Supplementary Online Content

Scott FI, Vajravelu RK, Mamtani R, et al. Association between statin use at the time of intra-abdominal surgery and postoperative adhesion-related complications and small-bowel obstruction. *JAMA Netw Open*. 2021;4(2):e2036315. doi:10.1001/jamanetworkopen.2020.36315

eMethods and eResults. Supplemental Methods and Results

eTable 1. Diagnostic Codes Used to Identify Surgical Events Within the Abdomen in The Health Improvement Network

eTable 2. Diagnostic Codes Used to Identify Surgical Events in Optum Clinformatics

eTable 3. Baseline Characteristics of the Study Cohort Within THIN Stratified by the Presence of Adhesion-Related Complications

eTable 4. Association Between Statin Use and Covariates With Small Bowel Obstruction in THIN

eTable 5. Baseline Characteristics of Surgical Cohort Within Optum, Stratified by the Presence of Adhesion-Related Complications

eTable 6. Association Between Statin Use and Covariates With Small Bowel Obstruction in Optum

eTable 7. Multivariable Model Assessing the Association Between Former Statin Use, Fibrate Use, and Adhesion-Related Complications (ARCs) and Small Bowel Obstruction (SBO) After Surgery in Optum's Clinformatics® Data Mart

eTable 8. Multivariable Model Assessing the Association Between Statin Dose Intensity and Adhesion-Related Complications (ARCs) and Small Bowel Obstruction (SBO) After Surgery in The Health Improvement Network

eTable 9. Multivariable Model Assessing the Association Between Statin Use at the Time of Surgery and Adhesion-Related Complications (ARCs) and Small Bowel Obstruction (SBO) After Surgery in The Health Improvement Network, Adjusting for Year of Initial Surgery and Country of Origin

eTable 10. Association Between Statin Use at the Time of Surgery and ARCs and SBOs Occurring Within 5, 4, 3, 2, and 1 Years of the Incident Surgical Event

eFigure. Covariate Balance With 1:1 Matching in Propensity Score Analyses

eReferences

This supplementary material has been provided by the authors to give readers additional information about their work.
eMethods and eResults. Supplemental Methods and Results

Small Bowel Obstruction analyses

A major clinical sequela of adhesive-related complications is small bowel obstruction (SBO). Further, approximately 70% of SBO admissions are thought to be secondary to adhesion formation. While SBOs were included in the overall adhesion-related complication used in the primary analyses, a secondary analysis was performed examining this specific outcome alone. All other components of these analyses were identical to those described for the primary analysis. These analyses were first conducted in The Health Improvement Network (THIN), and then repeated in Optum’s Clinformatics® Data Mart (Optum).

Propensity score analyses

In order to ensure we were comparing individuals of similar baseline characteristics at the time of surgery, we performed a propensity score analysis using the pscore and psmatch2 routines in Stata within the THIN cohort\textsuperscript{1,2}, as per our previously described methods\textsuperscript{3}. Variables included in propensity score specification included sex, age at the time of surgery, previously recorded comorbidities associated with statin use (obesity, diabetes, hyperlipidemia, and hypertension), smoking, surgical location, and history of malignancy. Multiple methods of matching were ascertained to assess which specification resulted in greatest balance of these factors, including 1:1 and 1:5 caliper matching and kernel weighting. Balance was assessed graphically and statistically using pstest.

After exploring these three different matching/weight methods, 1:1 matching was employed given its degree of balance (see Supplemental Figure 1). Within the matched cohort, there were 17,997 individuals. Adjusting for the propensity score in this cohort, statin use at the time of surgery was more strongly associated with a reduction in adhesion-related complications than in our base analyses (adjusted Hazard Ratio 0.41, 95% CI 0.23, 0.74). To ensure this effect estimate was not an artifact induced through matching, we performed 100 iterations of matching, re-sorting the patient population using a randomly generated new patient identifier with each iteration. The average of these 100 hazard ratios was 0.42, the 2.5th percentile 0.24, and the 97.5th percentile 0.62. Only two of 100 iterations were non-significant based on 95% confidence intervals.

Assessing outcomes within specific time windows after the incident surgery

In order to assess if the association between statin use at the time of intra-abdominal surgery and ARCs or SBOs varied depending on the time interval between the surgery of interest and outcomes, we repeated our analyses using our parsimonious model within THIN and only considering outcomes that occurred within specific time-from-surgery intervals as valid. We assessed outcomes occurring within 5, 4, 3, 2, or 1 year of the index surgical event for each of these analyses. The association between statins and ARCs or SBOs remained similar when only considering outcomes within each of these time windows as true outcomes (See Supplemental Table 10).

E-value estimation for the hazard ratio of ARCs with statin use.

E-values have been a suggested means for estimating the potential effect estimate an unmeasured confounder would need to have with both the exposure of interest (statins) and outcome (ARCs) to bias the measured effect estimate to 1.0\textsuperscript{4}. These were calculated using Stata’s evalue package, using the methods described by VanderWeele and Ding. In THIN, the e-value was 1.77, and in Optum it was 1.40

© 2021 Scott FI et al. JAMA Network Open.
## eTable 1. Diagnostic codes used to identify surgical events within the abdomen in The Health Improvement Network

