3.125 | .642 - 15.215            |
| DM Yes   | 18          | 3        | 21    |         |       |                         |
| Total    | 93          | 7        | 100   |         |       |                         |
CAD was showing more revisions

| Laparotomy status | No revision | Revision | Total | p value | OR | 95% Confidence Interval |
|-------------------|-------------|----------|-------|--------|----|-------------------------|
| CAD               | No          | 84       | 4     | 88     |    | .036                    |
|                   | Yes         | 9        | 3     | 12     | 7.000 | 1.348 | 36.349                 |
| Total             | 93          | 7        | 100   |        |    |                         |
COPD

| Laparotomy status | No revision | Revision | Total |
|-------------------|-------------|----------|-------|
| COPD No            | 85          | 4        | 89    |
| COPD Yes           | 8           | 3        | 11    |
| Total              | 93          | 7        | 100   |

| p value | OR      | 95% Confidence Interval |
|---------|---------|-------------------------|
| .028    | 7.969   | 1.510 - 42.044          |
### Crosstab

**Count**

| Lapstatus | Total | P       | 95% Confidence Interval |
|-----------|-------|---------|-------------------------|
|           |       |         | Lower | Upper |
| PVD .00   | 92    | 7       | 99    |       |
| 1.00      | 1     | 0       | 1     |       |
| Total     | 93    | 7       | 100   |       |

Bar Chart

- **lapstatus**: No Revision, Revision
- **COPD**: Count (No = 92, Yes = 1)
- **95% Confidence Interval**: Lower = 0.929, Upper = 0.981
Malignancy

| Laparotomy status | MG No revision | MG Yes revision | Total | p value | OR   | 95% Confidence Interval |
|-------------------|----------------|-----------------|-------|---------|------|------------------------|
|                   |                |                 |       |         |      | Lower | Upper |
| No                | 79             | 14              | 93    | .311    | 2.257| .398 | 12.802 |
| Total             | 84             | 16              | 100   |         |      |       |       |

Radiotherapy status did not show any significance as shown in table below.

Crosstab

| Lapstatus | .00 | 1.00 | Total | P     | OR   | 95% Confidence Interval |
|-----------|-----|------|-------|-------|------|------------------------|
|           |     |      |       |       |      | Lower | Upper |
| RADI 1.00 | 91  | 7    | 98    | .000  | .929 | .879 | .981  |
| 1.00      | 2   | 0    | 2     |       |      |       |       |
| Total     | 93  | 7    | 100   | 1.000 | .929 | .879 | .981  |

preexistent malignancy was considered as a variable and compared significance could not be obtained but 11/93, 2/7 had malignancy in the study group.
Pre op radiotherapy to patients were tabulated and it was found that 2/93, 0/7 underwent radiotherapy which did not show any significance.

Meanwhile the intraoperative parameters were analysed between groups based on their laparotomy status and the chi-square test was performed.

The parameters are categorised and displayed between the groups:

| Lapstatus          | 0.00 | 1.00 | Total |
|--------------------|------|------|-------|
| MALIG              | 1    | 0    | 1     |
| +                  | 2    | 0    | 2     |
| 0                  | 79   | 5    | 84    |
| ca breast          | 1    | 0    | 1     |
| ca cervix          | 1    | 0    | 1     |
| ca colon           | 3    | 1    | 4     |
| ca rectum          | 2    | 0    | 2     |
| ca stomach         | 0    | 1    | 1     |
| ca endometrium     | 1    | 0    | 1     |
| RCC+brain mets     | 2    | 0    | 2     |
| Recurrence         | 1    | 0    | 1     |
| **Total**          | **93** | **7** | **100** |

| <2 hours           | | | |
|-------------------| | | |
| <2 hours           | | | |
| Laprotomy status   | No Revision | Revision | Total | p value | OR | 95% Confidence Interval | |
| Less than 2hr      | 42           | 6         | 48    | .053    | .137 | .016 | 1.185 |
| Yes                | 51           | 1         | 52    |         |      |      |                 |
| **Total**          | **93**       | **7**     | **100** |         |      |      |                 |
### 2 – 4 hours

| Laprotomy status | No Revision | Revision | Total | p value | OR   | 95% Confidence Interval |
|------------------|-------------|----------|-------|---------|------|-------------------------|
| 2-4 HR           | No          | 59       | 2     | 61      |      |                         |
|                  | Yes         | 34       | 5     | 39      | .106 | 4.338 \(0.798_{\text{Lower}} \) \(23.588_{\text{Upper}} \) |
| Total            |             | 93       | 7     | 100     |      |                         |

