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GIT Complications after Open Heart Surgery: A Systematic Review and Meta-Analysis of Observational Study

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Keywords
GIT complications, open heart surgery, paralytic ileus.

Abstract
Background: There was not observational studies have reported correlations between GIT Complications after Open heart surgery. This meta-analysis was performed to investigate whether there is a correlation between GIT complications and Open-heart surgery.
Methods: Literature searches were performed in PubMed, Google, and the Cochrane Library from period August, 15, 2022 to October, 20, 2022. Studies that investigated the correlations between any GIT complications and Open-heart surgery were included. The pooled Odds ratio (ROs) with 95% confidence interval (CI) for GIT complications after open heart surgery was calculated by using RevMan 5.4.5.
Results: The eleven RCTs comprising 215,615 patients were included. Mainly types of GIT complications after open heart surgery in the studies were Isolated GIT Bleeding, Hiatus hernia, Jaundice, Dysphagia and paralytic ileus. ORs was 0.00(0.00-0.00); but the most significant GIT Complications after open heart surgery was Hiatus hernia ORs was (1.23 0.78, 1.95). the second significant GIT complications were Jaundice ORs was 0.05 (0.03-0.08) and Dysphagia ORs was 0.15 (0.08-0.25).
Conclusions: Correlation between GIT Complications and Open-heart surgery.

1.Introduction
The incidence of GIT Complication after open heart surgery is uncommon; but its serious. Currently, increasing numbers of observation studies have investigated the correlation between GIT Complications and open-heart surgery that given the prevalence GIT Complications after open heart surgery; its important to determine whether correlations exist between GIT Complications and open-heart surgery.

2.Methodology
Search strategy and eligibility criteria
The PubMed, Google, Cochrane Library were searched from August 1, 2022 until September 24, 2022, for studies that assessed the relationship between GIT Complications after open heart surgery.
The following medical subject heading (Mesh) term and Keywords were used: "GIT Complications", "after open heart surgery", "Paralytic ileus". The search was restricted to studies on humans and to those that were published in the English Language. The title and abstracts were screened by one author independently. The inclusion criteria were as follow: any study with and without GIT Complications after open heart surgery.
The exclusion criteria were as follow: Any complications, not GIT Complications after open heart surgery.
Data extraction
The following data were extracted: first author, year of publication, study design, Number of subjects, Types of Complications, Type of Surgery. As well as whether in hospital. Deaths were excluded in the survival analysis.

Statistical analysis

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Statistical analysis was performed with RevMan (version 5.4.5; Cochrane collaborations) ORs and their 95% Confidence Interval (Cis) were used to evaluate the association between GIT complications after open heart surgery. Statistical heterogeneities among studies were assessed by the I'2' statistic. The random effects model and the fixed effects model were used.

The assessment of publication bias was evaluated using the funnel plot. We followed both the preferred Reporting items for systematic Reviews and Meta-analysis of observation studies. All analyses were based on previously published studies; thus, no ethical approval and patient consent are not required.

3.Result

Literature searches and description of studies. The flow diagram of the literature searches is shown in Fig6. The entire study sample size from included studies was 215,615 patients. The characteristics of the included studies are shown in Table1. The quality of the included studies was analyzed.

Records Identified through database searching (n= 45)
Records after duplicates removed (n=0)
Records screened (n= 45)
Full-text articles assessed for eligibility (Included=11), (Excluded 34)
Studies included in qualitative synthesis (n=11)
Studies included in qualitative synthesis (n=11) Meta-analysis)(

F1: Flow chart of articles identified, included and excluded studies.

The Studies on GIT post open heart surgery complications: eleven studies were included in the analysis of correlation between any reported post open heart surgery complications.

The pooled ORs(95%CI) of GIT post open heart surgery complications was 0.00(0.00-0.00) non-significant Fig 5. The sensitivity analysis demonstrated that no individual study significantly influenced the overall effect of ORs. Studies bias was examined by Revman program Fig 6.

Mainly types of GIT complications after open heart surgery in the studies were Isolated GIT Bleeding Fig4, Hiatus hernia Fig1, JaundiceFig2, Dysphagia Fig3 .

But the most significant common GIT type complications after Open heart surgery was; Hiatus hernia Fig1.

