

The use of analgesics in patients after laparoscopic colorectal surgery at Cho Ray Hospital, 2024

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ABSTRACT

Laparoscopic colorectal surgery is increasingly common, but post-operative pain management remains a major challenge, especially with the use of multiple medications that pose a risk of interaction. This study aims to evaluate the use of analgesics and the rate of clinically significant drug interactions in patients after laparoscopic colorectal surgery. A retrospective cross-sectional study of patient records of laparoscopic colorectal surgery was conducted at Cho Ray Hospital from January to December 2024. Three datasets were used to identify drug interactions. The study used the T-test and Spearman correlation to identify factors affecting drug interactions. Paracetamol and tramadol were the two most commonly used analgesics. The most common drug interactions were dexamethasone-rocuronium (82.4%) and palonosetron-tramadol (30.6%). Patients taking multiple medications had a significantly increased risk of drug interactions ($P = 0.03$). The number of drug interactions was correlated with the length of hospital stay ($r = 0.127$; $P = 0.004$), the number of medications used ($r = 0.255$; $P < 0.001$), and the pre- and post-operative pain levels (VAS). This study recommends that careful monitoring and benefit-risk consideration of drug combinations, especially opioids and NSAIDs, are essential to optimize post-operative management of laparoscopic colorectal surgery.

Keywords: Analgesic, Cho Ray, Drug interaction, Hospital, Laparoscopic colorectal surgery

Introduction

Post-operative pain is considered an acute form of pain that, if left uncontrolled, is associated with the development of chronic pain that reduces quality of life [1, 2]. Post-operative pain management after laparoscopic colorectal surgery is an important part of post-operative recovery [3]. Currently, laparoscopic

colorectal surgery has been widely accepted because it offers pain relief, lower post-operative complication rates, faster recovery, and shorter hospital stays. However, most recommendations regarding post-operative pain management for laparoscopic procedures are based on studies conducted in open surgical procedures. Therefore, the optimal pain management for patients undergoing laparoscopic colorectal surgery remains controversial [4].

The study by Brown *et al.* showed that pain management strategies in elective laparoscopic colorectal surgery are often complex [5]. Appropriate consideration is needed in selecting the optimal multimodal pain management regimen, as different analgesics may provide optimal pain relief at different post-operative times. In recent years, natural products have gained increasing attention as potential sources of bioactive compounds

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with therapeutic and antioxidant properties that may contribute to future pain management strategies [6, 7].

At Cho Ray Hospital, approximately 1,200 laparoscopic colorectal surgeries are performed annually. However, there have been no published studies on the use of analgesics and drug interactions in patients undergoing laparoscopic colorectal surgery at this hospital. Therefore, this study aims to investigate analgesic use after laparoscopic colorectal surgery, analyze potential drug interactions, and provide clinicians with additional information to improve patient care.

Materials and Methods

Setting and research design

This study is a cross-sectional descriptive analysis based on retrospective medical records of patients who underwent laparoscopic colonoscopy at Cho Ray Hospital from January to December 2024, using the following inclusion criteria: (1) Patient records of adult patients (≥ 18 years) indicated for colorectal surgery, (2) which are completed and submitted to the General Planning Department for archiving. Emergency or open surgery cases were excluded. Additionally, patients with severe complications related to anesthesia and those with medical records indicating the use of fewer than 2 medications were excluded from the analysis.

Sample size

The study determined the minimum sample size using a formula to estimate a proportion:

$$n \geq \frac{Z_{1-\alpha/2}^2 \times p \times (1 - p)}{d^2} \quad (1)$$

In (1), the sample size (n) was determined using a Type I error probability (α) of 0.05, a confidence coefficient ($Z^2_{(1,\alpha/2)}$) corresponding to 95% confidence with $Z = 1.96$, and a margin of error (d) of 0.05. A retrospective study by Bui Tung Hiep et al. showed that 43.78% used level 2 analgesics [8]. Therefore, $P = 0.4378$ was taken.

The sample size $n = 378$ was calculated; an additional 30% was added to ensure the final sample size was 500. The sampling method involved collecting all medical records that met the study criteria.

Data collection and statistical analyses

From patient records, data is meticulously entered, coded, and analyzed to ensure objectivity. Drug Interactions Checker (Micromedex-MM, Drugs.com-D, Medscape-MED) was used. For each patient record, all eligible active ingredients were entered into the software to create a list of possible drug interactions and calculate the frequency of each interaction pair. The collected data were coded and imported using Microsoft

Excel 2010. SPSS 20.0 was used to test for associations using t-tests and Spearman's correlation.

