IV Antibiotics Before or Shortly After Colon Surgery Linked to Decreased Surgical Site Infections

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Last updated 06 June 2024 • Check for updates at EpicResearch.org

Key Findings:

- Patients who receive intravenous (IV) antibiotics with colon surgery have a 12% reduced likelihood of being diagnosed with a surgical site infection (SSI) following the surgery compared to those who did not receive IV antibiotics for their surgery. However, no significant difference was observed in the rate of SSI following rectal surgery.
- IV antibiotic use did not significantly reduce the likelihood of Methicillin-Resistant *Staphylococcus aureus* (MRSA) infection following colon or rectal surgery.
- For both colon and rectal surgery patients, regardless of IV antibiotic use, those whose surgery followed a trauma were more than twice as likely to experience an SSI or MRSA infection following their surgery compared to those whose surgery did not follow a trauma.

Colorectal surgery is often complicated by surgical site infections (SSIs), leading to poorer patient outcomes and increased healthcare costs.[1,2,3] We aimed to understand whether IV antibiotics given between seven days before through the day after a colon or rectal surgery are associated with a change in the likelihood of a patient being diagnosed with an SSI or Methicillin-Resistant *Staphylococcus aureus* (MRSA) infection, an antibiotic-resistant strain of bacteria.

We studied 359,987 colon surgeries and 81,605 rectal surgeries performed between January 1, 2017, and March 14, 2024. We adjusted for patient factors such as age, sex, BMI classification, smoking history, history of diabetes, social vulnerability quartile, whether the surgery was preceded by an emergency department or urgent care visit, and whether the surgery was scheduled or traumatic.

We found that patients who received IV antibiotics had a 12% reduced likelihood of SSI after colon surgery compared to those who did not receive IV antibiotics. The use of IV antibiotics did not significantly affect the rate of postoperative MRSA infections for colon surgeries. The use of IV antibiotics also did not significantly affect the rate of postoperative SSIs or MRSA infections for patients who underwent rectal surgery.