### >4 hours

| Laprotomy status | No revision | Revision | Total | p value | OR   | 95% Confidence Interval |
|------------------|-------------|----------|-------|---------|------|-------------------------|
| More than 4 hrs  | No          | 85       | 6     | 91      | .494 | 1.771 \(0.189_{\text{Lower}} \) \(16.595_{\text{Upper}} \) |
|                  | Yes         | 8        | 1     | 9       |      |                         |
| Total            |             | 93       | 7     | 100     |      |                         |

When the duration of surgery was categorised and taken into criteria it showed that 34/93 and 5/7 underwent surgery for 2 to 4 hrs, 51/93 and 1/7 underwent surgery for <2 hours and 8/93, 1/7 underwent surgery >4 hrs.

The site of pathology contributing for laparotomy was also studied though it did not show any significant p value, table shows that 30/93, 4/7 had pathology in forgut, 52/93, 3/7 had pathology in mid gut, 14/93, 1/7 had pathology in hindgut and 17/93, 2/7 patients had pathology in multiple sites.
This table shows that 30/93, 4/7 had pathology in foregut with a p value of 0.224. Though a significant p value was not obtained 4/7 patients in re laparotomy group predominantly had pathology in foregut.

|                | laparotomy status | p value | OR   | 95% Confidence Interval |
|----------------|-------------------|---------|------|-------------------------|
|                | No revision | Revision | Total |               | Lower  | Upper  |
| Others         | 63          | 3        | 66    | .224        | 2.800  | .589   | 13.309 |
| Foregut        | 30          | 4        | 34    |             |        |        |        |
| Total          | 93          | 7        | 100   |             |        |        |        |

Bar chart showing the number of patients underwent laparotomy due to foregut pathology.
### Mid gut

| laparotomy status | No revision | Revision | Total | p value | OR  | 95% Confidence Interval |
|-------------------|-------------|----------|-------|---------|-----|------------------------|
| Others            | 41          | 4        | 45    |         | .698| .591                   |
| Midgut            | 52          | 3        | 55    | .958    | .591| .125                   |
| Total             | 93          | 7        | 100   |         | .698| .591                   |

Bar diagram showing the number of patients underwent laparotomy due to mid gut pathology.
Hind gut

Count

|     | laparotomy status | p value | OR  | 95% Confidence Interval |
|-----|-------------------|---------|-----|-------------------------|
|     | 0.00              |         |     |                         |
|     | 1.00              |         |     |                         |
|     | Total             |         |     |                         |
| Others | 79 | 6 | 85 | 1.00 | .940 | .105 | 8.420 |
| Hindgut | 14 | 1 | 15 | 1.00 | .940 | .105 | 8.420 |
| Total | 93 | 7 | 100 | 1.00 | .940 | .105 | 8.420 |

Bar diagram showing the number of patients underwent laparotomy due to hind gut pathology
Classification of wounds were also taken as a variable but it also did not show any significance, only 5/93 (5%) clean wounds, 20/93 (20%), 1/7 (1%) clean contaminated, 36/93 (36%), 2/7 (2%) contaminated wounds, 34/93 (34%) dirty wounds, and 4/7 (4%) were dirty wounds.

| Type of wound   | Frequency | Percent |
|----------------|-----------|---------|
| Clean          | 3         | 3.0     |
| Clean Contaminated | 19      | 19.0    |
| Contaminated   | 40        | 40.0    |
| Dirty          | 38        | 38.0    |
| Total          | 100       | 100.0   |

