

# Audit of pain management following emergency laparotomies in cancer patients: A prospective observational study from an Indian tertiary care hospital

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## ABSTRACT

**Background:** Emergency laparotomies present a challenge in pain management given sick patients, odd timings and poor outcomes. Current recommendations favour multimodal opioid-sparing analgesia following elective laparotomies. No recommendation exists for emergency surgeries. **Methodology:** After approval and registration of the trial, adult patients posted for emergency laparotomy in the hospital (tertiary centre for cancer care) starting August 2015, for 6 months, were included in this prospective study. Patients' details including indication for emergency surgery, preoperative haemodynamic parameters, baseline coagulation status were captured. Patients were followed for pain scores, satisfaction with pain management and outcome. The number of anaesthesiologists present and their experience concerning regional techniques were noted. **Results:** Intestinal obstruction was the commonest cause of emergency laparotomy. Most patients belonged to the ASA IE/IIe class (91%). Intraoperatively, opioids were the mainstay of pain management with an epidural catheter inserted in only 9% of cases even though most cases were conducted by anaesthesiologists confident/expert in thoracic epidural insertion. There was no correlation of choice of pain management technique with the time of surgery ( $P = 0.22$ ), ASA grading ( $P = 0.28$ ), predicted mortality by p-Poosum scores ( $P = 0.24$ ). Pain at movement was moderate-severe in more than 50% of patients within the first 24 h. The regional group had better satisfaction when compared to opioid and non-opioid based management. ( $P < 0.001$ ). **Conclusion:** Regional techniques for pain management in emergency laparotomies are less preferred, therefore, opioids are the mainstay. Lack of experience is essentially not the primary reason for regional techniques not gaining popularity. Pain management in this group needs a thorough re-evaluation.

**Key words:** Emergency laparotomy, epidural analgesia, postoperative pain management

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## INTRODUCTION

Pain continues to be a significant problem following laparotomy.<sup>[1,2]</sup> In this era of fast track surgery, the ERAS (enhanced recovery after surgery) group has suggested that a multimodal rehabilitation programme with epidural analgesia, short laparotomy, early feeding and early mobilisation improve outcomes after elective colonic surgeries.<sup>[3]</sup>

Emergency laparotomy is a common intra-abdominal procedure, with generally poor outcomes<sup>[4]</sup> and this

group is demanding with time and resources. There is a paucity of data concerning outcomes in this

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group and there is still less data concerning pain management following emergency laparotomies. A national survey of epidural use, conducted by Walton *et al.* in the UK in 2006, revealed that fewer anaesthetists would administer an epidural before an emergency laparotomy; and still, fewer would use it intraoperatively.<sup>[5]</sup> The survey highlighted a wide variation in anaesthetic practice for a commonly performed procedure.<sup>[5]</sup> Various reasons that could account for the variability include preoperative surgical or anaesthesia concerns, coagulopathy, lack of time, lack of clinical skills in regional techniques, contraindications for the use of certain drugs/procedures, co-morbid conditions, intraoperative haemodynamic instability and alteration of laboratory parameters.<sup>[5]</sup>

Our audit aims to understand our current practices concerning pain management following emergency laparotomy in cancer patients. It also analyses factors influencing the choice of pain management techniques such as time of surgery, anaesthesiologist perception and skill at regional techniques, patient factors including American Society of Anaesthesiologists (ASA) physical status scores and p-Possum scores.<sup>[6]</sup>

## METHODS AND METHODOLOGY

After approval from a hospital ethics board [Project no 1350, approved on 21/07/2014] and registration of trial with Clinical Trial Registry of India [CTRI no-2014/07/004782], all adult patients posted for emergency laparotomy in the hospital (tertiary cancer care centre) starting August 2015, for 6 months, were included in the study. As data were captured from the anaesthesiology team and pain services, a waiver of consent was granted for the study after ensuring patient confidentiality.

Patients' details including indication for emergency surgery, preoperative haemodynamic parameters and baseline coagulation status were noted. Intraoperative pain management and the need for postoperative ventilation were noted. The number of anaesthesiologists present for the case and the experience of the senior anaesthesiologist conducting the emergency case concerning regional techniques inclusive of epidural analgesia were noted. The experience was clubbed into three groups: learning, confident and expert. For the study, the above terms were defined as - learning: no/minimal experience,

need constant supervision for the procedure, confident: have done the procedure earlier but occasionally may need supervision and expert: experienced and need no supervision for the procedure. For epidural analgesia, expertise was captured separately for thoracic and lumbar levels.