4.Discussion

The present study undertook a comprehensive review and meta-analysis of the literatures to assess the relationship between GIT complications and Open-heart surgery. The results demonstrated that, although the correlation was not significant by several studies, the pooled results showed that GIT complications after open heart surgery correlated with nonsignificant. There was not any study talked before about GIT Complications after open heart surgery, so we decided to meta-analysis study to determine the most significant GIT complications after open heart surgery. In the analysis of the relationship between GIT complications and open-heart surgery, the studies demonstrated low heterogeneity. The present study had some limitations the sample size may not be adequate to detect the significant correlation and a limited number of studies were included.

5.Conclusion

In summary, there is good evidence to support the correlations between GIT complications and Open-heart surgery, to reduce and determine the negative impact of most common and serious GIT complication after open heart surgery.

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Acknowledgements

Not applicable

Availability of data and materials

All data generated or analyzed during this study are included in the published articles which were listed in Table 1.

Ethics approval and consent to participate

All analyses were based on previous published studies; thus, no ethical approval and patient consent are required.

Consent for publication

Not applicable.

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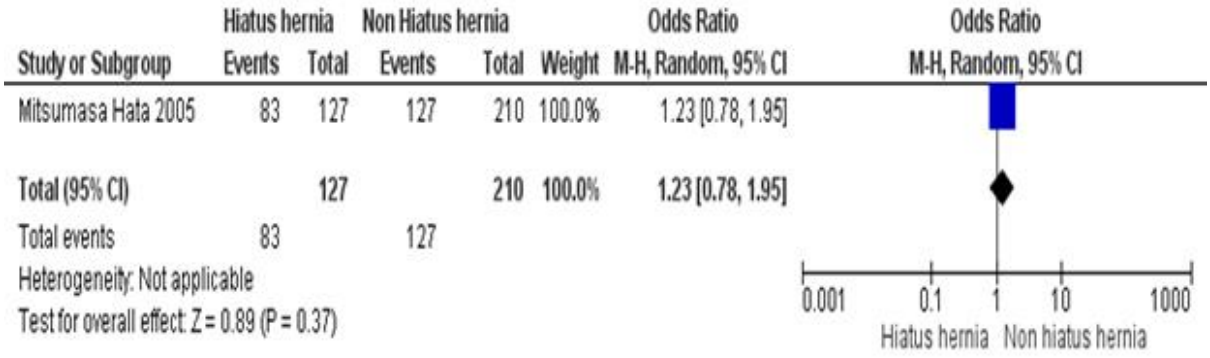