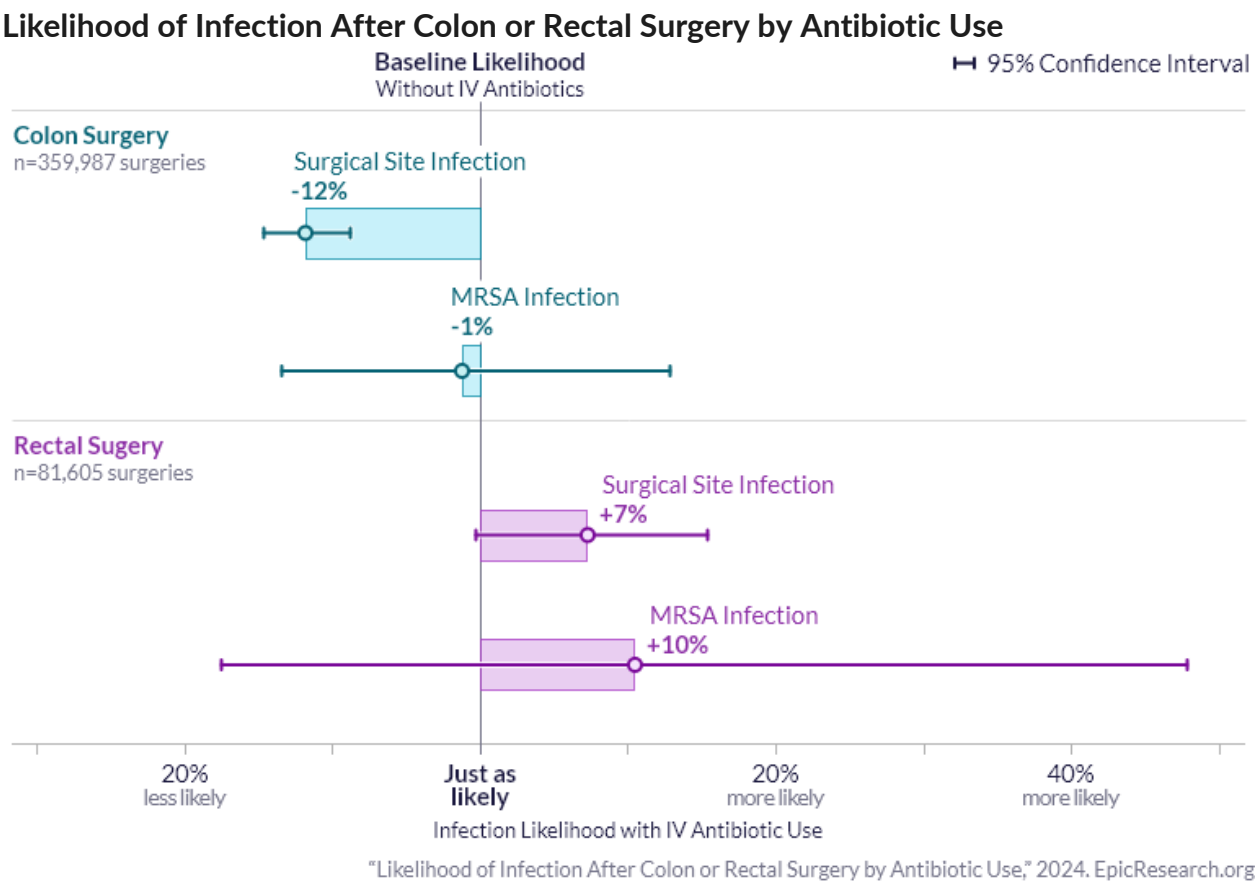

Figure 1. The likelihood of a patient having a surgical site infection or MRSA infection following colon or rectal surgery by antibiotic use.

Next, we studied the relationship between SSIs or MRSA infections and whether the surgery followed a trauma. We adjusted for the same factors as the above analysis. SSI after colon surgery was twice as likely for patients who had trauma-related surgery compared to those who did not have trauma-related surgery, as seen in Figure 2. The likelihood of MRSA infection was more than tripled for this population. Similarly, among patients who underwent rectal surgery, the likelihood of an SSI or MRSA infection was more than doubled among those who had trauma-related surgery.

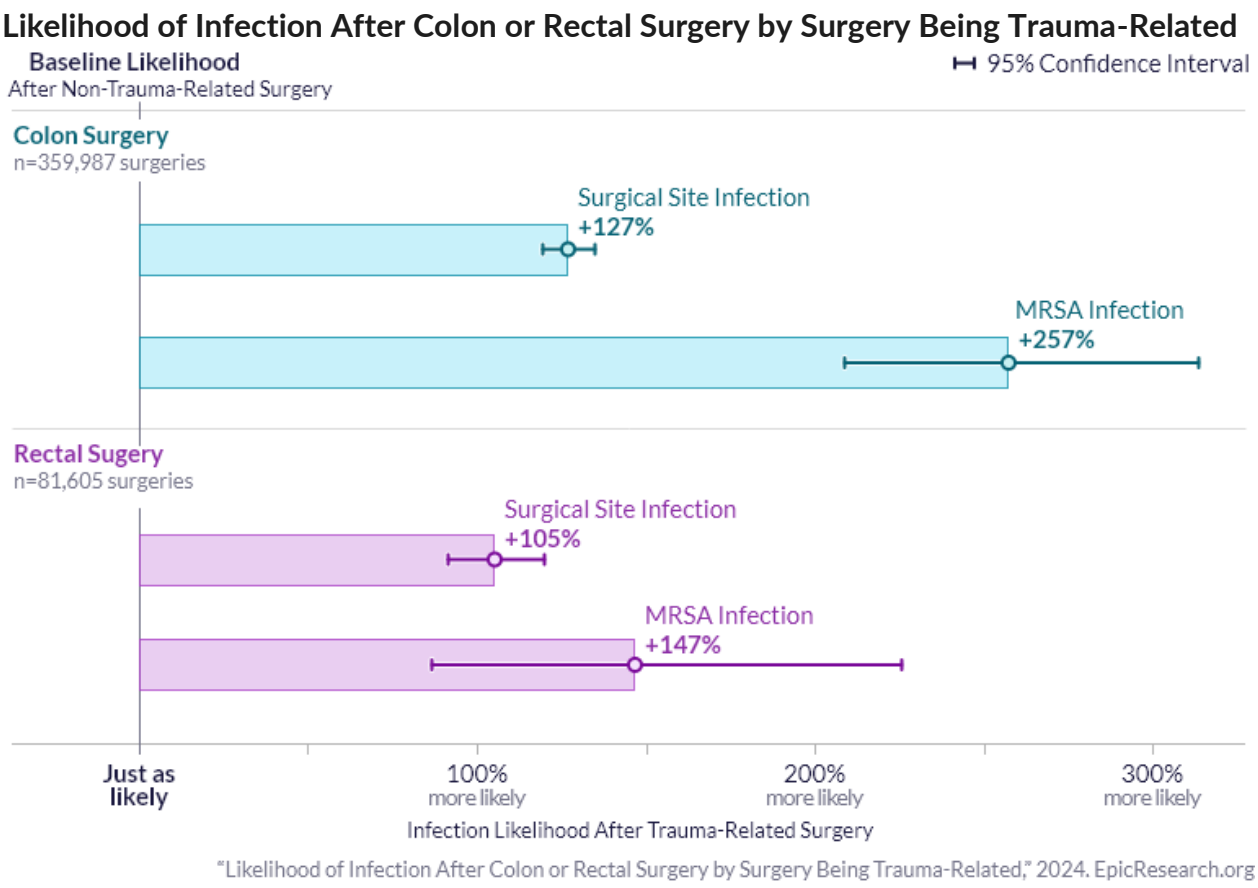

Figure 2. The likelihood of a patient having a surgical site infection or MRSA infection following colon or rectal surgery by the surgery being trauma-related or not.