All anaesthesiology residents working in the department during the 6 months ( $n = 75$ ), were asked to rate the following concerns during the management of emergency laparotomy cases. The concerns were clubbed into four categories: airway issues at induction, perioperative haemodynamic concerns, extubation plan and perioperative pain management. A numeric rating scale was used for the score of importance, with two endpoints defined by 1- least important, 10-most important.<sup>[7]</sup>

Pain scores in the postoperative period are routinely recorded on a numeric rating scale (1–10, 10- maximum pain). The average pain scores and worst pain scores at 24 h and 72 h were noted. For analysis, pain scores were clubbed as mild (1–3), moderate (4–6) and severe (7–10).<sup>[8]</sup> Postoperative pain management technique was clubbed as 'regional' (if the main analgesic plan was regional-based -epidural, abdominal catheters), 'opioid-based' (if any opioid-fentanyl/morphine/tramadol/tapendatol was used around the clock or as a rescue in 72 h) and 'non-opioid-based'. Non-opioid-based included the group in whom in absence of regional analgesia, opioids were not required in any form for pain management in wards; the patient may have received opioids in the post-anaesthesia care unit (PACU). This group received a combination of non-steroidal anti-inflammatory drugs (NSAIDs) and paracetamol either orally or intravenously, in the wards. In the regional and opioid groups, non-opioid drugs were also continued in combination.

Patients at the end of the 72-h period were asked to rate their satisfaction with pain management on a numeric scale of 1–10, 10- most satisfied. The outcome of emergency surgery was captured and grouped into discharged from hospital, mortality and readmission in the ICU. For the last group, the further course in ICU was not followed upon.

Analysis of data: Patient demographics including surgical details are expressed in percentage. p-Possum score was noted as median value with interquartile range for physiology score, operative

severity score and predicted morbidity and mortality. Patients with mild, moderate and severe pain after surgery were recorded in percentage. Categorical data such as ASA status, the expertise of anaesthesiologist and the implementation of regional techniques were compared using the Chi-square test. p-Poosum predicted mortality and pain management technique was compared using a one-way ANOVA test. Patient satisfaction was compared with pain management techniques using a non-parametric test – Kruskal-Wallis test. All data were analysed using SPSS software version 25.

## RESULTS

Around 135 patients underwent emergency laparotomy in 6 months and were prospectively included in the trial. Mean age: 48 ( $\pm 16$ ) years with male preponderance (1.5: 1). Nearly 91% of patients belonged to ASA I E/II E grade, [Table 1]. The commonest indication for exploration remained intestinal obstruction (63%), with diversion colostomy and hemicolectomy being the surgery that was frequently performed. Most cases were done either late in the evening or at night hours. Details of preoperative concerns and specific intraoperative management have been enumerated in Table 2.

Table 1: Demographics of the patients who underwent emergency laparotomy		
Variable (n=135)	No of patients	Percentage
Gender		
Male/Female	86/49	64/36
ASA grading		
IE/IIIE/IIIE/IVE/VE	91/32/9/2/1	67/24/7/1/1
Indication for exploration		
Intestinal Obstruction	90	67
Sepsis	22	17
Bowel Perforation/Ischemia	3	1
Burst abdomen	3	1
Others	17	14
Surgery performed		
Hemicolectomy	26	19
Ileostomy	20	15
Diversion Colostomy	37	27
Resection anastomosis	11	8
Secondary suturing	8	6
Adhesiolysis	5	4
Stoma revision	5	4
Others	23	17
Time of Surgery		
Day time (8 am to 6 pm)	31	23
Late evening (6 pm to 11 pm)	53	39
Nighttime (11 pm to 5 am)	44	33
Early morning (5 am to 8 am)	7	5

Around 9% of patients (12) were on a ventilator and 6% of patients (8) had deranged coagulation profile preoperatively. Epidural catheters were inserted in twelve patients. Intraoperatively, all but one patient received opioid analgesics, non-opioid analgesic was given in addition to 78 patients and 22 patients received wound infiltration at the end. In one patient, bilateral rectus sheath catheters were inserted at the end of the surgery. Thirty-two patients were shifted to ICU on a ventilator, while for the rest, the endotracheal tube was removed at the end of the surgery and patients were shifted to the post-anaesthesia recovery room.