| READ code | Description of code |
|-----------|----------------------|
| 76z..00   | Upper digestive tract operations NOS |
| 76y..00   | Other specified operations on upper digestive tract |
| 7710.11   | Panproctocolectomy |
| 7714300   | Transverse colectomy and ileostomy HFQ |
| 771E000   | Open colonoscopy |
| 7717411   | Mikulicz colectomy and colostomy |
| 7715y00   | Other specified excision of left hemicolon |
| 771F411   | Moschowitz sigmoidopexy |
| 7710100   | Panproctocolectomy anast ileum to anus & pouch creation HFQ |
| 7710300   | Proctocolectomy NEC |
| 771D200   | Open reduction of volvulus of sigmoid colon |
| 771Bz11   | Colostomy NEC |
| 7716100   | Sigmoid colectomy and anastomosis of colon to rectum |
| 771Ay11   | Weir appendicostomy |
| 771A000   | Tube caecostomy |
| 7715100   | Left hemicolecetomy+end to end anastomosis of colon to colon |
| 771T000   | Sub ex colon rectum creation colon pouch anast om colon anus |
| 7710y00   | Other specified total excision of colon and rectum |
| 7719300   | Bypass of colon by anastomosis of transverse colon to rectum |
| 771E.00   | Open endoscopic operations on colon |
| 7712.11   | Extended right hemicolectomy |
| 7716.11   | Sigmoid colectomy |
| 7714.00   | Excision of transverse colon |
| 771C.00   | Incision of colon |
| 771F000   | Open biopsy of lesion of colon |
| 771B.00   | Other exteriorisation of colon |
| 7713.00   | Other excision of right hemicolon NOS |
| 771z.00   | Colon operations or rectal sigmoidoscopy NOS |
| 7711100   | Total colectomy, ileostomy & creation of rectal fistula HFQ |
| 7716z00   | Excision of sigmoid colon NOS |
| 7714100   | Transverse colectomy and anastomosis of ileum to colon |
| 7719000   | Bypass of colon by anastomosis of ileum to colon |
| 7717200   | Colectomy and anastomosis NEC |
| 7716200   | Sigmoid colectomy and anastomosis NEC |
| 7714.11   | Transverse colectomy |
| 7719z00   | Bypass of colon NOS |
| 7719.00   | Bypass of colon |
| 7716400   | Sigmoid colectomy and exteriorisation of bowel NEC |
| 7713.00   | Other excision of right hemicolon |
| 7714z00   | Excision of transverse colon NOS |
| 7718100   | Excision of lesion of colon NEC |
| 7717y00   | Other specified other excision of colon |
| 7715.11   | Left hemicolecetomy |
| 771B200   | Refashioning of colostomy |
| Code   | Description                                                                 |
|--------|-----------------------------------------------------------------------------|
| 771600 | Sigmoid colectomy+end to end anastomosis of ileum to rectum                 |
| 771D.00| Intraabdominal manipulation of colon                                        |
| 7719400| Bypass of colon by anastomosis of colon to rectum NEC                        |
| 7712y00| Other specified extended excision of right hemicolon                         |
| 7710z00| Total excision of colon and rectum NOS                                       |
| 7711.11| Total colectomy                                                              |
| 771Tz00| Subtotal excision of colon NOS                                               |
| 7712.00| Extended excision of right hemicolon                                         |
| 7713200| Right hemicolecotomy and anastomosis NEC                                     |
| 7718.00| Exirpation of lesion of colon                                               |
| 771Ay00| Other specified exteriorisation of caecum                                    |
| 7713000| Right hemicolecotomy+end to end anastomosis of ileum to colon               |
| 7710.12| Total proctocolectomy                                                       |
| 7711011| Hampton ileo-rectal anastomosis                                              |
| 771A500| Appendicocaececostomy                                                       |
| 771B100| End colostomy                                                               |
| 7717300| Colectomy and ileostomy NEC                                                 |
| 7715200| Left hemicolecotomy and anastomosis NEC                                      |
| 7717z11| Colectomy NEC                                                               |
| 7716y00| Other specified bypass of colon                                              |
| 7713.11| Other right hemicolecotomy                                                   |
| 7717z12| Hemicolecotomy NEC                                                          |
| 771A011| Allen-Welch caecostomy                                                       |
| 771A100| Refashioning of caecostomy                                                   |
| 771B.11| Colostomy                                                                   |
| 7711000| Total colectomy and anastomosis of ileum to rectum                          |
| 771C011| Drainage of pericolonic tissue                                               |
| 7712000| Extended right hemicolecotomy and end to end anastomosis                    |
| 771D000| Open reduction of intussusception of colon                                  |
| 771D300| Open reduction of volvulus of colon NEC                                      |
| 771B600| Percutaneous endoscopic sigmoid colostomy                                   |
| 771Ey00| Other specified open endoscopic operation on colon                           |
| 7711211| Extended right hemicolecotomy and anastomosis ileum to colon                |
| 771D400| Open relief of strangulation of colon                                        |
| 7713300| Right hemicolecotomy and ileostomy however further qualified                |
| 771B300| Closure of colostomy                                                         |
| 771Fz00| Other open operation on colon NOS                                            |
| 771F300| Open removal of foreign body from colon                                     |
| 7713011| Ileocaecal resection                                                        |
| 7710200| Panproctocolectomy and anastomosis of ileum to anus NEC                     |
| 7717000| Colectomy and end to end anastomosis of colon to colon NEC                  |
| 771B500| Reduction of prolapse of colostomy                                          |
| 7715.00| Excision of left hemicolon                                                   |
| 771..00| Colon operations and sigmoidoscopy of rectum                                |
| 7711.00| Total excision of colon                                                     |
| 7712200| Extended right hemicolecotomy and anastomosis NEC                           |
| Code   | Description                                                      |
|--------|-----------------------------------------------------------------|
| 771A400 | Creation of antegrade continence enema stoma                    |
| 771Ty00 | Other specified subtotal excision of colon                      |
| 771200  | Extended excision of right hemicolon NOS                        |
| 771Dy00 | Other specified intraabdominal manipulation of colon             |
| 7713100 | Right hemicolecotomy+side to side anast ileum to transv colon   |
| 7714000 | Transverse colectomy and exteriorisation of bowel NEC           |
| 7713y00 | Other specified other excision of right hemicolon               |
| 771By00 | Other specified other exteriorisation of colon                   |
| 7717412 | Paul colectomy and colostomy                                    |
| 771T300 | Subtotal excision of colon and creation of colonic pouch NEC    |
| 771A311 | Closure of caecostomy                                           |
| 771C200 | Colotomy                                                        |
| 771A.00 | Exteriorisation of caecum                                       |
| 7715z00 | Excision of left hemicolon NOS                                  |
| 7710111 | Parks panproctocolectomy, ileoanal anastom & creation pouch     |
| 7719100 | Bypass of colon by anastomosis of caecum to sigmoid colon        |
| 7715400 | Left hemicolecotomy and exteriorisation of bowel NEC            |
| 771F400 | Sigmoidopexy                                                    |
| 771D100 | Open reduction of volvulus of caecum                            |
| 7717400 | Colectomy and exteriorisation of bowel NEC                      |
| 771Fy00 | Other specified other open operation on colon                    |
| 7714000 | Transverse colectomy and end to end anastomosis                 |
| 771.00  | Total excision of colon and rectum                              |
| 771..11 | Colon and caecum operations                                     |
| 771ly00 | Other specified total excision of colon                         |
| 771F.00 | Other open operations on colon                                  |
| 771T.00 | Subtotal excision of colon                                      |
| 7710000 | Panproctocolectomy and ileostomy                                |
| 771B400 | Dilation of colostomy                                           |
| 7715300 | Left hemicolecotomy and ileostomy however further qualified     |
| 7717.11 | Other colectomy                                                 |
| 771Bz00 | Other exteriorisation of colon NOS                              |
| 771B000 | Loop colostomy                                                  |
| 771A200 | Closure of caecostomy                                           |
| 7719200 | Bypass colon by anastomosis of transverse to sigmoid colon       |
| 771Cy00 | Other specified incision of colon                               |
| 771F200 | Enterorrhaphy of colon                                          |
| 7716y00 | Other specified excision of sigmoid colon                       |
| 7716.00 | Excision of sigmoid colon                                       |
| 7717100 | Colectomy and side to side anastomosis of ileum to colon NEC    |
| 7718200 | Extirpation of lesion of colon NOS                              |
| 7717500 | Partial colectomy NEC                                           |
| 7715000 | Left hemicolecotomy+end to end anastomosis of colon to rectum   |
| 7717200 | Other excision of colon NOS                                     |
| 771C100 | Caecotomy                                                       |
| 7714y00 | Other specified excision of transverse colon                     |
| 771C000 | Drainage of colon                                               |
| 7712300 | Extended right hemicolecotomy and ileostomy HFQ                 |