**Wound Status vs lapstatus**

| WOUNDSS         | laparotomy status |
|-----------------|-------------------|
|                 | No Revision | Revision | Total |
| WOUNDSS Clean   | 3           | 0         | 3     |
| WOUNDSS Clean contaminated | 18     | 1         | 19    |
| WOUNDSS Contaminated | 38     | 2         | 40    |
| WOUNDSS Dirty   | 34          | 4         | 38    |
| Total           | 93          | 7         | 100   |
### Clean Laparotomy Status

|        | laparotomy status |                  | p value | OR  | 95% Confidence Interval |
|--------|-------------------|------------------|---------|-----|-------------------------|
|        |                   | No Revision      | Revision | Total |                      |
| Clean  | Others            | 88               | 7        | 95   | 1.000                   |
|        | Clean             | 5                | 0        | 5    | .926                    |
| Total  |                   | 93               | 7        | 100  | .875                    |
|        |                   |                  |          |      | .980                    |

### Bar Chart

- **No Revision**: 93
- **Revision**: 7

**Lapstatus**
- No revision
- Revision

**Count**
- No: 93
- Yes: 7
Clean contaminated wound

| Laprotomystatus | No Revision | Revision | Total | P Value | OR   | 95% Confidence Interval |
|----------------|------------|----------|-------|---------|------|-------------------------|
| Clean No       | 73         | 6        | 79    |         |      |                         |
| Contaminated   | 20         | 1        | 21    | 1.000   | .608 | .069                    |
| Total          | 93         | 7        | 100   |         |      |                         |

Bar Chart

- Clean Contaminated
- Count
- Lapstatus
  - No Revision
  - Revision
# Contaminated wound

| lapstatus | No Revision | Revision | Total | p value | OR | 95% Confidence Interval |
|-----------|-------------|----------|-------|---------|----|------------------------|
| Contaminated | No          | 57       | 5     | 62      |    | .706                   |
|            | Yes         | 36       | 2     | 38      | .633| .117 3.439            |
| Total      | 93          | 7        |       | 100     |    |                        |

![Bar Chart](attachment:image.png)
## Dirty wound

|                 | No Revision | Revision | Total | p value | OR  | 95% Confidence Interval |
|-----------------|-------------|----------|-------|---------|-----|-------------------------|
| DIRTY No        | 59          | 3        | 62    | .422    |    | .488 10.959             |
| DIRTY Yes       | 34          | 4        | 38    |         | 2.314 |    |                       |
| Total           | 93          | 7        | 100   | .422    |    | .488 10.959             |

**Bar Chart**

- **Lap status**
  - No Revision
  - Revision

**Count**

- No
  - DIRTY: 60
- Yes
  - DIRTY: 30
The timing of surgery was also considered whether it was planned or elective to know the percentage of laparotomy being done as elective or emergency. It was found that 68/93 & 5/7 were the number of cases underwent emergency laparotomies 25/93 & 2/7 underwent elective surgery.

**EMEREL * lapstatus Cross tabulation**

Count

| laparotomy status | No Revision | Revision | Total |
|-------------------|-------------|----------|-------|
| ELECTIVE          | 25          | 2        | 27    |
| EMERGENCY         | 68          | 5        | 73    |
| Total             | 93          | 7        | 100   |
Blood loss during surgery did not show any significance, 73/93& 3/7 had blood loss <500ml, 16/93, 3/7 had blood loss 500 to 1000ml, 3/93 & 1/7 had blood loss between 1000-1500ml and 1/93 & 0/7 had blood loss >2000ml.

Count

| BLOODLOSS         | No revision | Revision | Total |
|-------------------|-------------|----------|-------|
| <500ml            | 73          | 3        | 76    |
| 500 to 1000ml     | 16          | 3        | 19    |
| 1000-1500ml       | 3           | 1        | 4     |
| >2000ml           | 1           | 0        | 1     |
| Total             | 93          | 7        | 100   |
The patients in the relaparotomy group predominantly have extended midline incision 5/7.

**INCISION * lapstatus Cross tabulation**

| INCISION     | Lapstatus  | Count |
|--------------|------------|-------|
|              | No Revision| Revision| Total |
| Maffuci      | 2          | 0       | 2     |
| Upper        | 28         | 1       | 29    |
| Lower        | 19         | 1       | 20    |
| Extended Midline | 41   | 5       | 46    |
| Mid Middle   | 5          | 0       | 5     |
| Total        | 93         | 7       | 100   |

**Bar Chart**
Wound infection showed significant p value in which 20/93 and 5/7 had wound infection, whereas 73/93 & 2/7 did not have infection.