Twelve patients were intubated and sedated and continued to be on ventilator support, while we had mortality in 3 cases within 72 h. Postoperative pain management in the remaining 120 cases included epidural analgesia in 13 patients (in one patient epidural catheter was present from the primary surgery and continued following emergency exploration) and intermittent local anaesthetic through rectus sheath catheters in one case, in addition to non-opioid medications.

Fourteen patients were started on intravenous opioids using patient-controlled analgesia pumps in addition to non-opioid medication. Two patients were continued on the transdermal patch while one patient was continued on oral morphine. Fifty-nine patients received inj. tramadol 50 mg 8 hourly followed by as per need. Two patients were started on oral tapentadol 50 mg 8 hourly. A total of 78 patients were thus on opioid medication in addition to non-opioid pain killers. In the remaining 28 patients, only non-opioid analgesia- paracetamol (500 mg-1 g) and/or diclofenac (1 mg/kg max of 50 mg TDS) either oral or intravenously 6–8 hourly was prescribed for pain management.

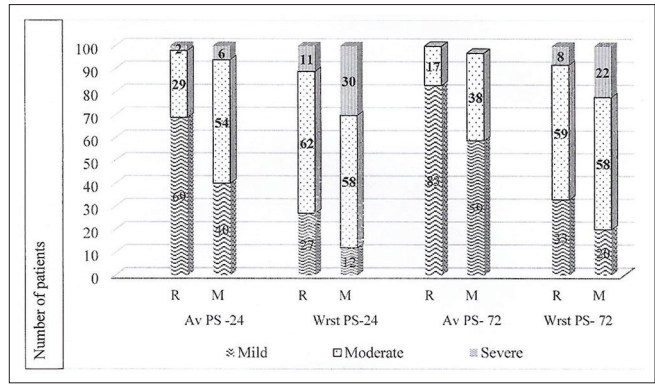
We analysed pain scores in 120 patients, 83% of patients had mild pain scores when average scores at rest were analysed. Pain at movement was moderate-severe in more than 50% of patients within the first 24 h and up to 38% of patients still had moderate-severe pain at movement by the end of 72 h, Figure 1. There was no correlation between the worst scores at 72 h with various modalities of pain management ( $P = 0.06$ ). The median score of patients' satisfaction with pain management was 5[4–7] (10- highly satisfied) The regional group had better satisfaction when compared to opioid and non-opioid

Table 2: Preoperative and intraoperative anaesthesia concerns and management		
Variable (n=135)	No of patients	Percentage
<b>Preoperative concerns</b>		
Patient on ventilator	12	9%
On inotropic supports/haemodynamic stability	10	7%
Airway concerns	3	2%
Coagulopathy	8	6%
<b>P-Possum score- median value [IQR]</b>		
Physiology score	17[8]	
Operative severity score	15[9]	
Predicted mortality	2.4[6.8]	
Predicted morbidity	35[33]	
<b>Intraoperative concerns</b>		
Haemodynamic instability	34	25%
<b>Intraoperative Pain Management technique (more than one technique can apply to one patient)</b>		
Opioids	134	99%
Epidural	12	9%
Wound infiltration	22	16%
Regional techniques	1	1%
Nonopioids	78	58%
<b>Postoperative recovery</b>		
Extubated on table	103	76%
Shifted on ventilator	32	24%
<b>Course in PACU/ICU (stay post-surgery)</b>		
Stay less than 24 h	107	79%
Stay for 24-48 h	7	5%
Stay more than 48 h	21	16%
<b>Outcome</b>		
Discharged home	121	
Mortality	9	
Readmission to ICU	5	

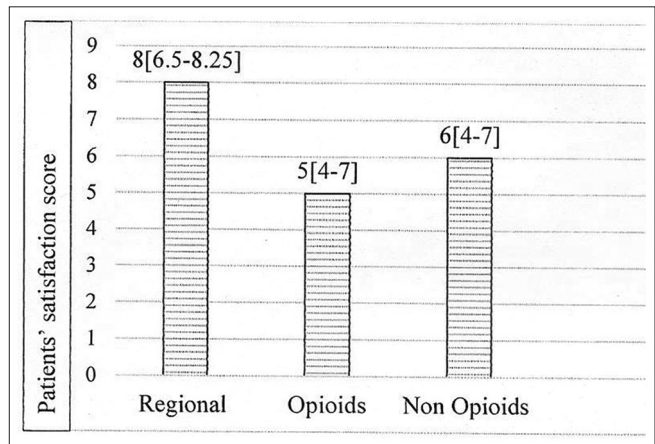
based management. ( $P < 0.001$ ), refer to Figure 2.