© 2021 Scott Fl et al. JAMA Network Open.
| Code          | Description                                      |
|--------------|--------------------------------------------------|
| 7718000      | Excision of diverticulum of colon                |
| 7714200      | Transverse colectomy and anastomosis NEC         |
| 771D200      | Intraabdominal manipulation of colon NOS         |
| 771B311      | Mikulicz closure of colostomy                    |
| 7717.00      | Other excision of colon                          |
| 7718200      | Destruction of lesion of colon NEC               |
| 771A1.11     | Caecostomy                                       |
| 771y.00      | Other specified operations on colon or rect sigmoidoscopy |
| 771E.11      | Open colonoscopy                                |
| 771A300      | Caecostomy NEC                                  |
| 7701200      | Incidental appendicectomy                        |
| 7702y00      | Other operation on appendix NOS                  |
| 7702y00      | Other specified other operation on appendix      |
| 7700400      | Endoscopic emergency appendicectomy             |
| 7701.11      | Non emergency appendicectomy                    |
| 7701000      | Interval appendicectomy                          |
| 7702000      | Drainage of abscess of appendix                  |
| 7702.00      | Other operations on appendix                     |
| 7700300      | Emergency appendicectomy NEC                     |
| 7700.11      | Emergency appendicectomy                         |
| 7700000      | Emergency excision of abnormal appendix and drainage HFO |
| 770y.00      | Other specified operations on appendix           |
| 7702100      | Drainage of appendix NEC                         |
| 7700200      | Emergency excision of appendix NOS               |
| 7701z20      | Other excision of appendix NOS                   |
| 7701.00      | Other excision of appendix                       |
| 7701400      | Endoscopic appendicectomy NEC                    |
| 7702200      | Appendicostomy                                   |
| 7701100      | Prophylactic appendicectomy NEC                  |
| 770..00      | Appendix operations                              |
| 770z.00      | Appendix operations NOS                          |
| 7700200      | Emergency excision of normal appendix            |
| 770y000      | Other specified other excision of appendix       |
| 7700100      | Emergency excision of abnormal appendix NEC      |
| 770y000      | Other specified emergency excision of appendix   |
| 7701300      | Planned delayed appendicectomy NEC               |
| 7700.00      | Emergency excision of appendix                   |
| 7701211      | Appendicectomy NEC                               |
| 7722100      | Open cauterisation of lesion of rectum           |
| 7723.13      | Rectopexy                                        |
| 773C500      | Closure of bowel fistula                         |
| 7721015      | Abdominoperineal resection of rectum and end colostomy |
| 7720200      | Partial excision of rectum & sigmoid colon for prolapse NOS |
| 7721y00      | Other specified excision of rectum               |
| 7721500      | Ant resect rectum stapled anast sigmoid to anus with J pouch |
| 7721100      | Proctectomy and anastomosis of colon to anus     |
| 7721.00      | Excision of rectum NEC                           |
| 772..00      | Rectum operations                                |
| Code   | Description                                                                 |
|--------|-----------------------------------------------------------------------------|
| 7720.11| Rectosigmoidectomy                                                          |
| 773E00 | Other specified therapeutic operations on ileoanal pouch                    |
| 772100 | Excision of rectum NOS                                                      |
| 773C00 | Closure of perforated bowel ulcer NEC                                       |
| 772000 | Other operations on bowel                                                   |
| 772010 | Rectosigmoidectomy, closure rectal stump & exteriorise bowel                |
| 772020 | Therapeutic operations on ileoanal pouch                                    |
| 772101 | Other operation on bowel NOS                                                |
| 772102 | Miles abdominoperineal excision of rectum and end colostomy                |
| 772002 | Open excision of lesion of rectum                                           |
| 772102 | Gabriel abdominoperineal excision of rectum & end colostomy                |
| 7723.11| Proctoectomy                                                                |
| 772003 | Open destruction of lesion of rectum NEC                                    |
| 772104 | Lloyd-Davies abdominoperineal excision rectum+end colostomy                |
| 772101 | Abdominoperineal excision of rectum and end colostomy                      |
| 7721.11| Proctectomy                                                                 |
| 773E100| Revision of ileoanal pouch                                                  |
| 773E200| Therapeutic operations on ileoanal pouch NOS                                |
| 772004 | Rectosigmoidectomy and rectopecty                                           |
| 772105 | Anterior resection of rectum and anastomosis NEC                            |
| 772011 | Hartmann rectosigmoidectomy and colostomy                                    |
| 7722.00| Open extirpation of lesion of rectum                                        |
| 772220 | Open extirpation of lesion of rectum NOS                                    |
| 773C00 | Other specified other operation on bowel                                     |
| 772120 | Anterior resection rectum + staple anastomosis colon-rectum                 |
| 773E00 | Excision of ileoanal pouch                                                  |
| 7723.12| Rectopecty for prolapse                                                     |
| 772001 | Rectopecty                                                                  |
| 772230 | Open laser destruction of lesion of rectum                                  |
| 7720y0 | Partial excision of rectum and sigmoid colon for prolapse OS               |
| 772140 | Anterior resection of rectum and exteriorisation of bowel                   |
| 7722.11| Open operation on rectal polyp                                               |
| 7723.00| Fixation of rectum for prolapse                                             |
| 7722.12| Open polypectomy of rectum                                                  |
| 772101 | Rankin abdominoperineal excision of rectum and end colostomy               |
| 7720.00| Partial excision of rectum and sigmoid colon for prolapse                   |
| 772160 | Perineal resection of rectum HFQ                                            |
| 760L011| Belsey fundoplication using thoracic approach                               |
| 760011 | Roux-en-y oesophagogastrectomy                                              |
| 760L200| Antireflux fundoplication using abdominal approach                           |
| 760140 | Total oesophagectomy and interposition of colon NEC                         |
| 760030 | Extended total gastrectomy                                                  |
| 760A011| Insertion of Celestin tube into oesophagus via stomach                     |
| 760K.12| Repair of hiatus hernia                                                     |
| 760L00 | Other specified antireflux operation                                        |
| 760800 | Cardiomyotomy                                                              |
| 7600012| Ivor - Lewis oesophagogastrectomy                                           |
| 760020 | Excision of oesophagus and stomach NOS                                      |
| Code    | Description                                                                 |
|---------|-----------------------------------------------------------------------------|
| 760L100 | Antireflux operation using thoracic approach NEC                             |
| 7605200 | Removal of bypass of oesophagus                                             |
| 7606300 | Repair of rupture of oesophagus                                             |
| 760L111 | Antireflux procedure using thoracic approach NEC                             |
| 7605y00 | Other specified attention to connection of oesophagus                       |
| 760K000 | Repair of oesophageal hiatus using thoracic approach                        |
| 760K200 | Repair of oesophageal hiatus using abdominal approach                       |
| 760L012 | Nissen fundoplication using thoracic approach                               |
| 7609z00 | Open operation on oesophageal varices NOS                                   |
| 7606y00 | Other specified repair of oesophagus                                        |
| 7609y11 | Tanner devascularisation for bleeding varices                               |
| 7609100 | Transection of oesophagus using staple gun                                  |
| 760Ky00 | Other specified repair of diaphragmatic hernia                              |
| 7603311 | Dahhalm excision of diverticulum of oesophagus                              |
| 760L312 | Hill repair of hiatus hernia and gastropexy                                 |
| 760A.11 | Insertion of Atkinson tube in oesophagus                                    |
| 760L200 | Repair of oesophageal NOS                                                   |
| 7602.00 | Partial excision of oesophagus                                              |
| 7600013 | Oesophagogastrectomy                                                       |
| 7603300 | Excision of diverticulum of oesophagus                                      |
| 7600100 | Oesophagogastrect & anastom oesophagus to transposed jejunum                |
| 760L800 | Laparoscopic Nissen fundoplication using abdominal approach                 |
| 7601213 | Roux oesophagectomy and interposition of jejunal loop                       |
| 760L000 | Antireflux fundoplication using thoracic approach                           |
| 760L.11 | Oesophageal reflux operations                                               |
| 7600.11 | Oesophagogastrectomy                                                       |
| 760Kz00 | Repair of diaphragmatic hernia NOS                                          |
| 7604z00 | Repair of oesophagus by interposition of colon NEC                          |
| 7600400 | Revision of fundoplication of stomach                                       |
| 7603000 | Excision of lesion of oesophagus                                           |
| 7604500 | Bypass of oesophagus by interposition of colon NEC                          |
| 760K012 | Mason repair of oesophageal hiatus hernia                                  |
| 7604300 | Bypass of oesophagus by interposition of jejunum NEC                        |
| 760L311 | Antireflux gastroplasty                                                     |
| 760A000 | Insertion of tubal prosthesis into oesophagus via stomach                   |
| 7609400 | Open injection sclerotherapy to oesophageal varices                        |
| 760K100 | Repair of diaphragmatic hernia using thoracic approach NEC                  |
| 760B100 | Open removal of foreign body from oesophagus                               |
| 7601200 | Total excision of oesophagus NOS                                            |
| 760..00 | Oesophagus (including hiatus hernia) operations                             |
| 760.11  | Total oesophagectomy                                                       |
| 760K.00 | Repair of diaphragmatic hernia                                              |
| 7603100 | Open laser destruction of lesion of oesophagus                             |
| 7600011 | Bancroft partial gastrectomy and oesophagogastrectomy                      |
| 7608.00 | Incision of oesophagus                                                     |
| 7602200 | Partial excision of oesophagus NOS                                          |
| 760A300 | Open removal of tubal prosthesis from oesophagus                           |
| 7606.00 | Repair of oesophagus                                                       |