Fig1

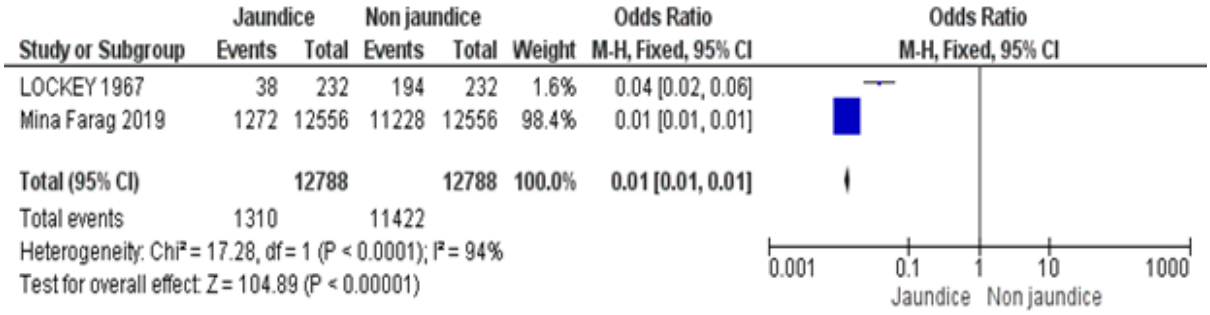

Fig2

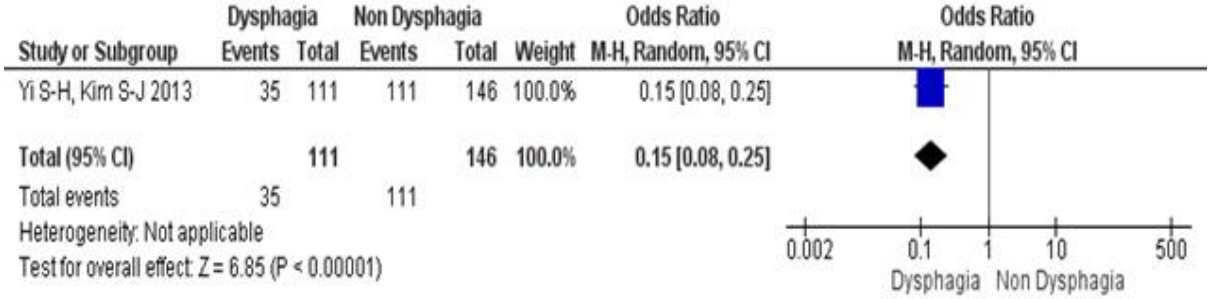

Fig3

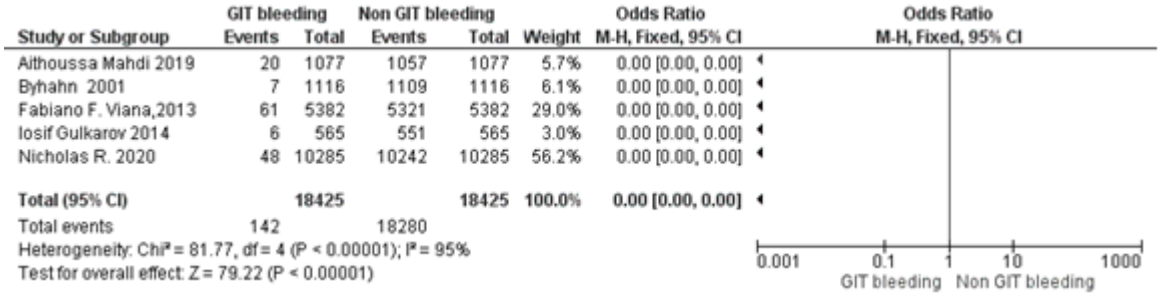

Fig4

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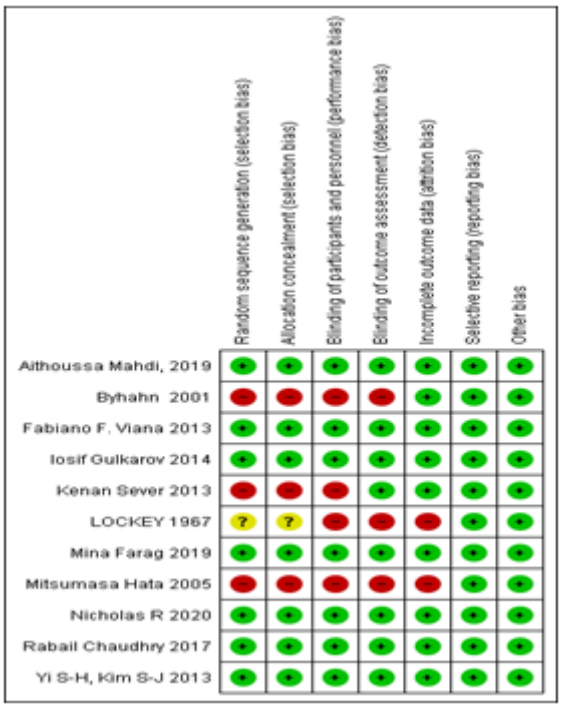