Concerning the outcome, 90% of patients (121 patients) in the study period, were discharged from the hospital, nine patients died and five patients were readmitted in the intensive care unit.

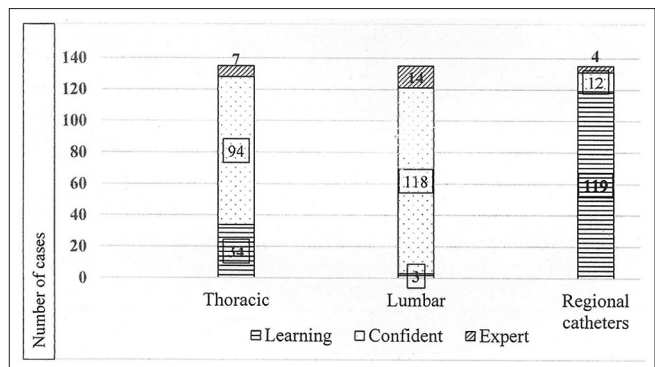
We looked at factors that influenced pain management and we analysed the total number of anaesthesia team members present for at least 50% of anaesthesia time in the theatre. Around 97% of the cases were covered with more than two anaesthesiologists- 59% of cases 2, 34% of cases 3 anaesthesiologists were present. About 92% of cases, the senior-most anaesthesiologist for the case was a senior registrar. In 4% of cases, a consultant anaesthesiologist was present and for an equal number of cases a postgraduate student headed the team. The experience of the senior-most anaesthesiologist with regional technique revealed that 75% of cases were conducted by anaesthesiologists confident/expert in



**Figure 1:** Pain scores in the postoperative period (n = 120). Av PS-24: Average Pain Score- at the end of 24 h. Wrst PS-24: Worst Pain Score – at the end of 24 h. Av PS-72: Average Pain Score- at the end of 72 h. Wrst PS-72: Worst Pain Score – at the end of 72 h. R- pain at rest. M- pain at movement. Mild pain 1–3, Moderate pain 4–6, Severe pain 7–10 where the pain is measured on an 11 point numeric rating scale (10- most severe pain)



**Figure 2:** Patients' satisfaction score and correlation with possible variables. (n = 120). The patient satisfaction score was recorded on a numeric scale 1–10, 10 – most satisfied. Patient satisfaction score was more in patients who were offered regional techniques ( $P < 0.001$ )



**Figure 3:** Graph describing the experience of senior anaesthesiology at regional techniques. (N = 75). Thoracic – Epidural catheter placement at the thoracic level. Lumbar - Epidural catheter placement at the lumbar level. Regional catheters – Field blocks inclusive but not restricted to rectus sheath, transversus abdominis plane block

thoracic epidural insertion, Figure 3. There was no correlation of choice of pain management technique

with either experience at the regional technique or, time of surgery ( $P = 0.22$ ) or ASA grading ( $P = 0.28$ ). There was no association between p-Possum predicted mortality and pain management technique ( $P = 0.24$ ). Self-rated scores for key anaesthetic issues in the perioperative period revealed hemodynamics and airway concerns take precedence over pain issues during emergency cases. Refer to Figure 4.

## DISCUSSION

Pain at movement remains a significant issue following emergency laparotomies. Results of the audit reveal that opioids remain the mainstay of pain management following these surgeries. The choice of pain management is not linked to the time of surgery, patient factors including ASA physical grading and p-Possum scores.

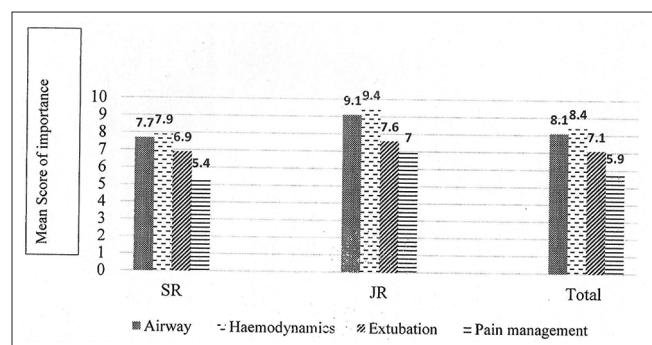
Worldwide emergency laparotomies are associated with poor outcomes and prolonged hospital stay.<sup>[9,10]</sup> There is a lack of standardised protocol for this vulnerable group and there is a need to develop an enhanced recovery programme for these patients.<sup>[11]</sup> A comprehensive bundle including preoperative optimisation, surgical intervention and postoperative care can potentially improve outcomes in this group of patients and needs attention.<sup>[12]</sup>