| Code   | Description                                                      |
|--------|------------------------------------------------------------------|
| 760y00 | Other specified excision of oesophagus and stomach               |
| 7601111| McKewown total oesophagectomy                                    |
| 760B00 | Open biopsy of lesion of oesophagus                              |
| 7601000| Total oesophagectomy and anastomosis of pharynx to stomach       |
| 760A.00| Open placement of prosthesis in oesophagus                       |
| 7605000| Revision of interposition anastomosis of oesophagus              |
| 760LS00| Insertion of Angelchick prosthesis                               |
| 760L.00| Antireflux operations                                            |
| 7604100| Bypass of oesophagus by anastomosis of oesophagus to stomach     |
| 7602.11| Partial oesophagectomy                                           |
| 7602.00| Oesophagus (including hiatus hernia) operations NOS              |
| 760.00 | Excision of oesophagus and stomach                               |
| 7602111| Oesophagectomy NEC                                              |
| 7608100| Oesophagomyotomy NEC                                             |
| 760L200| Antireflux operation NOS                                        |
| 760A100| Open insertion of tubal prosthesis into oesophagus NEC           |
| 7601y00| Other specified total excision of oesophagus                     |
| 7608011| Heller cardiomyotomy                                            |
| 760M200| Removal of Angelchick prosthesis                                 |
| 7601.00| Total excision of oesophagus                                     |
| 760K500| Laparoscopic repair of hiatus hernia                             |
| 7601200| Total oesophagectomy and interposition of jejunum NEC           |
| 760..11| Oesophagus operations                                           |
| 7602400| Partial oesophagectomy-interposition microvasc attach colon      |
| 760K.11| Repair of oesophageal hiatus hernia                              |
| 7600000| Oesophagogastrectomy & anastomosis of oesophagus to stomach     |
| 7605100| Revision of anastomosis of oesophagus NEC                        |
| 760L700| Endoscopic Nissen fundoplication using thoracic approach         |
| 760L300| Antireflux gastropexy                                           |
| 760by00| Other specified incision of oesophagus                           |
| 7602000| Partial oesophagectomy and end to end anastomosis of oesoph      |
| 7602y00| Other specified partial excision of oesophagus                   |
| 7602300| Partial oesophagectomy+anastomosis oesophagus to jejunum NEC    |
| 760L611| Thal - Nissen stricturoplasty                                   |
| 760B.00| Other open operations on oesophagus                              |
| 760y.00| Oesophagus (including hiatus hernia) operations OS               |
| 760A200| Open revision of tubal prosthesis in oesophagus                 |
| 7609000| Disconnection of azygous vein                                   |
| 760By00| Other specified other open operation on oesophagus              |
| 760M.00| Revision of antireflux operations                               |
| 76002200| Oesophagogastrect & anastomosis of oesophagus to jejunum NEC   |
| 760A200| Open placement of prosthesis in oesophagus NOS                   |
| 7604.00| Bypass of oesophagus                                            |
| 760K300| Repair of diaphragmatic hernia using abdominal approach NEC      |
| 760B200| Other open operation on oesophagus NOS                           |
| 7604000| Bypass of oesophagus by anastomosis of oesophag to oesophag     |
| 760L211| Nissen fundoplication using abdominal approach                   |
| 760L600| Oesophagogastric fundoplasting                                   |
| Code     | Description                                                      |
|----------|------------------------------------------------------------------|
| 7608z00  | Incision of oesophagus NOS                                       |
| 7609200  | Transection of oesophagus NEC                                    |
| 7609.00  | Open operations on oesophageal varices                           |
| 760Mz00  | Revision of antireflux operation NOS                             |
| 761B000  | Pyloromyotomy                                                    |
| 761Hz00  | Other operation on stomach NOS                                   |
| 7618000  | Gastropexy NEC                                                   |
| 761C100  | Repair of perforation of pylorus                                 |
| 7617z00  | Gastrostomy operation NOS                                        |
| 7611211  | Billroth II partial gastrectomy and gastroenterostomy           |
| 761J000  | Closure of perforated gastric ulcer                              |
| 7619z00  | Incision of stomach NOS                                          |
| 761Jy00  | Other specified operation on gastric ulcer                       |
| 7617y00  | Other specified gastrostomy operation                           |
| 7616014  | Mayo-Ward gastrojejunostomy                                      |
| 7611500  | Sleeve gastrectomy NEC                                           |
| 7614.00  | Connection of stomach to duodenum NEC                            |
| 7616600  | Laparoscopic gastric bypass                                      |
| 761J.00  | Operations on gastric ulcer                                      |
| 7614z00  | Connection of stomach to duodenum NOS                            |
| 7611700  | Wedge resection of stomach                                       |
| 7618.00  | Other repair of stomach                                          |
| 7611212  | Hofmeister valved gastrectomy                                     |
| 761Cz00  | Other operation on pylorus NOS                                   |
| 7613500  | Partitioning of stomach NEC                                      |
| 7610100  | Total gastrectomy and anastomosis of oesophagus to duodenum      |
| 761B300  | Revision of pyloroplasty                                          |
| 7616100  | Revision of anastomosis of stomach to jejunum NEC                |
| 7612.00  | Open extirpation of lesion of stomach                            |
| 761B.00  | Incision of pylorus                                              |
| 7610000  | Total gastrectomy and excision of surrounding tissue             |
| 7610.11  | Schlatter total gastrectomy                                      |
| 761J111  | Suture of ulcer of stomach NEC                                   |
| 7611000  | Partial gastrectomy and anastomosis of stomach to duodenum       |
| 761B.11  | Pyloromyotomy                                                    |
| 7615000  | Bypass stomach by anastomosis of stomach to transposed jejunum   |
| 7617200  | Reconstruction of gastrostomy                                    |
| 7611100  | Partial gastrectomy & anastomosis of stomach to transp jejunum   |
| 761A000  | Open biopsy of lesion of stomach                                 |
| 7616300  | Open reduction of intussusception of gastroenterostomy          |
| 7611012  | Billroth I partial gastrectomy & gastroduodenal anastomosis      |
| 761C.00  | Other operations on pylorus                                      |
| 7611.00  | Partial excision of stomach                                      |
| 7618y00  | Other specified other repair of stomach                          |
| 7615.11  | Gastrojejunostomy, transposed                                    |
| 7613.00  | Plastic operations on stomach                                    |
| 7614111  | Jaboulay gastroduodenostomy                                      |
| 761B600  | Open dilation of pylorus                                          |
| Code    | Description                                                                 |
|---------|-----------------------------------------------------------------------------|
| 7611215 | Polya partial gastrectomy and anastomosis stomach to jejunum                |
| 7617300 | Closure of gastrostomy                                                      |
| 761Az00 | Other open operation on stomach NOS                                         |
| 7611800 | Completion gastrectomy                                                      |
| 761A100 | Open insertion of prosthesis into stomach                                   |
| 7617.00 | Gastrostomy operations                                                      |
| 761A00  | Distal partial gastrectomy                                                  |
| 7613400 | Partitioning of stomach using staples                                       |
| 761A300 | Reduction of volvulus of stomach                                            |
| 7617.11 | Artificial opening to stomach                                               |
| 7610y00 | Other specified total excision of stomach                                   |
| 7618200 | Closure of abnormal opening of stomach NEC                                  |
| 7611300 | Partial gastrectomy preserving pylorus                                      |
| 761B211 | Finney pyloroplasty                                                         |
| 7612100 | Open excision of lesion of stomach NEC                                      |
| 7618200 | Other repair of stomach NOS                                                 |
| 761y.00 | Other specified operations on stomach or pylorus                            |
| 761J100 | Closure of gastric ulcer NEC                                                |
| 761By00 | Other specified incision of pylorus                                         |
| 7617000 | Creation of permanent gastrostomy                                           |
| 7612y00 | Other specified open extirpation of lesion of stomach                       |
| 7614000 | Bypass of stomach by anastomosis of oesophagus to duodenum                  |
| 761..11 | Gastric and pylorus operations                                              |
| 761B100 | Repair of congenital atresia of pylorus                                     |
| 7610400 | Total gastrectomy and anastomosis oesophagus to jejunum NEC                 |
| 7617112 | Creation of Witzel temporary gastrostomy                                    |
| 7611200 | Partial gastrectomy and anastomosis stomach to jejunum NEC                  |
| 7610.00 | Total excision of stomach                                                   |
| 7611900 | Proximal gastrectomy                                                        |
| 7616011 | Gastroenterostomy NEC                                                       |
| 761B200 | Pyloroplasty NEC                                                           |
| 7617.12 | Creation of gastrostomy                                                     |
| 7614200 | Revision of anastomosis of stomach to duodenum                             |
| 7610.12 | Total gastrectomy                                                           |
| 761B200 | Incision of pylorus NOS                                                     |
| 7614100 | Bypass of stomach by anastomosis of stomach to duodenum                    |
| 761..00 | Stomach and pylorus operations                                              |
| 7612500 | Resection of gastric ulcer by cautery                                       |
| 761A.00 | Other open operations on stomach                                            |
| 7612000 | Open excision of polyp of stomach                                          |
| 7616.00 | Other connection of stomach to jejunum                                      |
| 761z.00 | Stomach and pylorus operations NOS                                          |
| 7614y00 | Other specified connection of stomach to duodenum                           |
| 7613200 | Laparoscopic adjustable gastric banding                                     |
| 7613100 | Partitioning of stomach                                                    |
| 7616x00 | Conversion from previous anastomosis stomach to jejunum NEC                 |
| 7616013 | Mason high gastric bypass                                                   |
| 7613300 | Partitioning of stomach using band                                          |