Results and Discussion

The average age of patients undergoing colorectal surgery was 60.58 ± 11.77 years, with the majority aged 60 years or older ($n = 282$; 56.4%). Males accounted for 62.6% ($n = 313$), and females 37.4% ($n = 187$). The average BMI was 21.51 ± 3.39 kg/m², with 65% within the normal range (18.5-24.9). The average hospital stay was 9.41 ± 2.38 days. Ninety patients (18.0%) had comorbidities, none of whom were allergic to analgesics. Before surgery, all experienced only mild pain. Postoperatively, the VAS score increased during the first 3 days (4.71 ± 0.97), decreased from the fourth to the seventh day (3.55 ± 1.09), and continued to decline after the seventh day (2.53 ± 1.22) (Table 1). The results were consistent with domestic studies [8-10] but differed from international reports [5, 11, 12], reflecting variations in life expectancy, healthcare systems, and lifestyle factors.

Table 1. Characteristics of patients after laparoscopic colorectal surgery participating in the study

Variables	n (%) or mean \pm SD
Age group (years)	
18-30	4 (0.8%)
31-59	214 (42.8%)
≥ 60	282 (56.4%)
Age (Mean \pm SD)	60.58 \pm 11.77
Gender	
Male	313 (62.6%)
Female	187 (37.4%)
BMI	
< 18.5	101 (20.2%)
18.5 \leq BMI < 25	325 (65%)
25 \leq BMI < 30	67 (13.4%)
BMI ≥ 30	7 (1.4%)
BMI (Mean \pm SD)	21.51 (3.39%)
Occupation	
Intellectual work	46 (9.2%)
Physical work	274 (54.8%)
Trading	23 (4.6%)
Unemployed/retired	157 (31.4%)
Days of hospitalization	9.41 \pm 2.38
Comorbidity	
Yes	90 (18.0%)
No	410 (82.0%)
History of analgesic allergy	
No	500 (100.0%)
Pre-surgery pain levels	
Mild pain	500 (100.0%)
Post-surgical VAS scores	
Days 1-3	4.71 \pm 0.97
Days 4-7	3.55 \pm 1.09
> 7 days	2.53 \pm 1.22

Notes: BMI = body mass index; VAS = visual analog scale.

In the initial post-operative period, the majority of patients received IV paracetamol (99.8%) and IM tramadol (99.2%), then switched to oral medication as they recovered (Table 2).

These results are consistent with domestic studies [9, 10] and confirm the central role of paracetamol and tramadol. However, in Europe and the United States, NSAIDs and oral opioids are preferred early on to reduce invasive interventions and limit opioid dependence [5, 12]. In Vietnam, paracetamol and tramadol remain the primary choices due to their effectiveness, low cost, and few side effects. Still, pain management protocols need to be updated in line with international trends to optimize treatment.

The survey revealed that patients used a variety of medications, most commonly pain relievers/anti-inflammatory drugs, antibiotics, vitamins, minerals, and electrolytes (100%), followed by acid-suppressing medicines (98%) and laxatives (93.4%) (Figure 1a). The majority were prescribed 6-8 medications (61.6%), 33.2% used 2-5 drugs, and 5.2% used ≥ 9 medications (Figure 1b). These results are consistent with previous studies in Vietnam [8, 10], underscoring the importance of multi-therapy monitoring to limit drug interactions, side effects, and unnecessary costs.

Table 2. Characteristics of analgesics used in the treatment phase

APIs	RoA	Day 0	Days 1-3	Days 4-7	> 7 days
Paracetamol	IV	499 (99.8%)	475 (95.0%)	345 (69.0%)	113 (22.6%)
	PO	0 (0.0%)	8 (1.6%)	10 (2.0%)	9 (1.8%)
Meloxicam	IM	1 (0.2%)	5 (1.0%)	0 (0.0%)	0 (0.0%)
Tramadol	IM	0 (0.0%)	496 (99.2%)	305 (61.0%)	55 (11.0%)
Nefopam	IV	333 (66.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Levobupivacain	LIA	5 (1.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Dexamethasone	IV	473 (94.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Lidocain	IV	5 (1.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

Notes: API = active pharmaceutical ingredients; RoA = route of administration; IV = Intravenous; PO = per os / Oral; IM = intramuscular; LIA = local infiltration anesthesia