As suggested by the literature, the postoperative pathway is a modifiable risk in this group.<sup>[13]</sup> Previous audits have revealed that infection and gastrointestinal complications are the commonest categories of postoperative complications.<sup>[11]</sup> Pulmonary complications are easily modifiable and can be prevented with a good postoperative pain programme and aggressive physiotherapy. The role of epidural

and suitable regional techniques in the enhanced recovery programme in elective laparotomy is well-established<sup>[3,14-16]</sup> To add on, epidural analgesia remains the standard postoperative pain management strategy for all elective laparotomies at our centre. Unfortunately, in less than 9% of the total patients, epidural analgesia was attempted before emergency laparotomies. A similar finding has also been reported from other centres.<sup>[11]</sup>

Patient factors can play a role in decision making and include contraindications for the use of certain drugs/procedures, co-morbid conditions, intraoperative haemodynamic instability and alteration of laboratory parameters.<sup>[5]</sup> To understand patient factors in our study, we looked at stratification scores including ASA and p-Possum. The subjective nature of ASA assessment and its association with interobserver variability limits its use as a predictor of mortality when used alone;<sup>[17,18]</sup> hence, in addition to ASA scores p-Possum score was used for risk stratification. Though the predictability of p-Possum would vary as per the health system, with countries offering consultant delivered services, there is an overestimation of mortality by p-Possum.<sup>[19,20]</sup> For a consultant led service like the UK model – the prediction should be similar. However, postoperative pain management was not mainly influenced by patient factors as there was no association between ASA grading and p-Possum score and pain management in our audit.

The prevalence of oligoanalgesia in the emergency department is not uncommon.<sup>[21]</sup> The barriers in establishing a good pain management programme in the emergency department include inadequate knowledge and formal training in acute pain management, opiophobia, the ED environment and the ED culture.<sup>[21]</sup> The previous survey of epidural use during emergency surgery reveals a lack of consistency in the use of epidural analgesia following emergency laparotomy and highlights the need for further research.<sup>[5]</sup> Taking a cue from the same, we looked at the number of anaesthesiologists present in the operation theatre for the emergency cases and their experience concerning regional analgesia. In around 97% of cases, there were at least two anaesthesiologists in the theatre and more than two-thirds of times the senior-most anaesthesiologist was confident in the placement of the epidural catheter, suggesting that manpower and lack of knowledge are not the main key players for poor compliance to epidural analgesia.



**Figure 4:** Concerns during anaesthetic management in emergency laparotomy- Residents feedback. Importance scale scored on a 1-10 numeric scale (10- most important) SR- Senior resident (qualified anaesthesiologist) (N = 28). JR – Junior resident (anaesthesiologist in training) (N = 47)

Considering the heterogeneity of patients presenting for emergency surgery, the decision-making process must not be influenced by the time of the surgery but be based on objective risk stratification score.<sup>[22,23]</sup> Similarly, in our hospital, oncology cases needing urgent surgery may not necessarily be sick to withstand surgery. Change in attitude towards pain management during after hours is not just a reflection of the experience, but a change in priority of the senior-most anaesthesiologist conducting the case. Airway issues and haemodynamic instability seem to be of top concern with pain management draining down the list. However, it is encouraging to note that audits like the one in this study, do help in stimulating the entire environment. In the years following this audit, we have seen more acceptability to adapt regional techniques and there has been a trend towards increasing the use of epidural analgesia in the emergency laparotomy group.

This audit is not without limitations. We followed up patients only till 72 h for pain scores. Effect of pain management on surgical outcomes was not assessed including reasons for readmission to ICU or mortality were not analysed. Besides, opioid-related side effects were not closely monitored.

## CONCLUSION

Regional techniques for pain management in emergency laparotomies are less preferred, opioids are the mainstay. Lack of experience is essentially not the primary reason for regional techniques not gaining popularity as airway and haemodynamics take precedence over pain management. Pain management in patients undergoing emergency exploratory laparotomy needs a thorough re-evaluation. Therefore, prospective studies defining the role of regional/opioid-sparing techniques in emergency surgeries are needed.

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## Conflicts of interest

There are no conflicts of interest.

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