© 2021 Scott Fl et al. *JAMA Network Open.*
| Code   | Procedure                                                                 |
|--------|---------------------------------------------------------------------------|
| 7615.00 | Connection of stomach to transposed jejunum                              |
| 761Hy00 | Other specified other operation on stomach                               |
| 7611214 | Moynihan partial gastrectomy & retrocolic gastroenterostomy              |
| 7615300 | Closure of connection of stomach to transposed jejunum                   |
| 7613111 | Mason vertical banded gastroplasty                                      |
| 7613000 | Gastroplasty NEC                                                         |
| 7617111 | Creation of gastrostomy NEC                                             |
| 761Ay00 | Other specified other open operation on stomach                          |
| 7616200 | Conversion to anastomosis of stomach to jejunum                          |
| 761A200 | Open insertion of feeding tube into stomach                              |
| 761C000 | Open biopsy of lesion of pylorus                                        |
| 7619.00 | Incision of stomach NEC                                                 |
| 7619000 | Open removal of foreign body from stomach                               |
| 7615200 | Conversion to anastomosis of stomach to transposed jejunum               |
| 7616000 | Bypass of stomach by anastomosis of stomach to jejunum NEC               |
| 7617100 | Creation of temporary gastrostomy                                        |
| 7616015 | Printer high gastric bypass                                              |
| 761J.11 | Stomach ulcer operations                                                |
| 7611200 | Partial excision of stomach NOS                                         |
| 7611y00 | Other specified partial excision of stomach                             |
| 7619100 | Gastrotomy and ligation of bleeding point of stomach                     |
| 7611213 | Mayo partial gastrectomy and retrocolic gastroenterostomy               |
| 761B500 | Pyloromyotomy and wedge resection                                       |
| 7610300 | Total gastrectomy & anastomosis oesophagus to transp jejunum            |
| 7611.11 | Partial gastrectomy                                                     |
| 761B011 | Ramstedt pyloromyotomy                                                  |
| 7611216 | Partial gastrectomy and gastrojejunostomy                                |
| 7616012 | Gastrojejunostomy NEC                                                   |
| 7611400 | Sleeve gastrectomy and duodenal switch                                  |
| 761A400 | Devascularisation of stomach                                            |
| 761Cy00 | Other specified other operation on pylorus                               |
| 761H.00 | Other operations on stomach                                             |
| 7612200 | Open laser destruction of lesion of stomach                             |
| 761B212 | Heinecke-Mikulicz pyloroplasty                                          |
| 7615z00 | Other connection of stomach to jejunum NOS                              |
| 7616000 | Laparoscopic sleeve gastrectomy                                         |
| 7610z00 | Total excision of stomach NOS                                           |
| 7619.11 | Gastrostomy NEC                                                         |
| 761B213 | Mikulicz-Heinecke pyloroplasty                                          |
| 7616z00 | Other connection of stomach to jejunum NOS                              |
| 7616000 | Total excision of stomach NOS                                           |
| 7611600 | Creation of duodenostomy                                                |
| 7618100 | Closure of perforation of stomach NEC                                   |
| 7632y00 | Other specified jejunostomy                                             |
| 7623500 | Creation of duodenostomy                                                |
| 7648000 | Open biopsy of lesion of ileum                                          |
| 7633y00 | Other specified bypass of jejunum                                       |
| 7623200 | Other open operation on duodenum NOS                                    |
| Code     | Description                                                          |
|----------|---------------------------------------------------------------------|
| 7626z00  | Other operation on duodenum NOS                                      |
| 7647100  | Open relief of strangulation of ileum                               |
| 7627.00  | Operations on duodenal ulcer                                        |
| 7638z00  | Other operation on jejunum NOS                                      |
| 7627000  | Closure of perforated duodenal ulcer                                |
| 7623.00  | Other open operations on duodenum                                    |
| 7648300  | Closure of perforation of ileum                                     |
| 7623411  | Duodenotomy NEC                                                     |
| 7621100  | Open destruction of lesion of duodenum                               |
| 7620.11  | Duodenectomy                                                        |
| 7627100  | Suture of duodenal ulcer not elsewhere classified                    |
| 7635.00  | Other open operations on jejunum                                    |
| 7642300  | Bypass of ileum by anastomosis of ileum to transverse colon         |
| 764z.00  | Ileum operations NOS                                                |
| 7627200  | Operation on duodenal ulcer NOS                                     |
| 763z.00  | Jejunum operations NOS                                              |
| 7623000  | Open biopsy of lesion of duodenum                                    |
| 7620y00  | Other specified excision of duodenum                                 |
| 7644100  | Closure of anastomosis of ileum                                     |
| 7645212  | Creation of split ileostomy                                          |
| 7642100  | Bypass of ileum by anastomosis of ileum to ileum                    |
| 762y.00  | Other specified operations on duodenum                               |
| 7622y00  | Other specified bypass of duodenum                                   |
| 7645y00  | Other specified creation of ileostomy                                |
| 7620x11  | Duodenectomy NEC                                                    |
| 7640300  | Ileectomy and anastomosis of ileum to colon                         |
| 7621z00  | Open extirpation of lesion of duodenum NOS                           |
| 7648z00  | Other specified other open operation on ileum                        |
| 7626y00  | Other specified other operation on duodenum                          |
| 7640x11  | Ileectomy NEC                                                        |
| 7632200  | Closure of jejunostomy                                               |
| 7642400  | Bypass of ileum by anastomosis of ileum to colon NEC                 |
| 7648y00  | Other specified other open operation on ileum                        |
| 7643.11  | Other anastomosis of ileum                                           |
| 7622200  | Bypass of duodenum NOS                                               |
| 762..00  | Duodenum operations                                                  |
| 7635100  | Incision of jejunum                                                  |
| 7635y00  | Other specified other open operation on jejunum                      |
| 7645z00  | Creation of ileostomy NOS                                            |
| 7640.11  | Ileectomy                                                            |
| 7644z00  | Attention to connection of ileum NOS                                 |
| 7621000  | Excision of lesion of duodenum                                       |
| 7643z00  | Other connection of ileum NOS                                        |
| 7644000  | Revision of anastomosis of ileum                                     |
| 7642y00  | Other specified bypass of ileum                                      |
| 7644y00  | Other specified attention to connection of ileum                     |
| 7633000  | Bypass of jejunum by anastomosis of jejunum to jejunum              |
| 7623300  | Open insertion of tubal prosthesis into duodenum                     |
| Code   | Description                                                                 |
|--------|-----------------------------------------------------------------------------|
| 7643000 | Anastomosis of ileum to caecum                                              |
| 7642z00 | Bypass of ileum NOS                                                         |
| 7644200 | Resection of ileostomy                                                      |
| 7645000 | Creation of continent ileostomy                                             |
| 7647311 | Noble plication of ileum                                                   |
| 7627200 | Oversew of blood vessel of duodenal ulcer                                  |
| 7632.11  | Artificial opening into jejunum                                             |
| 7630z00  | Excision of jejunum NOS                                                    |
| 7643400  | Anastomosis of ileum to anus and creation of pouch HFO                     |
| 7622000  | Bypass of duodenum by anastomosis of stomach to jejunum                    |
| 7638400  | Transposition of jejunum                                                   |
| 7633212  | Jejunocolostomy                                                             |
| 7622.00  | Bypass of duodenum                                                          |
| 7642000  | Bypass of ileum by anastomosis of jejunum to ileum                         |
| 7648700  | Enterotomy and removal of gallstone                                         |
| 7630y00  | Other specified excision of jejunum                                         |
| 7648400  | Exclusion of segment of ileum                                               |
| 764Bz00  | Other operation on ileum NOS                                                |
| 7632.00  | Jejunostomy                                                                 |
| 764y.00  | Other specified operations on ileum                                         |
| 7640y00  | Other specified excision of ileum                                           |
| 764.11   | Small intestine operations                                                  |
| 7640z00  | Excision of ileum NOS                                                       |
| 764By00  | Other specified other operation on ileum                                    |
| 7643y00  | Other specified other connection of ileum                                   |
| 7647.00  | Intraabdominal manipulation of ileum                                        |
| 762z.00  | Duodenum operations NOS                                                    |
| 7632200  | Jejunostomy NOS                                                             |
| 7640200  | Ileectomy and anastomosis of ileum to ileum                                |
| 764C.00  | Transplantation of ileum                                                   |
| 7620.00  | Excision of duodenum                                                        |
| 7648600  | Oversewing of small bowel                                                   |
| 7647400  | Mobilisation of intestine                                                   |
| 7632000  | Creation of jejunostomy                                                    |
| 7643200  | Anastomosis of ileum to colon NEC                                           |
| 7643300  | Anastomosis of ileum to rectum                                              |
| 7647300  | Plication of ileum                                                          |
| 7647z00  | Intraabdominal manipulation of ileum NOS                                    |
| 7635200  | Closure of perforation of jejunum                                           |
| 7641100  | Excision of lesion of ileum NEC                                             |
| 7633z00  | Bypass of jejunum NOS                                                       |
| 7641000  | Excision of Meckel diverticulum                                             |
| 7638100  | Intubation of jejunum for measurement of intestinal function                |
| 7631000  | Excision of lesion of jejunum                                               |
| 7645y11  | Creation of Gross ileostomy                                                 |
| 7620z00  | Excision of duodenum NOS                                                    |
| 7642200  | Bypass of ileum by anastomosis of ileum to caecum                           |
| 7648.00  | Other open operations on ileum                                              |