**WONDI * lapstatus Cross tabulation**

|                | laparotomy status |                  | p value | OR      | 95% Confidence Interval | Lower | Upper |
|----------------|-------------------|------------------|---------|---------|-------------------------|-------|-------|
|                | No Revision | Revision | Total |         |                         |       |       |
| Wound Infection No | 73      | 2        | 75    | .010   | 9.125                   | 1.646 | 50.594|
|                | 20      | 5        | 25    |         |                         |       |       |
| Total          | 93      | 7        | 100   |         |                         |       |       |

*Bar Chart*

- **x-axis**: Wound Infection (No, Yes)
- **y-axis**: Count
- **Legend**: lapstatus (No Revision, Revision)
Wound dehiscence had a significant p value where 10/93 and 3/7 had wound dehiscence, 83/93 & 4/7 did not have wound dehiscence.

### Crosstab

| Wound Dehiscence | No Revision | Revision | Total |
|------------------|-------------|----------|-------|
| No               | 83          | 4        | 87    |
| Yes              | 10          | 3        | 13    |
| **Total**        | **93**      | **7**    | **100**|

| p value | OR  | 95% Confidence Interval |
|---------|-----|-------------------------|
| .045    | 6.225 | 1.214 - 31.912          |

### Bar Chart

- **Y-axis (Count)**: Count ranging from 0 to 100
- **X-axis (Wound dehiscence)**: No and Yes
- **Legend**:
  - No revision
  - Revision

---

65
Intra abdominal abscess showed a significant p value of 0.04. 3/93 & 3/7 had abscess, whereas 90/93 & 4/7 had negative findings.

| laparotomy status | No Revision | Revision | Total | p value | OR | 95% Confidence Interval |
|-------------------|-------------|----------|-------|---------|-------------------------|------------------|
| ABCES No S        | 90          | 4        | 94    | .004    | 22.500                  | 3.406            |
|                   | 3           | 3        | 6     |         |                         | 148.618          |
| Total             | 93          | 7        | 100   |         |                         |                  |
The intra op and post op inotropic support had a significant p value of 0.002 & 0.003 respectively, pre op inotopic support were started in 7/93 & 4/7 patients, 86/93 & 3/7 did not require inotropic support.

| laparotomy status | No Revision | Revision | Total |
|-------------------|-------------|----------|-------|
| Inotropic support |             |          |       |
| No                | 86          | 3        | 89    |
| Yes               | 7           | 4        | 11    |
| Total             | 93          | 7        | 100   |

Post op inotropic support were required in 15/93 & 5/7 and 78/93 & 2/7 did not require inotropic support.

When studying the variables using pre op, intra op and post op characters variables with significant p value has been identified, in this retrospective study the factors with significant p value are SHT, CAD, COPD, pre op and post op inotropic support, wound infection, abscess and wound dehiscence.
| S.No | Patient characteristics            | P value |
|------|------------------------------------|---------|
|      | **PRE OP CHARACTERISTICS**         |         |
|      |                                    |         |
| 1    | Systemic hypertension              | 0.012   |
| 3    | Coronary artery disease            | 0.036   |
| 4    | COPD                               | 0.028   |
|      | **INTRA OP**                       |         |
| 12   | Inotropic support                  | 0.002   |
|      | **POST OP**                        |         |
| 1    | Inotropic support                  | 0.003   |
| 2    | Wound infection                    | 0.010   |
| 3    | Wound dehiscence                   | 0.045   |
| 4    | Intra abdominal abscess            | 0.004   |
The mean number of days spent in icu for laparotomy group was 2 days and the mean number of days spent in icu for revision laparotomy group was 11 days. The mean days spent in ventilator for laparotomy group and revision laparotomy group are 0.5 and 5 days respectively, the mean number of days spent in hospital for laparotomy group is 12 days and the mean number of days spent in hospital for revision group is 32 days. The expected post op day in which the patient has undergone re do surgery is between 4th to 15th day. The lab values like serum k and albumin did not have any significant outcome.