Risk of bias summary: fig 6

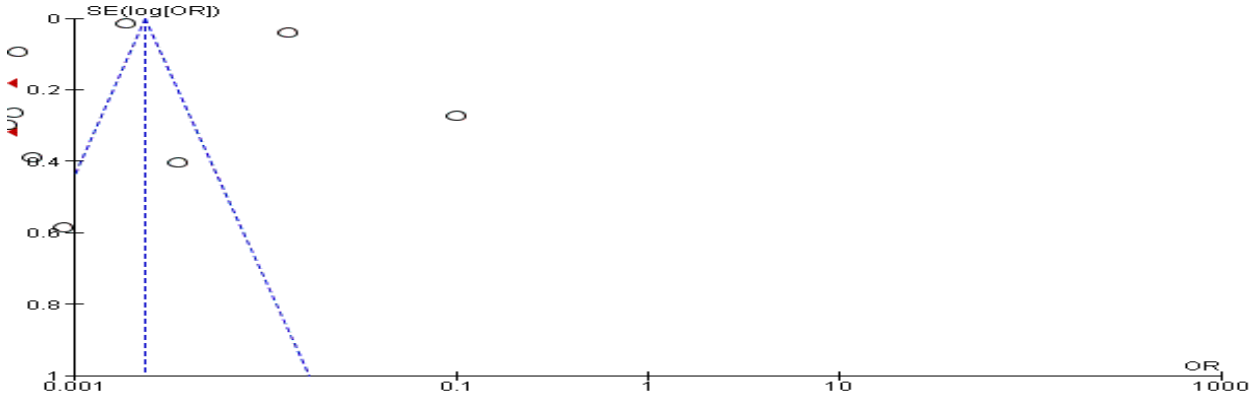

Fig 6. Funnel plot

Fig5. Forest plot

Study or Subgroup	GIT Complications Events	Total	Non GIT Complications Events	Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Aithoussa Mahdi 2019	20	1077	1057	1077	0.5%	0.00 [0.00, 0.00]
Byhahn 2001	23	1116	1093	1116	0.5%	0.00 [0.00, 0.00]
Fabiano F. Viana,2013	61	5382	5321	5382	2.7%	0.00 [0.00, 0.00]
Iosif Gulkarov 2014	13	565	551	565	0.3%	0.00 [0.00, 0.00]
Kenan Sever 2013	29	1360	1331	1360	0.7%	0.00 [0.00, 0.00]
LOCKEY 1967	13	232	219	232	0.1%	0.00 [0.00, 0.01]
Mina Farag 2019	1272	12566	11228	12566	5.1%	0.01 [0.01, 0.01]
Mitsumasa Hata 2005	6	210	204	210	0.1%	0.00 [0.00, 0.00]
Nicholas R. 2020	246	10285	10079	10285	5.0%	0.00 [0.00, 0.00]
Rabail Chaudhry 2017	7624	182688	175064	182688	85.0%	0.00 [0.00, 0.00]
Yi S-H, Kim S-J 2013	35	146	111	146	0.0%	0.10 [0.06, 0.17]
Total (95% CI)		**215627**		**215627**	**100.0%**	**0.00 [0.00, 0.00]**
Total events	9342		206258			

Heterogeneity: Chi² = 2762.20, df = 10 (P < 0.00001); I² = 100%
Test for overall effect: Z = 394.67 (P < 0.00001)

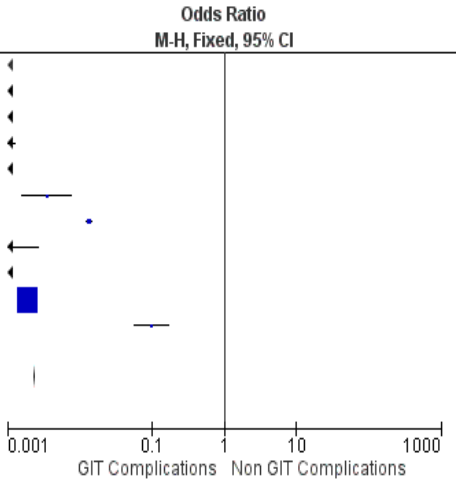

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Table 1:

Study ID	Country	Registration number	Study Design	Characters of patients	Length of	Study arms	Numbers	Age, mean(SD)	Gender	GIT complication after open heart surgery	Comorbidities
Kenan Sever 2013	New York	DOI: 10.1177/0003319713482357	Cohort study	1360 adult patients underwent open heart surgery with cardiopulmonary bypass at our institution. Operative procedures included coronary artery bypass grafting (CABG), isolated valve surgery, com bined CABG and valve surgery, aortic root replacement, surgi cal excision of intracardiac tumors, and surgical correction of adult congenital heart defects.	3 years	single arm	1360 patients	Age (mean + SD) 68.2 + 5.6	Gender (M/F) 6/2	Paralytic ileus /Upper gastrointestinal bleeding /Lower gastrointestinal bleeding /Acute mesenteric ischemia	Diabetes mellitus/ Hypertension/ Peripheral arterial disease/ Cerebrovascular accident/ Chronic renal failure
Mitsumasa Hata 2005	Japan	_	RCT	210 patients, 157 males and 53 fe males (average age 64.5±9.3 years, range: 28-_		3 groups	70 patients to every group.	Age 65.0±7.0/ 62.6±10.0 / 66.1±9.0	Sex (M/F) 19/7 . 50/18 55/19	Epigastric pain /Upper GI bleeding /Hiatus hernia /Esophagitis /Supeficial gastritis /Erosive gastritis /Hemorrhagic gastritis /Active ulcer /Gastric cancer	Diabetes /Hypertension/Renal insufficiency /Smoking/ CABG/ Valve surgery / Aortic surgery / CPB duration.
Byhahn 2001	Germany	DOI: 10.1007/s00268-001-0095-3	Cohort study	A total of 1116 patients who had undergone cardiosurgical pro cedures with extrac one year		Two groups	No GIT complications (n 1093) /GIT complications (n 23)	Age (years) 66.1 8.12 / 64.6 9.71	Male 775 (70.9%) 15 (65.2%) Female 318 (29.1%) 8 (34.8%)	Hepatic failure/Ischemic or necrotic bowel disease 5 /Gastric bleeding 7 /P'seudomembranous colitis 3 /Acute cholecystitis 2 /Septic rupture of the spleen 1	Hypertension History of myocardial infarction
Yi S-H, Kim S-J 2013	Korea	DOI: 10.1097/PHM.0b013e3182876384	cross sectional study (retrospective)	The mean + SD age, gestational age, and birth weight of the infants were 3.4 ± 3.0 mos, 38.6 + 1.8 wks, and 3.0 + 0.5 kg, re spectively. The body weight and the height at operation were 5.4 ± 1.9 kg and 59.3 ±11.6 cm, respectively.	_	Two groups	Infants with Dysphagia (n = 35) / Inf	Age at operation, mos 2.9 (2.7) / 3.5 (3.1)	Male 19 / 59 Female 16 / 52	Dysphagia	Neurologic/ Malformation syndrome/ Previous open heart surgery/ Preoperative cardiac failure/ Preoperative ventilator care/ Preoperative nonoral feeding.
Iosif Gullarov 2014	New York, USA	doi: 10.5761/atcs.oa.13.02245	cross sectional study (retrospective)	The records of 565 consecutive adult patients who underwent mitral valve surgery	30 days	No GI complication/ GIT Complication	n = 552 / n = 13	65 ± 14 / 68 ± 12	Male	Diverticulitis (n = 1) /Ischemic bowel (n = 3)/Isolated GI bleed (n = 6) /GI bleed + acute cholecystitis (n = 3)	Hypertension / Hypercholesterolemia/ Myocardial infarction/ CAD/ Diabetes/ CVA/ COPD/ CRI / Cardiac angioplastic / Atrial fibrillation/ Vasopressor use/ Cardiogenic shock
LOCKEY (1967)	London	http://thorax.bmj.com/	RCT	Two hundred and thirty-two patients who had open heart operations at the National Heart Hospital have been studied.	_	Two groups	male group 144 / female group 88	Age : congenital heart lesion 3-56 (20)	aquiredMale and female	Jaundice	congenital heart lesions and acquired Mainly aortic /Mainly mitral /Multiple valve
Althoussa Mahdi 2019	Morocco	10.4103/0976-5042.147501	retrospectively	Patients with and without GIB were similar when compared for age, smoking, vascular disease, left ventricular function, Canadian Cardiovascular Society angina class, functional class New York Heart Association (NYHA) III-IV	30 days	Two groups	f 1077 patients undergoing cardiopulmonary bypass(CPB) from 1994 to 2012	Age (years): Control group: 50.18±13.5	Sex: Male/female 718/355 18/2	A total of 1077 adult patients who underwent CPB were included in this study. GIB occurred in 1.83% (20/1077).	Smoking Diabetes mellitus Hypertension Chronic obstructive pulmonary Renal insufficiency Cerebro-vascular disease Peripheral vascular disease History of peptic ulcer disease and/or gastritis CCS angine Class III-IV Pulmonary arterial hypertension Prior cardiac surgery Atrial fibrillation
Fabiano F. Viana,2013	Australia	doi: 10.1111/ans.12134	We performed a retrospective review of a prospectively collected database	We analysed a prospectively collected database containing all adult cardiac surge _		Two groups	5382 patients	Age Control group: 68	ObSex (male): Control group: 46	The incidence of GI complications was 1.1% (61 out of 5382 patients) with an overall 30-day mortality of 33% (versus 3% in the non-GI complication group). The most common complications were GI bleeding, gastroenteritis and bowel ischaemia. Patients who had GI complications were significantly older.In the patients with GI bleeding (n = 21), 13 had upper GI bleeding, five lower GI bleeding and three combined upper and lower GI bleeding.	Smoking history Diabetes mellitus Hypercholesterolemia Hypertension Stroke Peripheral vascular diseases Obese Chronic lung disease Infective endocarditis Immunosuppression Myocardial infarction Heart failure Shock Arrhythmia Inotrope use Anticoagulation Steroid