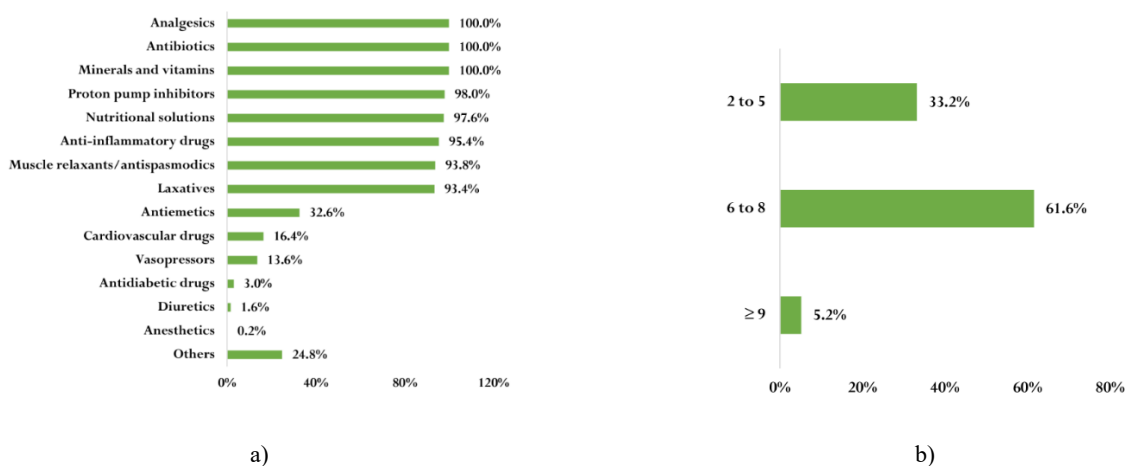


Figure 1. a) Classes of medications administered post-laparoscopic colorectal surgery; b) Number of medicines per prescription.

Table 3. Drug interactions after laparoscopic colorectal surgery by treatment phase.

Number of medicine interactions	D	MD	MM
Day 1-3			
0	62 (11.7)	495 (99.0)	338 (67.4)
1	220 (44.4)	4 (0.8)	151 (30.4)
2	161 (32.5)	1 (0.2)	9 (1.8)
3	22 (4.4)	0 (0.0)	2 (0.4)
4	28 (5.6)	0 (0.0)	0 (0.0)
5	7 (1.4)	0 (0.0)	0 (0.0)
Total	438 (88.3)	5 (1.0)	162 (32.6)
Day 4-7			
0	131 (25.7)	494 (98.8)	492 (98.4)
1	269 (54.2)	4 (0.8)	7 (1.4)
2	78 (15.7)	2 (0.4)	1 (0.2)
3	18 (3.6)	0 (0.0)	0 (0.0)
4	3 (0.6)	0 (0.0)	0 (0.0)
5	1 (0.2)	0 (0.0)	0 (0.0)
> 7 days			
0	486 (97.2)	494 (98.8)	493 (98.6)
1	11 (2.2)	5 (1.0)	7 (1.4)
2	1 (0.2)	1 (0.2)	0 (0.0)
3	2 (0.4)	0 (0.0)	0 (0.0)

Total	14 (2.8)	6 (1.2)	7 (1.4)
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Notes: D = drugs.com; MD = medscape; MM = micromedex

Post-surgery, the rate of drug interactions decreased over time: 88.3% in the first 3 days, 74.3% from days 4-7, and 2.8% after day 7 (Table 3). Previous studies in Vietnam have shown similar results [8, 10], reflecting the increased use of analgesics, antibiotics, and supportive medications in the early stages. Meanwhile, in developed countries, the rate of interactions after day 7 is only 40-50% thanks to advanced pharmaceutical management strategies and stricter monitoring [5, 12]. This indicates the need to strengthen monitoring and optimize medicine management in Vietnam to reduce the risk of interactions.

Table 4 shows that the dexamethasone-rocuronium interaction accounted for the highest proportion (412 cases; 82.4%), reflecting its widespread use in the post-operative period and the risk of altered muscle relaxant duration of action. The palonosetron-tramadol interaction accounted for 30.6%,

potentially increasing the risk of serotonin syndrome. The high frequency of these two interactions underscores the need to develop prescribing guidelines that consider interactions, integrate assessments into treatment protocols and clinical pharmacist consultations, and develop more reliable tools for aggregating interaction data.

Patients with drug interactions tended to be older, had higher BMI, longer hospital stays, and greater VAS scores, but the differences were not statistically significant ($P > 0.05$) (Table 5). Conversely, the number of medications used was significantly higher in the interaction group (6.20 ± 1.52 vs. 4.50 ± 1.29 ; $P = 0.03$), as observed in the study by Nguyen *et al.* [13]. The results confirm that polypharmacy is a significant risk factor, highlighting the role of reviewing and evaluating treatment regimens, especially in patients using multiple medications.