**Group Statistics**

|                  | Lapstatus | N  | Mean  | Std. Deviation | Std. Error Mean |
|------------------|-----------|----|-------|----------------|-----------------|
| SALBUMIN         | .00       | 93 | 2.8140| .77748         | .08062          |
|                  | 1.00      | 7  | 3.5143| .24103         | .09110          |
| K                | .00       | 93 | 3.9758| .80978         | .08397          |
|                  | 1.00      | 7  | 4.0571| .44668         | .16883          |
| VENTILATOR       | .00       | 93 | .5699 | 1.87893        | .19484          |
|                  | 1.00      | 7  | 5.5714| 8.03860        | 3.03830         |
| ICU DAY          | .00       | 93 | 3.0645| 3.73528        | .38733          |
|                  | 1.00      | 7  | 11.5714| 13.87873      | 5.24567         |
| DAY HOSP         | .00       | 93 | 12.5054| 6.07673        | 6.3013          |
|                  | 1.00      | 7  | 32.4286| 28.14757      | 10.63878        |

The other post operative complications present in the 100 patients are shown in the table below.
| Conditions                                    | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------------------------------|-----------|---------|---------------|-------------------|
| Non specific                                 | 67        | 67.0    | 67.0          | 68.0              |
| Alcohol withdrawal                          | 2         | 2.0     | 2.0           | 70.0              |
| ARDS                                        | 1         | 1.0     | 1.0           | 71.0              |
| Basal atelectasis                           | 1         | 1.0     | 1.0           | 72.0              |
| Bed sore                                    | 3         | 3.0     | 3.0           | 75.0              |
| Burst abdomen                               | 1         | 1.0     | 1.0           | 76.0              |
| CHD stricture, pleural effusion             | 1         | 1.0     | 1.0           | 77.0              |
| Focal seizure                               | 1         | 1.0     | 1.0           | 78.0              |
| Hypokalemia                                 | 2         | 2.0     | 2.0           | 80.0              |
| Hypokalemia, sepsis, shock                  | 1         | 1.0     | 1.0           | 81.0              |
| Metabolic acidosis                          | 1         | 1.0     | 1.0           | 82.0              |
| Metabolic acidosis, hypokalemia             | 1         | 1.0     | 1.0           | 83.0              |
| Paralytic ileus                             | 6         | 6.0     | 6.0           | 89.0              |
| Pleural effusion                            | 5         | 5.0     | 5.0           | 94.0              |
| Pneumonia                                   | 2         | 2.0     | 2.0           | 96.0              |
| Seizure                                     | 1         | 1.0     | 1.0           | 97.0              |
| Sepsis                                      | 1         | 1.0     | 1.0           | 98.0              |
| Sepsis, og stenting                         | 1         | 1.0     | 1.0           | 99.0              |
| T-2 resp failure                            | 1         | 1.0     | 1.0           | 100.0             |
| Total                                       | 100       | 100.0   | 100.0         |                   |

Table to show the mean and range of the post of day in which patient undergoing relaparotomy is calculated
## Statistics

**VAR00003**

|                  |        |        |
|------------------|--------|--------|
| N Valid          | 7      |        |
| Missing          | 0      |        |
| Mean             | 8.7143 |        |
| Median           | 8.0000 |        |
| Mode             | 4.00\(^a\) |    |
| Std. Deviation   | 3.63842|        |
| Variance         | 13.238 |        |
| Range            | 11.00  |        |
| Minimum          | 4.00   |        |
| Maximum          | 15.00  |        |

\(^a\) Multiple modes exist. The smallest value is shown

### AMA

| AMA  | Frequency | Percent |
|------|-----------|---------|
| No   | 85        | 85.0    |
| Yes  | 15        | 15.0    |
| Total| 100       | 100.0   |

### LTAC

| LTAC | Frequency | Percent |
|------|-----------|---------|
| No   | 98        | 98.0    |
| Yes  | 2         | 2.0     |
| Total| 100       | 100.0   |

### Home

| Home | Frequency | Percent |
|------|-----------|---------|
| No   | 28        | 28.0    |
| Yes  | 72        | 72.0    |
| Total| 100       | 100.0   |
| DEATH | Frequency | Percent |
|-------|-----------|---------|
| No    | 97        | 97.0    |
| Yes   | 3         | 3.0     |
| Total | 100       | 100.0   |

To know the laparotomy outcome the patient discharge status was considered and analysed. 3/7 pts went home, 3/7 pts went Against medical advice, 1/7 needed LTAC( long term assistance care) . In total irrespective of the number of laparotomies 72/100 went home, 15/100 went against medical advice, 2/100 needed LTAC, 3/100 died.