© 2021 Scott Fl et al. JAMA Network Open.
| Code       | Description                                              |
|------------|----------------------------------------------------------|
| 7645100    | Creation of temporary ileostomy                         |
| 7642.00    | Bypass of ileum                                         |
| 7648100    | Strictureplasty of ileum                                |
| 7622200    | Bypass of duodenum by anastomosis of duodenum to jejunum |
| 7641.00    | Open extirpation of lesion of ileum NOS                 |
| 7623400    | Incision of duodenum NEC                                |
| 7644.11    | Attention to anastomosis of ileum                       |
| 7640100    | Ileectomy and anastomosis of duodenum to ileum          |
| 7645.00    | Creation of ileostomy                                   |
| 7627y00    | Other specified operation on duodenal ulcer             |
| 763y.00    | Other specified operations on jejunum                   |
| 7642500    | Duodenal switch                                         |
| 7630.11    | Jejunectomy                                             |
| 7643.00    | Other connection of ileum                               |
| 7632100    | Refashioning of jejunostomy                             |
| 7640.00    | Excision of ileum                                       |
| 7626.00    | Other operations on duodenum                            |
| 7620000    | Gastroduodenectomy                                      |
| 7638200    | Passage of Crosby capsule into jejunum for biopsy of mucosa |
| 7647000    | Open reduction of intussusception of ileum              |
| 7643100    | Anastomosis of ileum to transverse colon                |
| 7644.00    | Attention to connection of ileum                        |
| 7641y00    | Other specified open extirpation of lesion of ileum     |
| 7635000    | Open biopsy of lesion of jejunum                        |
| 7623100    | Closure of perforation of duodenum NEC                  |
| 7630.00    | Excision of jejunum                                     |
| 763..00    | Jejunum operations                                      |
| 7633100    | Bypass of jejunum by anastomosis of jejunum to ileum    |
| 7638y00    | Other specified other operation on jejunum              |
| 7633200    | Bypass of jejunum by anastomosis of jejunum to colon    |
| 7634.11    | Operative jejunoscopy                                   |
| 7644300    | Resection of ileo-colic anastomosis                     |
| 7645200    | Creation of defunctioning ileostomy                     |
| 7638.00    | Other operations on jejunum                             |
| 7630300    | Partial jejunectomy and anastomosis of jejunum to ileum |
| 7641.00    | Open extirpation of lesion of ileum                     |
| 764..00    | Ileum operations                                        |
| 7634000    | Open jejunoscopy                                        |
| 7622100    | Bypass of duodenum by anastomosis of duodenum to duodenum |
| 7633.00    | Bypass of jejunum                                       |
| 7803y00    | Other specified repair of liver                         |
| 7803z00    | Repair of liver NOS                                     |
| 7802400    | Excision of multiple lesions of liver                   |
| 7806z00    | Therapeutic laparoscopic operation on liver NOS          |
| 7802y00    | Other specified extirpation of lesion of liver          |
| 7805200    | Exploration of liver                                   |
| 7804100    | Open removal of calculus from liver                     |
| 7804200    | Incision of liver NOS                                   |
| Code    | Description                                      |
|---------|--------------------------------------------------|
| 7802500 | Excision of lesion of liver NEC                  |
| 7804200 | Open wedge biopsy of lesion of liver             |
| 7800200 | Transplantation of liver NOS                     |
| 7803000 | Removal of lacerated fragment of liver           |
| 7801500 | Left hepatic trisegmentectomy                    |
| 7806y00 | Therapeutic laparoscopic operation on liver OS   |
| 780..00 | Liver operations                                 |
| 7805100 | Open insertion of cannula for perfusion of liver |
| 7801y00 | Other specified partial excision of liver        |
| 7801.00 | Partial excision of liver                        |
| 7800.00 | Transplantation of liver                         |
| 7801100 | Left hemihepatectomy                             |
| 7804.11 | Hepatotomy                                       |
| 7807200 | Diagnostic laparoscopic examination of liver NOS  |
| 7800200 | Replacement of previous liver transplant         |
| 7805200 | Other open operation on liver NOS                |
| 7806100 | Laparoscopic insertion of cannula into gall bladder |
| 7805211 | Exploration of liver transplant                  |
| 7801700 | Extended right hemihepatectomy                   |
| 7801600 | Right hepatic trisegmentectomy                   |
| 7807100 | Laparoscopic ultrasound examination liver biop lesion liver |
| 7806.00 | Therapeutic endoscopic operations on liver using laparoscope |
| 780y.00 | Other specified operations on liver              |
| 7803200 | Packing of laceration of liver                   |
| 7802z00 | Extirpation of lesion of liver NOS               |
| 780z.00 | Liver operations NOS                             |
| 7807200 | Laparoscopic ultrasound examination of liver NEC |
| 7801300 | Wedge excision of liver                          |
| 7804y00 | Other specified incision of liver                |
| 7800100 | Heterotopic transplantation of liver             |
| 7801400 | Marsupialisation of lesion of liver              |
| 7801900 | Right hemihepatectomy NEC                        |
| 7800y00 | Other specified transplantation of liver         |
| 7801.11 | Partial hepatectomy                              |
| 7800000 | Orthotopic transplantation of liver              |
| 7804.00 | Incision of liver                                |
| 7800111 | Auxillary liver transplant                       |
| 7801200 | Partial excision of liver NOS                    |
| 7801A00 | Left hemihepatectomy NEC                         |
| 7801200 | Resection of segment of liver                    |
| 7804000 | Open drainage of liver                           |
| 7801000 | Right hemihepatectomy                            |
| 7805.00 | Other open operations on liver                   |
| 7807000 | Diagnostic laparoscopic examination and biopsy liver lesion |
| 7803100 | Repair of laceration of liver                    |
| 7805y00 | Other specified other open operation on liver    |
| 7803.00 | Repair of liver                                  |
| 7802000 | Excision of lesion of liver                      |
| Code       | Description                                                                 |
|------------|------------------------------------------------------------------------------|
| 7807.00    | Diagnostic endoscopic examination of liver using laparoscope                 |
| 7807y00    | Diagnostic laparoscopic examination of liver OS                              |
| 7810300    | Partial cholecystectomy and exploration of common bile duct                  |
| 781..00    | Gall bladder operations                                                      |
| 7812200    | Repair of perforation of gall bladder                                        |
| 7811311    | Cholecystoenterostomy                                                        |
| 7814000    | Excision of lesion of gall bladder                                           |
| 7810100    | Total cholecystectomy and exploration of common bile duct                    |
| 7811.00    | Connection of gall bladder                                                   |
| 7810411    | Thorek partial cholecystectomy                                               |
| 7812100    | Closure of cholecystotomy                                                    |
| 7811100    | Anastomosis of gall bladder to duodenum                                      |
| 7811011    | Cholecystogastrostomy                                                        |
| 7812.00    | Repair of gall bladder                                                       |
| 7810211    | Cholecystectomy NEC                                                          |
| 7813200    | Drainage of tissue surrounding gall bladder                                  |
| 7810.00    | Excision of gall bladder                                                     |
| 7811111    | Cholecystoduodenostomy                                                       |
| 7810200    | Excision of gall bladder NOS                                                 |
| 7810500    | Endoscopic cholecystectomy                                                   |
| 7813000    | Open removal of calculus from gall bladder                                   |
| 7811300    | Anastomosis of gall bladder to intestine NEC                                  |
| 7812000    | Closure of fistula of gall bladder                                           |
| 7810.11    | Cholecystectomy                                                              |
| 7813012    | Open cholecystotomy                                                          |
| 7817.00    | Other operations on gall bladder                                             |
| 7811211    | Cholecystojjunostomy                                                         |
| 7812200    | Repair of gall bladder NOS                                                   |
| 7813011    | Bobb cholelithotomy                                                          |
| 7811.11    | Anastomosis of gall bladder                                                  |
| 7811200    | Anastomosis of gall bladder to jejunum                                       |
| 781..11    | Cholecyst operations                                                         |
| 7813.00    | Incision of gall bladder                                                     |
| 7811212    | Roux-en-y cholecystojejunostomy                                              |
| 7810y00    | Other specified excision of gall bladder                                     |
| 7814300    | Removal of foreign body from gall bladder                                    |
| 7813111    | Cholecystostomy NEC                                                          |
| 7810000    | Total cholecystectomy and excision of surrounding tissue                    |
| 7811000    | Anastomosis of gall bladder to stomach                                       |
| 7810511    | Laparoscopic cholecystectomy                                                 |
| 7814200    | Exploration of gall bladder                                                  |
| 7813y00    | Other specified incision of gall bladder                                     |
| 7813.11    | Cholecystotomy                                                               |
| 7814.00    | Other open operations on gall bladder                                       |
| 7810200    | Total cholecystectomy NEC                                                    |
| 7812.00    | Gall bladder operations NOS                                                  |
| 7814200    | Other open operation on gall bladder NOS                                     |
| 7813100    | Drainage of gall bladder                                                     |
| Code       | Description                                    |
|------------|------------------------------------------------|
| 7814100    | Open biopsy of lesion of gall bladder          |
| 7813200    | Incision of gall bladder NOS                  |
| 7814y00    | Other specified other open operation on gall bladder |
| 7811400    | Revision of anastomosis of gall bladder       |
| 7810400    | Partial cholecystectomy NEC                   |
| 7824400    | Roux-en-y procedure for biliary atresia       |
| 7825z00    | Repair of bile duct NOS                      |
| 7826000    | Open removal of calculus and drainage of bile duct |
| 7826111    | Choledocholithotomy NEC                       |
| 782A300    | Operative choledochoscopy NEC                 |
| 782Ay00    | Other specified other open operation on bile duct |
| 7825000    | Reconstruction of bile duct                  |
| 7823300    | Revision of anastomosis of common bile duct  |
| 7820200    | Partial excision and anastomosis of bile duct to jejunum |
| 7822011    | Kasai hepatojunostomy + insertion tubal prosthesis |
| 782y.00    | Other specified operations on bile duct       |
| 7826.11    | Choledochotomy                                |
| 7826y00    | Other specified incision of bile duct         |
| 7823200    | Anastomosis of common bile duct to jejunum NEC |
| 7826.12    | Exploration of bile duct                      |
| 7823211    | Pancreatectomy NEC                            |
| 7826.00    | Incision of bile duct                         |
| 7826100    | Open removal of calculus from bile duct NEC   |
| 7823y00    | Other specified connection of common bile duct |
| 7820.00    | Excision of bile duct                         |
| 7823211    | Cholochoojunostomy NEC                        |
| 7822100    | Anastomosis of hepatic duct to jejunum NEC    |
| 7823111    | Roux-en-y choledochoenterostomy               |
| 7824y00    | Other specified open operation on prosthesis in bile duct |
| 782z.00    | Bile duct operations NOS                      |
| 7826z00    | Incision of bile duct NOS                     |
| 7825111    | Choledochcholedochostomy                      |
| 7822z00    | Connection of hepatic duct NOS                |
| 782..00    | Bile duct operations                          |
| 7822y00    | Other specified connection of hepatic duct    |
| 7821z00    | Extirpation of lesion of bile duct NOS        |
| 7826300    | Exploration of bile duct                      |
| 7822300    | Open dilation of anastomosis of hepatic duct  |
| 782A200    | Direct puncture operative cholangiography     |
| 782A000    | Open biopsy of lesion of bile duct            |
| 782..11    | Choledochus operations                        |
| 7823000    | Anastomosis of common bile duct to duodenum   |
| 7825100    | Reanastomosis of bile duct                    |
| 7822200    | Revision of anastomosis of hepatic duct       |
| 7823400    | Open dilation of anastomosis of common bile duct |
| 782Az00    | Other open operation on bile duct NOS         |
| 7825.11    | Choledochoplasty                              |