Table 4. Frequency of clinically significant drug interaction pairs

Drug interaction pairs	D	MD	MM	n (%)
Amlodipine-bisoprolol	Yes	Yes	No	3 (0.6%)
Bisoprolol-dapagliflozin	Yes	No	Yes	1 (0.2%)
Bisoprolol-Insulin	Yes	No	Yes	2 (0.4%)
Bisoprolol-spirolactone	Yes	Yes	No	1 (0.2%)
Captopril-potassium chloride	Yes	No	Yes	1 (0.2%)
Ciprofloxacin-metronidazole	Yes	No	Yes	1 (0.2%)
Ciprofloxacin-tramadol	Yes	No	Yes	1 (0.2%)
Dapagliflozin-insulin	Yes	Yes	Yes	1 (0.2%)
Dexamethasone-cisatracurium	Yes	Yes	Yes	27 (5.4%)
Dexamethasone-rocuronium	Yes	Yes	Yes	412 (82.4%)
Dexamethasone-midazolam	Yes	Yes	No	1 (0.2%)
Ephedrine-phenylephrine	Yes	Yes	No	1 (0.2%)
Fluconazole- tramadol	Yes	No	Yes	1 (0.2%)
Palonosetron-tramadol	Yes	No	Yes	153 (30.6%)
Potassium chloride-amlodipine	Yes	Yes	No	1 (0.2%)
Tramadol-metoclopramide	Yes	No	Yes	16 (3.2%)
Esomeprazol-Fluconazole	No	Yes	Yes	1 (0.2%)

D = drugs; MD = medscape; MM = micromedex

Table 5. Association between patient-related factors in laparoscopic colorectal surgery and potential drug interactions

Variables	Drug interactions		P-value (t-test)
	No Mean ± SD	Yes Mean ± SD	
Age	54.00 ± 9.93	60.63 ± 11.79	0.26
BMI	19.98 ± 3.53	21.52 ± 3.39	0.88
Length of hospital stay (days)	8.00 ± 1.41	9.42 ± 2.39	0.24
Number of medications	4.50 ± 1.29	6.20 ± 1.52	0.03
Preoperative VAS	1.50 ± 0.58	1.52 ± 0.59	0.95
VAS on post-operative days 1-3	4.58 ± 0.32	4.70 ± 0.83	0.79
VAS on post-operative days 4-7	3.00 ± 0.87	3.49 ± 0.93	0.36

Notes: BMI = body mass index; VAS = visual analog scale; SD = standard deviation

The number of drug interactions was associated with length of hospital stay ($r = 0.127$; $P = 0.004$), number of medications

used ($r = 0.255$; $P < 0.001$), and pre- and post-operative pain levels (Table 6). Maher *et al.* also noted a similar correlation

coefficient ($r \approx 0.2-0.3$) [14], while Patel *et al.* showed that longer hospital stays increased costs and mortality due to adverse drug events [15]. These results suggest the need for accurate pain

assessment, individualized analgesic regimens, and close monitoring to limit the harm from drug interactions.

Table 6. Correlation between patient-related factors in laparoscopic colorectal surgery and the number of drug interactions.

Variables	Spearman correlation coefficient	P-value
Age	0.019	0.688
BMI	0.078	0.081
Number of medications	0.255	0.000
Length of hospital stay (days)	0.127	0.004
Preoperative VAS	0.110	0.014
VAS on post-operative days 1-3	0.192	0.000
VAS on post-operative days 4-7	0.131	0.007
VAS on post-operative 7 days onwards	0.101	0.401

Strengths and limitations

This study has several limitations. First, relying on retrospective data from patient records may not fully and accurately reflect the effectiveness of pain control and side effects. Therefore, prospective studies are needed for a more comprehensive assessment. Second, intervention studies should be conducted to evaluate the effectiveness of alternative pain management models, including regional anesthesia, receptor antagonists (e.g., low-dose ketamine), or selective COX-2 inhibitors. These strategies are particularly relevant in the context of the growing global trend toward limiting opioid use.

Conclusion

The study revealed that paracetamol and tramadol are the primary pain relief choices after laparoscopic colorectal surgery at Cho Ray Hospital. The high frequency of interactions, such as dexamethasone-rocuronium and palonosetron-tramadol, suggests the need for prescribing guidelines that account for their risks. This study highlights the importance of enhanced close monitoring, particularly in elderly patients and those taking multiple medications. Healthcare professionals should carefully consider the benefit-to-risk ratio when combining pain medications, especially opioids and NSAIDs.

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Conflict of interest: None

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Ethics statement: The study was approved by the Scientific Council of Cho Ray Hospital. Decision No. 6609/QD_BVCR, signed on December 10, 2024. Medical records of surgical patients are collected and analyzed honestly and accurately. Personal information is used only for research, is encrypted, and is anonymized to prevent identification.

Data is securely stored with restricted access and never shared beyond the study.

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