The rank of operating surgeon was considered in which 16/93 & 1/7 were performed by Senior residents, 43/93 & 3/7 by Assistant professor and 14/93, 3/7 by Professors , for 20 surgeries the details of surgeon were not available

**SURGEON * lapstatus Crosstabulation**

| SURGEON * lapstatus | Lapstatus |
|---------------------|-----------|
|                     | 0.00      | 1.00      | Total |
| 0.00                | 20        | 0         | 19    |
| 1.00                | 16        | 1         | 17    |
| 2.00                | 43        | 3         | 46    |
| 3.00                | 14        | 3         | 17    |
| Total               | 93        | 7         | 100   |
DISCUSSION

PSG hospital is a tertiary care centre where it serves lakhs of people in and around Coimbatore district, patient admission, operation details and discharge summary are recorded in computarized system.

Incidence of relaparotomy in this study was 7%, various studies have found different incidence rates in various scenarios which is as low as 1.9%\(^{(5)}\) to as high as 24%\(^{(4)}\), Incidence varies from study to study due to different variables and study design. 1/7 patient underwent initial surgery elsewhere, 1/7 patient underwent 2 revision laparotomy.

The indications for relaparotomy were anastamoticleak 2/7 (20%), burst abdomen 2/7 (20%), pancreatic injury 1/7 (10%), bladder injury 1/7 (10%), negative laparotomy 1/7 (10%), anastamotic leak and burst abdomen seems to be the leading cause of revision laparotomy in similar studies too\(^{2}\). The re exploration rate for anastamotic leak and burst abdomen were high while the re exploration rate for peritonitis, wound dehiscence or fistula was either low or not done\(^{5}\). This study has a good number of therapeutic relaparotomy indicating that all these patients abdomen were opened only for good. The incidence of negative revision laparotomy was only 10% (1/7), which coincides with a study conducted Matthias et al \(^{4}\) wherein the incidence of negative revision laparotomy was 9%. The incidence of multiple revision laparotomy is 10% (1/7), the
indications of revision laparotomy are more or less the same, the only difference is the incidence of each indication.

The number of relaparotomy does not increase the significance it’s the time of intervention which matters. The total number of relaparotomy was 7 in which 5/7 were performed in emergency set up. Many of the patients requiring repeat laparotomy in which the index surgery were done as emergency basis. Another study also shows that the maximum relaparotomies are taken as emergency surgery only. The number of planned relaparotomy were 2/7, emergency relaparotomy were 5/7. The percentage of emergency relaparotomy is consistent with a study conducted by Matthias et al which is 85%.

The mean duration between laparotomies depends upon the index surgery, surgical technique and post op factors and it varies according to ICU and hospital set up. In this study the mean duration between laparotomies were 8.85 days and it ranges from 4 to 15 day. The mean duration between first and second relaparotomy is 5 th day.

This study was designed in such a way that the cause of relaparotomy and the factors leading to re exploration were analysed by selecting variables, each variable starting from pre op to intra op and post op were chosen and studied using univariant analysis, the significant variable with p value <0.05 was obtained which was consistent with other study.
The pre op factors included patient demographics and co morbids, the intra op characters included were the site of pathology, duration of surgery, blood loss and inotropic support, where as the post op characteristics included surgery related complications. Genderwise distribution of relaparotomy was higher in male patients which is comparable to similar study, the male:female ratio is 7:3, the male participants were more in both laparotomy and revision laparotomy group. The mean age of the participants was 49.6 (10).

The mean age of participants were 50 with male dominance in a study conducted by Unalp HR et al. The pre op factors with significant p value are SHT, CAD, COPD.

Systemic hypertension was present in 26%, diabetes mellitus was present in 21%, coronary artery disease was present in 12%, COPD was present in 11% and peripheral vascular disease was present in 1%. The percentage of CAD and COPD was found to be 21% and 14% respectively in a study conducted by Oddeke van et al 12 which is very well similar to this study. CAD with significant p value was also found in a study conducted by Jerry J.Kimet al.3