© 2021 Scott FI et al. *JAMA Network Open.*
| Code     | Description                                                                 |
|----------|-----------------------------------------------------------------------------|
| 7820y00  | Other specified excision of bile duct                                       |
| 7823011  | Choledochoduodenostomy                                                     |
| 7821000  | Excision of lesion of bile duct                                            |
| 7823.00  | Connection of common bile duct                                             |
| 7825v00  | Other specified repair of bile duct                                         |
| 782R.00  | Laparoscopic ultrasound examination of bile duct                           |
| 782Rz00  | Laparoscopic ultrasound examination of bile duct NOS                        |
| 7823.11  | Anastomosis of common bile duct                                            |
| 7822.00  | Connection of hepatic duct                                                 |
| 7820000  | Excis ampulla of Vater & replant com bile duct in duodenum                 |
| 7823100  | Anastomosis of common bile duct to transposed jejunum                       |
| 7824z00  | Open operation on prosthesis in bile duct NOS                             |
| 7825.00  | Repair of bile duct                                                        |
| 782A.00  | Other open operations on bile duct                                          |
| 7822000  | Anast hepatic duct to transp jejunum+insert tubal prosth                   |
| 7821.00  | Extirpation of lesion of bile duct                                          |
| 7830100  | Transplantation of whole pancreas                                          |
| 7835.00  | Connection of pancreatic duct                                              |
| 7835.12  | Roux-en-y pancreaticojejunostomy                                            |
| 783D000  | Laparoscopic ultrasound examination panc biop lesion panc                   |
| 7834100  | Excision of lesion of pancreas NEC                                         |
| 7835212  | Peustow pancreaticojejunostomy                                              |
| 783Fz00  | Other operations on pancreas NOS                                            |
| 783D.00  | Laparoscopic ultrasound examination of pancreas                            |
| 7833z00  | Other partial excision of pancreas NOS                                      |
| 7833.12  | Partial pancreatectomy NEC                                                 |
| 7835211  | Pancreatectomy pancreaticojejunostomy                                       |
| 7833y00  | Other specified other partial excision of pancreas                         |
| 7834.00  | Extirpation of lesion of pancreas                                          |
| 7839200  | Open pancreatography NEC                                                   |
| 7832z00  | Excision of head of pancreas NOS                                           |
| 7831z00  | Total excision of pancreas NOS                                              |
| 7835200  | Anastomosis of pancreatic duct to transposed jejunum                       |
| 7837000  | Open cystogastrotomy of pancreans                                          |
| 783z.00  | Pancreas operations NOS                                                    |
| 7833500  | Pancreatectomy NEC                                                         |
| 7831200  | Excision of transplanted pancreans                                         |
| 7832.11  | Pancreatectomy, head of pancreans                                          |
| 7836400  | Open dilation of pancreatic duct                                           |
| 783F.00  | Other operations on pancreas                                              |
| 7833000  | Subtotal pancreatectomy                                                   |
| 7836100  | Open removal of calculus from pancreatic duct                             |
| 7833.00  | Other partial excision of pancreans                                        |
| 7832200  | Pancreatectoduodenectomy NEC                                               |
| 7831.11  | Total pancreatectomy                                                      |
| 7832100  | Pancreatectoduodenectomy and resection of antrum of stomach                |
| 7839300  | Exploration of pancreas NEC                                               |
| 783...0  | Pancreas operations                                                        |
| Code     | Description                                           |
|----------|-------------------------------------------------------|
| 7836.00  | Other open operations on pancreatic duct             |
| 78353000| Anastomosis of pancreatic duct to jejunum NEC        |
| 7831100 | Total pancreatectomy NEC                             |
| 7832113 | Whipple pancreaticoduodenectomy                     |
| 7838.00  | Incision of pancreas                                 |
| 7837.00  | Open drainage of lesion of pancreas                  |
| 7839z00  | Open examination of pancreas NOS                     |
| 7830.00  | Transplantation of pancreas                          |
| 7833600 | Pancreatic necrosectomy                              |
| 7836y00  | Other specified other open operation on pancreatic duct|
| 7838000 | Division of annular pancreas                         |
| 783A.00  | Other open operations on pancreas                    |
| 7831.00  | Total excision of pancreas                           |
| 7832.00  | Excision of head of pancreas                         |
| 7833400 | Excision of tail of pancreas NEC                     |
| 783A0000 | Open biopsy of lesion of pancreas                    |
| 7836z00  | Other open operation on pancreatic duct NOS          |
| 7838z00  | Incision of pancreas NOS                             |
| 7832000 | Pancreaticoduodenectomy and excision of surrounding tissue|
| 7837.11  | Open drainage of cyst of pancreas                    |
| 7839.00  | Open examination of pancreas                         |
| 783y.00  | Other specified operations on pancreas               |
| 7832011 | Childs pancreaticoduodenectomy                       |
| 7830z00  | Transplantation of pancreas NOS                      |
| 7837300 | Drainage of cyst of pancreas NEC                     |
| 7837y00  | Other specified open drainage of lesion of pancreas  |
| 7842y00  | Other specified other operation on spleen            |
| 7840000 | Total excision of spleen and replantation of fragments|
| 7842500 | Exploration of spleen                                |
| 7841z00  | Other excision of spleen NOS                         |
| 784y.00  | Other specified operations on spleen                 |
| 7840.11  | Total splenectomy                                    |
| 7842400 | Banding of spleen                                    |
| 7840.00  | Total excision of spleen                             |
| 7841000 | Partial splenectomy                                  |
| 7840z00  | Total excision of spleen NOS                         |
| 7840300 | Splenectomy NEC                                      |
| 7842300 | Repair of spleen                                     |
| 7842.00  | Other operation on spleen                            |
| 7842000 | Transplantation of spleen                            |
| 784z.00  | Spleen operations NOS                                |
| 7840100 | Total splenectomy                                    |
| 7841.00  | Other excision of spleen                             |
| 7842z00  | Other operation on spleen NOS                        |
| 7841100 | Marsupialisation of lesion of spleen                  |
| Code     | Description                                      |
|----------|--------------------------------------------------|
| 7B26600  | Detrusor myotomy                                 |
| 7B00y00  | Other specified transplantation of kidney        |
| 7B12.14  | Replantation of ureter                          |
| 7B22.00  | Enlargement or replacement of bladder            |
| 7B12z00  | Reimplantation of ureter NOS                     |
| 7B21.00  | Partial excision of bladder                      |
| 7B1..00  | Ureter operations                                |
| 7B10.00  | Excision of ureter                               |
| 7B10.11  | Ureterectomy                                     |
| 7B2z.00  | Bladder operations NOS                          |
| 7B10200  | Secondary ureterectomy                           |
| 7B05111  | Drainage of kidney NEC                          |
| 7B20y00  | Other specified total excision of bladder        |
| 7B02.00  | Partial nephrectomy                              |
| 7B06300  | Exploration of renal transplant                  |
| 7B15100  | Intubated ureterotomy                            |
| 7B11z00  | Urinary diversion NOS                           |
| 7B06.00  | Other open diversion NOS                         |
| 7B00400  | Allotransplantation kidney from cadaver, heart non-beating |
| 7B02y00  | Other specified partial nephrectomy              |
| 7B15.00  | Incision of ureter                               |
| 7B04.00  | Open repair of kidney                            |
| 7B25.00  | Open operations on contents of bladder           |
| 7B20.00  | Total excision of bladder                        |
| 7B05400  | Therapeutic open aspiration of renal cyst        |
| 7B00.00  | Transplantation of kidney                        |
| 7B21y00  | Other specified partial excision of bladder      |
| 7B22500  | Caecal bladder augmentation                      |
| 7B05100  | Open nephrostomy or pyelostomy                   |
| 7B03300  | Rovsing's operation for polycystic kidney        |
| 7B03.11  | Open removal of renal lesion                     |
| 7B02300  | Lower pole partial nephrectomy                   |
| 7B12600  | Intravesical unilateral ureteric reimplantation  |
| 7B11500  | Ureterosigmoidostomy                             |
| 7B01800  | Nephroureterectomy with pluck lower ureterectomy |
| 7B15200  | Upper third ureterolithotomy                      |
| 7B22900  | Ileal bladder replacement                        |
| 7B01600  | Simple nephrectomy -live donor                   |
| 7B12000  | Unspecified bilateral reimplantation of ureter   |
| 7B22800  | Clam ileocystoplasty                             |
| 7B12611  | Cohen unilateral reimplantation of ureter        |
| 7B21.11  | Partial cystectomy                               |
| 7B12.11  | Bischoff replantation ureter                     |
| 7B12500  | Extravesical bilateral reimplantization of ureters|
| 7B16y00  | Other specified other open operation on ureter    |
| 7B02200  | Partial nephrectomy NOS                          |
| 7B00200  | Transplantation of kidney from cadaver           |
| 7B23400  | Closure of extrophy of bladder                   |
| Code   | Description                                                                 |
|--------|-----------------------------------------------------------------------------|
| 7B22700| Ileal augmentation of bladder                                               |
| 7B2D.00| Operations on bladder                                                      |
| 7B11800| Creation of other continent conduit                                         |
| 7B11y00| Other specified urinary diversion                                           |
| 7B12.12| Hutch replantation of ureter                                               |
| 7B12200| Ureteric reimplantation after urinary diversion                            |
| 7B16000| Open excision of ureterocele                                               |
| 7B26z00| Other open operation on bladder NOS                                        |
| 7B12300| Intravesical bilateral ureter reimplantation                               |
| 7B23000| Cystourethroplasty                                                         |
| 7B0y.00| Other specified operations on kidney                                       |
| 7B12800| Extravesical unilateral reimplantation of ureter                           |
| 7B05000| Unspecified open removal of calculus from kidney                           |
| 7B01100| Nephroureterectomy-unspecified                                             |
| 7B2Dz00| Operations on bladder NOS                                                  |
| 7B13200| Ileal replacement of ureter                                                |
| 7B13000| Anastomosis of ureter to bladder                                           |
| 7B01500| Transplant nephrectomy                                                     |
| 7B0...11| Renal operations                                                           |
| 7B12311| Cohen bilateral ureter reimplantation                                      |
| 7B0...00| Kidney operations                                                          |
| 7B22.11| Augmentation or replacement of bladder                                     |
| 7B15400| Lower third ureterolithotomy                                                |
| 7B25000| Open removal of bladder calculus                                           |
| 7B16100| Open excision of ureteric lesion                                           |
| 7B20100| Radical cystourethrectomy - female                                        |
| 7B26000| Open extirpation of bladder lesion                                         |
| 7B16300| Open biopsy of ureteric lesion                                              |
| 7B16600| Open exploration of ureter                                                 |
| 7B04100| Revision of pyeloplasty                                                    |
| 7B14.00| Repair of ureter                                                           |
| 7B06y00| Other specified other open operation on kidney                             |
| 7B20.11| Total cystectomy                                                           |
| 7B20200| Radical cystoprostatectomy                                                 |
| 7B02000| Heminephrectomy for duplex kidney                                          |
| 7B04400| Repair of renal laceration                                                 |
| 7B20z00| Total excision of bladder NOS                                              |
| 7B04500| Plication and pyeloplasty of kidney                                        |
| 7B15z00| Incision of ureter NOS                                                     |
| 7B04600| Anderson-Hynes pyeloplasty                                                 |
| 7B00000| Autotransplant of kidney                                                   |
| 7B03000| Open deroofing of renal cyst                                               |
| 7B00z00| Transplantation of kidney NOS                                              |
| 7B01200| Bilateral nephrectomy                                                      |
| 7B04700| Culp pyeloplasty                                                           |
| 7B05.00| Incision of kidney or renal pelvis                                         |
| 7B21z00| Partial excision of bladder NOS                                            |
| 7B10000| Total ureterectomy                                                         |
| Code       | Description                                                                 |
|------------|----------------------------------------------------------------------------|
| 7B26500    | Vesicostomy                                                                |
| 7B02100    | Division of isthmus of horseshoe kidney                                    |
| 7B01y00    | Other specified total nephrectomy                                         |
| 7B12511    | Leadbetter bilateral reimplantation of ureters                            |
| 7B2y.00    | Other specified operations on bladder                                      |
| 7B22z00    | Enlargement of bladder NOS                                                |
| 7B22600    | Caecal bladder replacement                                                |
| 7B26y00    | Other specified other open operation on bladder                            |
| 7B10y00    | Other specified excision of ureter                                         |
| 7B23300    | Repair of rupture of bladder                                              |
| 7B05200    | Incision of kidney NOS                                                    |
| 7B06100    | Open renal denervation                                                    |
| 7B01000    | Radical nephrectomy                                                       |
| 7B20000    | Radical cystoprostaticurethrectomy                                         |
| 7B01011    | Nephrectomy and excision of perirenal tissue                              |
| 7B26300    | Open biopsy of bladder lesion                                              |
| 7B01400    | Simple nephrectomy - other                                                |
| 7B25100    | Open removal of foreign body from bladder                                 |
| 7B04200    | Nephropexy                                                                 |
| 7B25200    | Cystostomy and removal of blood clot                                       |
| 7B20400    | Cystectomy NEC                                                            |
| 7B12512    | Politano bilateral reimplantation of ureters                              |
| 7B25z00    | Open operation on contents of bladder NOS                                  |
| 7B11900    | Creation of colonic conduit                                               |
| 7B16200    | Ureterolysis                                                               |
| 7B23z00    | Other repair of bladder NOS                                               |
| 7B01.00    | Total nephrectomy                                                         |
| 7B11100    | Unspecified other urinary intestinal diversion                            |
| 7B05500    | Therapeutic open aspiration of renal pelvis                               |
| 7B04z00    | Open repair of kidney NOS                                                 |
| 7B12.00    | Reimplantation of ureter                                                  |
| 7B20300    | Simple cystectomy                                                         |
| 7B11011    | Uretero-ileostomy, unspecified                                            |
| 7B2..00    | Bladder operations                                                        |
| 7B13.00    | Other connection of ureter                                                |
| 7B02.00    | Kidney operations NOS                                                     |
| 7B2Dy00    | Other specified operations on bladder                                      |
| 7B11000    | Construction of unspecified ileal conduit                                |
| 7B12811    | Leadbetter unilateral reimplantation of ureter                            |
| 7B00111    | Allotransplantation of kidney from live donor                              |
| 7B03100    | Open excision of renal lesion                                             |
| 7B10z00    | Excision of ureter NOS                                                    |
| 7B04.11    | Pyeloplasty                                                                |
| 7B13400    | Revision of ureteric anastomosis                                          |
| 7B10300    | Ureterectomy NEC                                                          |
| 7B05y00    | Other specified incision of kidney                                         |
| 7B1z.00    | Ureter operations NOS                                                     |
| 7B00100    | Transplantation of kidney from live donor                                  |