Mina Farag 2019	Germany	DOI: 10.1002/ehf2.12447	retrospectively	Only patients with the need for CPB installation,who were at least 18 years of age at the time of the proce dure, were included. Operations were performed with the use of crystalloid or blood, antegrade cardioplegia, and on pump beating heart procedures.	_	one group	1272	Age (years) 65.36 ± 12.8	Female 355 (27.9)	355 (27.9%) of patients developing post-operative hyperbilirubinaemia were female.	Pulmonary hypertension Diabetes mellitus History of smoking Arterial hypertension Atrial fibrillation PAD COPD Previous MI Previous PCI Unstable angina Renal impairment History of hepatic disease Preoperative dialysis Obesity Emergency procedure Previous cardiac surgery Acute CHF Preoperative intubation
Rabail Chaudhry 2017	USA	DOI: http://dx.doi.org/10.1053/j.jvca.2017.0-Population based study		Patient age, gender, race, admission type (elective versus emergent) were examined. Other accompanying diagnoses were assessed for using ICD-9 diagnosis codes for diabetes (250), hypertension (401), hypercholesterolemia (272), peripheral vascular disease (443.9), obesity (278), chronic lung disease (490-2, 494, 496, 770.7), infective endocarditis (421.0-1), myocardial infarction (410), heart failure (428.22), arrhythmia (427), anticoagulation (V58.61), current smoker (V15.82), current steroid use (V58.65), and chronic kidney failure (585.9). These comorbidities were observed in previous studies to be the most common conditions associated	_	Two groups	182,688 adult patients (>17 years of	Age: 18-49 group: 485 (6.41) 50-64 group: 16292 (9.3) 1947 (25.75) >=65 59995 (34.3) 5130 (67.84) 98822	GIT Complications Non GIT Complications <0.001 <0.001 <0.001	Male GIT complications group: 5575 (73.72) Non GIT complications:1189706(67.9) <0.001 Female 1987 (26.28) 56144 (32.1) <0.001	The most common GI complication in the entire cardiac and vascular population was post operative ileus (POI) (2.71%) followed by GI hemorrhage (0.52%) as shown in Table 1. The other GI complications that patients had in descending order of incidence were Pancreatitis (0.48%), Mesenteric Ischemia (0.31%), Bowel Obstruction (0.25%), Acute Cholecystitis (0.21%) and Intestinal Perforation (0.07%).	Diabetes Hypertension Hypercholesterolemia Peripheral vascular disease Obesity Chronic lung disease Chronic Renal failure Infective endocarditis Myocardial Infarction Heart failure Arrhythmia Anticoagulation Current smoker Steroid Use PROCEDURE TYPE CABG (off pump) CABG (on pump) Valve Repair Abdominal Aortic Repair
Nicholas R. 2020	USA	DOI: 10.1111/jocs.15321	retrospective study	This was a retrospective single institutional analysis that included adults (18 years or older) that underwent Society of Thoracic Surgeons (STS)-indexed cardiac operations at a multihospital health system between January 2010 and February 2018. Patients were stratified based on whether or not they experienced a GI compli cation in the initial 30-day postoperative period. GI complications included cholecystitis requiring operative cholecystectomy or per cutaneous drainage, GI bleeding requiring transfusion, mesenteric ischemia requiring operative exploration, hepatic failure, prolonged ileus, pancreatitis, and/or Clostridium difficile infection.	_	Two groups	A total of 10,285 patients were includ	Age, mean (SD), years	GIT complications gFemale: GIT complications group: 30	10,039 (97.6%) patients did not experience a postoperative GIcomplication, whereas 246 (2.4%) of patients did. In comparison to those without GI complications. GI bleeding requiring transfusion 49 (19.5%) Mortality rate 33 (28.0%) Pancreatitis 1 (0.4%) Mortality rate 1 (4.0%) Cholecystitis requiring cholecystectomy or drainage 8 (3.3%) Mortality rate 3 (2.5%) Mesenteric ischemia requiring exploration 30 (12.2%) Mortality rate 19 (16.1%) Hepatic failure 54 (21.9%) Mortality rate 32 (27.1%) Prolonged ileus 34 (13.8%) Mortality rate 8 (6.8%) Clostridium difficile 69 (28.0%) Mortality rate 23 (19.5%).	patients with these complications were older and had a higher incidence of preoperative comorbidities such as atrial fibrillation, congestive heart failure, chronic obstructive pulmon ary disease, prior myocardial infarction, history of immunosuppression, liver disease, peripheral vascular disease, and/or cerebrovascular dis ease