These data come from Cosmos, a dataset created in collaboration with a community of Epic health systems representing more than 249 million patient records from 1,400 hospitals and more than 32,900 clinics from all 50 states and Lebanon. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Graphics by Brian Olson.

References

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Data Definitions

Term	Definition
Study period	1/1/2017 – 3/14/2024
Study population	Patients at least 18 years or older who underwent **colon** or **rectal surgery** following an outpatient face–to-face encounter or an encounter with ICD-10-CM code Z48* within 30 days prior. Surgeries where the patient had a prior surgery on the same body region in the prior year were excluded. Surgeries where the patients had a **sepsis** diagnosis in the year preceding the surgery were excluded.
Colon surgery	A procedure with CPT code 44025, 44110, 44111, 44137, 44140, 44141, 44143, 44144, 44145, 44146, 44147, 44150, 44151, 44155, 44156, 44157, 44158, 44160, 44188, 44204, 44205, 44206, 44207, 44208, 44210, 44211, 44212, 44213, 44227, 44320, 44322, 44340, 44345, 44346, 44604, 44605, 44620, 44625, or 44626,
Rectal surgery	A procedure with CPT code 45110, 45111, 45112, 45113, 45114, 45116, 45119, 45120, 45121, 45126, 45395, 45397, 45540, 45541, 45550, 45562, 45563, or 57307.
Antibiotic regimens	An antibiotic order that started up to seven days before through one day after the surgery with RxNorm code 733, 2180, 82122, 139462, 74169, 10627, 11124, 6922, 2582, 1272, 20481, 2187, 2189, 2193, 2194, 2551, 325642, or 1596450 and a route of "intravenous," "intramuscular," "intravenous bolus," "injection," or "intravenous drip."
Surgical infections	A diagnosis from the day following surgery through the following 30 days: • Surgical site infections – A diagnosis with ICD-10-CM code T81.41*-T81.43*. • MRSA infection – A diagnosis with ICD-10-CM code A49.02 or B95.62 or SNOMED code 115329001 or a lab with LOINC code 76081-9, 95412-1, 53572-4, 52969-3, 13317-3, or 90001-9 where the result was flagged as "Abnormal," "High," or "Panic."
Sepsis	A diagnosis with ICD-10-CM code A32.7, I76, O85, O86.04, A40*, A41*, R65.2*, T81.12*, or T81.44*.
Confounders	Age at time of surgery: 18-40, 41-59, 60-74, and 75+ Legal sex **Smoker / former smoker**: (Y/N) Socioeconomic Social Vulnerability Index quartile **Diabetes**: (Y/N) **Traumatic surgery**: (Y/N) **Elective surgery**: (Y/N) **Emergency room or urgent care start**: (Y/N)
Smoker / former smoker	Tobacco use status of one of the following: ○ Current ○ Current every day smoker ○ Current some day smoker ○ Every day ○ Former ○ Former smoker

	○ Heavy smoker ○ Heavy tobacco smoker ○ Light smoker ○ Light tobacco smoker ○ Some days Or a tobacco pack year or packs per day greater than zero.
Diabetes	A diagnosis with ICD-10-CM code E10* or E11*.
Traumatic surgery	An encounter with DRG code 183, 184, 185, 604, 605, 913, 914, 963, 964, or 965, or SNOMED 417746004 within seven days before the surgery through the day of surgery.
Scheduled surgery	Surgery not classified as a traumatic surgery and includes one of the following: • The primary diagnosis of the surgical encounter matches a diagnosis on an encounter preceding the surgery encounter between two days through one year prior to the surgery. • Diagnosis with ICD-10-CM code Z01.81 is on an encounter during the 30 days preceding the surgery encounter.
Emergency room/urgent care start	An emergency room or urgent care visit within seven days before the surgery.

Table 1. Likelihood of Infection After Colon or Rectal Surgery by Antibiotic Use

	Odds Ratio	Low CI	High CI
Rectal MRSA	1.10	0.82	1.48
Rectal SSI	1.07	1.00	1.15
Colon MRSA	0.99	0.87	1.13
Colon SSI	0.88	0.85	0.91

Table 2. Likelihood of Infection After Colon or Rectal Surgery by Surgery Being Trauma-Related

	Odds Ratio	Low CI	High CI
Colon SSI	2.27	2.19	2.35
Colon MRSA	3.57	3.09	4.13
Rectal SSI	2.05	1.91	2.20
Rectal MRSA	2.47	1.87	3.26