Intraoperative characteristics like site of pathology, classification of wound, duration of surgery, type of incision, blood loss and need for inotropic support were studied. When site of pathology was considered nothing was significant but majority in the group had forgut30/93, 4/7...
and 52/93, 3/7 midgut pathology and minority of the group had pathology in hindgut 14/93, 1/7-hindgut and multiple site 17/93, 2/7. Blood loss also was studied but it failed to show any significance but patients on intra op inotropic support had significant p value. The patient in laparotomy group had all types of midline incision whereas 5/7 had extended mid line incision

**INCISION * lapstatusCrosstabulation**

| INCISION       | Lapstatus | No Revision | Revision | Total |
|----------------|-----------|-------------|----------|-------|
| Maffuci        |           | 2           | 0        | 2     |
| Upper          |           | 28          | 1        | 29    |
| Lower          |           | 19          | 1        | 20    |
| Extended       |           | 41          | 5        | 46    |
| Midline        |           | 5           | 0        | 5     |
| Total          |           | 93          | 7        | 100   |

The type of wound and the frequency with percentage has been shown in table below
| Type of wound      | Frequency | Percent |
|-------------------|-----------|---------|
| Clean             | 3         | 3.0     |
| Clean contaminated| 19        | 19.0    |
| Contaminated      | 40        | 40.0    |
| Dirty             | 38        | 38.0    |
| Total             | 100       | 100.0   |

Most of the above mentioned factors were studied by Jerry.J.Kim et al and the results were more or less the same.

As per expectations complications related to revision laparotomy are high and our results were no different when post op complications were analysed it was found that wound infection, wound dehiscence and intra-abdominal abscess had significant p value which is consistent in a study conducted by Koirola et al. The other post op complications taken into account were pulmonary complications, septicaemia, dyselectremia, cardiovascular complications, stroke, tracheostomy, enterocutaneous fistula, laparostomy and others. 1/7 had tracheostomy and 2/7 had laparostomy in this study.

The need for multiple laparotomies is associated with worse outcomes in terms of ICU care, ventilator dependency and increased hospital stay.
mean number of days spent in icu for laparotomy group was 2 days and the mean number of days spent in icu for revision laparotomy group was 11 days, The mean days spent in ventilator for laparotomy group and revision laparotomy group are 0.5 and 5 days respectively, the mean number of days spent in hospital for laparotomy group is 12 days and the mean number of days spent in hospital for revision group is 32 days. The expected post op day in which the patient has undergone redo surgery is between 4th to 15th day and the mean post op day was 8.7.

The rank of operating surgeon was considered in which 16/93 & 1/7 were performed by Senior residents, 43/93 & 3/7 by Assistant professor and 14/93, 3/7 by Professors, for 20 surgeries the details of surgeon were not available. and the table is shown below.

**SURGEON * lapstatusCrosstabulation**

|        | Lapstatus | Count |
|--------|-----------|-------|
| SURGEON | .00       | 20    |
| N      | 1.00      | 16    |
|        | 2.00      | 43    |
|        | 3.00      | 14    |
| Total  |           | 93    |

Junior two ranks performed majority of the index surgeries this is attributed to the staffing ratio of the hospital, whereas it was not possible
to bring out the leak rate or complications related to surgery. This has no impact on the study. What is shown here is emergency theatres which were performed by junior two consultants. Similar findings are shown in a study conducted by professor BFK Odimba et al. This forms a deficit in co-relation between experience of Surgeon and impact on surgical outcome, which can be focused upon in the next study.

Thus 8 variables with significant p value have be obtained and shown in the table

| S.NO | SHT | CAD | COPD | INOTROPS PRE OP | INOTROPS POST OP | INFECTION | DEHISICENCE | ABSCESS | TOTAL |
|------|-----|-----|------|-----------------|-----------------|-----------|-------------|---------|-------|
| 1    | 1   | 0   | 0    | 0               | 0               | 1         | 0           | 0       | 2     |
| 2    | 1   | 1   | 1    | 0               | 1               | 0         | 0           | 0       | 4     |
| 3    | 1   | 1   | 1    | 0               | 0               | 0         | 1           | 1       | 5     |
| 4    | 0   | 0   | 0    | 1               | 1               | 1         | 1           | 1       | 5     |
| 5    | 1   | 1   | 1    | 1               | 1               | 1         | 0           | 0       | 6     |
| 6    | 1   | 0   | 0    | 1               | 1               | 1         | 1           | 1       | 6     |
| 7    | 0   | 0   | 0    | 1               | 1               | 1         | 0           | 0       | 3     |

Among the variables a minimum of 2 to a maximum of 6 variables were present in relaparotomy group.
CONCLUSION

Although repeat laparotomies create a huge stress for the patient in the post-operative period, due to lack of adequate pre-operative nutritional preparation, further worsened by the pathology from the disease/ previous surgery, the need for re-laparotomy supersedes these risks in view of worsening clinical status of the patient. The decision for re-laparotomy has to be made by an experienced surgeon and with all relevant investigations needed without any time delay. The major result of our study was the incidence of revision laparotomy 7% and the incidence of second revision laparotomy was 1%. This was an observation study and the results were based on retrospective data available with which some significant predictors were obtained and the findings were observed in the other studies. The major limitation of this study can be overcome by randomized control trial which will have ethical consideration. Anyhow this study incidence was concordance with major studies and the scoring system should be developed with the important predictors listed.
LIMITATIONS

Among the patient demographics BMI and personal habits could not be studied as there were many missing data in patient records. Though alcohol usage and smoking have shown to be significant in a other studies since this study is retrospective correct information regarding personal details were not available. Burst abdomen was a major indication in our study the suture material used for abdomen closure could have also been considered. The mortality rate could not be calculated as significant number of patients went AMA which could be due to increased financial constraints considering patient affordability they could not have been able to continue ICU treatment.
RECOMMENDATION

To develop a scoring system with the important predictors listed. All the necessary investigations and pre op preparation has to be made once the decision for revision laparotomy has taken the patient has to be shifted to operating room without any time delay. Utmost post op care has to be given to prevent revision laparotomy associated morbidity and mortality.
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| Abbreviation | Full Form |
|--------------|-----------|
| ARDS         | Acute Respiratory Distress Syndrome |
| ICU          | Intensive Care Unit |
| MODS         | Multiole Organ Dysfunction Score |
| SOFA         | Sepsis related/Sequential Organ Failure Assessment |
| IL-6         | Interleukin-6 |
| LTAC         | Long term Assistance care |
| ACS          | Abdominal Compartment Syndrome |
| AMA          | Against medical advice |
| SHT          | Systemic Hypertension |
| CAD          | Coronary Artery Diseases |
| COPD         | Chronic Obstructive Pulmonary Disease |
**Pre OP and Intra OP Characteristics**

| Patient Characteristics | 1st laparotomy | 2nd laparotomy |
|-------------------------|----------------|---------------|
| Age                     |                |               |
| Sex                     |                |               |
| BMI                     |                |               |
| ASA CLASS               |                |               |
| CO MORBIDITIES: SHT, DM, CAD, COPD, PVD, MALIGNANCY, TOBACCO & ALCOGOL ABUSE | | |
| LAB VALUES: serum albumin, potassium | | |
| OPERATING TIME: < 2 hours | 2–4 hours | > 4 hours |
| INTRA OP FINDING:       |                |               |
| SITE OF LAPAROTOMY:     |                |               |
| FORGUT                  |                |               |
| MID GUT                 |                |               |
| HIND GUT                |                |               |
| CONTAMINATION:          |                |               |
| clean/clean contaminated/dirty | | |
| FLUIDS:                 |                |               |
| intra op pressor support, blood loss | | |
| EMERGENCY / ELECTIVE    |                |               |
| DURATION BETWEEN 1ST AND 2ND LAPARATOMY | | |
| Patient Characteristics |
|--------------------------|
| POST OPERATIVE PRESSOR SUPPORT |
| POST OPERATIVE RETURN OF BOWEL SOUND |
| DAYS ON VENTILATOR |
| DAYS IN ICU |
| DAYS IN HOSPITAL |
| POSTOPERATIVE COMPLICATIONS |
| WOUND INFECTION |
| WOUND DEHISCENCE |
| ABSCESS |
| BLEEDING |
| FISTULA |
| TRACHEOSTOMY |
| PULMONARY EMBOLUS |
| DEEP VEIN THROMBOSUS |
| VENTILATOR PNEUMONIA |
| URINARY TRACT INFECTION |
| ACUTE RENAL FAILURE |
| STROKE |
| ACUTE MI |
| DISCHARGE |
| -HOME |
| -AMA |
| -LTAC(long term asst care) |
| -death |