© 2021 Scott FI et al. JAMA Network Open.
| Code      | Description                                      |
|-----------|--------------------------------------------------|
| 7B22000   | Unspecified caecocystoplasty                     |
| 7B01311   | Excision of half of horseshoe kidney             |
| 7B11B00   | Insertion of subcutaneous urinary diversion stent|
| 7B11.00   | Urinary diversion                                |
| 7B16.00   | Other open operations on ureter                  |
| 7B21000   | Diverticulectomy of bladder                      |
| 7B04000   | Other open pyeloplasty                           |
| 7B22y00   | Other specified enlargement of bladder           |
| 7B00211   | Allotransplantation of kidney from cadaver       |
| 7B11600   | Construction of standard ileal conduit           |
| 7B15111   | Davis intubated ureterotomy                      |
| 7B22B00   | Colonic bladder replacement                      |
| 7B20500   | Cystourethrectomy                                |
| 7B22300   | Ileocaecocystoplasty                             |
| 7B06000   | Open renal biopsy                                |
| 7B24.00   | Open drainage of bladder                         |
| 7B15.11   | Ureterotomy                                      |
| 7B1y.00   | Other specified operations on ureter             |
| 7B22100   | Unspecified ileocystoplasty                     |
| 7B21700   | Construction of continent ileal conduit          |
| 7B23.00   | Other repair of bladder                          |
| 7B15000   | Unspecified open ureterolithotomy                |
| 7B26200   | Open transection of bladder                      |
| 7B22.12   | Enlargement of bladder                           |
| 7B15y00   | Other specified incision of ureter               |
| 7B24y00   | Other specified open drainage of bladder         |
| 7B15300   | Middle third ureterolithotomy                    |
| 7B23y00   | Other specified other repair of bladder          |
| 7B22200   | Unspecified colocystoplasty                     |
| 7B23100   | Repair of vesicocolic fistula                    |
| 7B01z00   | Total nephrectomy NOS                            |
| 7B13100   | Boari flap anastomosis of ureter to bladder      |
| 7B22A00   | Colonic bladder augmentation                     |
| 7B16z00   | Other open operation on ureter NOS               |
| 7B26.00   | Other open operations on bladder                 |
| 7B06200   | Exploration of kidney                            |
| 7B10100   | Excision of segment of ureter                    |
| 7B26400   | Exploration of bladder                           |
| 7B23500   | Repair of fistula of bladder NEC                 |
| 7B22400   | Ileocaecal bladder replacement                   |
| 7B06z00   | Other open operation on kidney NOS               |
| 7B01.11   | Total excision of kidney                         |
| 7B00300   | Allotransplantation of kidney from cadaver, heart-beating |
| 7B02.11   | Partial excision of kidney                       |
| 7B12y00   | Other specified reimplantation of ureter         |
| 7B04511   | Hamilton plication and pyeloplasty of kidney     |
| 7B01700   | Nephroureterectomy with open lower ureterectomy  |
| 7B02200   | Upper pole partial nephrectomy                   |
| Code     | Description                                               |
|----------|-----------------------------------------------------------|
| 7B01511  | Excision of rejected transplanted kidney                  |
| 7B01300  | Heminephrectomy for horseshoe kidney                      |
| 7B12100  | Unspecified unilateral reimplantation of ureter           |
| 7B10400  | Excision of duplex ureter                                 |
| 7B21100  | Partial cystectomy                                        |
| 7B11200  | Revision of urinary diversion                             |
| 7E0y.00  | Other specified operations on uterus                      |
| 7E2..00  | Ovary and broad ligament operations                       |
| 7E06511  | Hysterotomy NEC                                           |
| 7E04.12  | Wertheim hysterectomy                                     |
| 7E2..12  | Ovary operations                                          |
| 7E17200  | Open reversal of female sterilisation NOS                 |
| 7E28200  | Division of uteropelvic ligament                          |
| 7E04711  | Abdominal hysterectomy and left salpingoopherectomy       |
| 7E19011  | Removal of ectopic pregnancy from fallopian tube          |
| 7E13.00  | Partial excision of fallopian tube                        |
| 7E19100  | Drainage of fallopian tube                                |
| 7E04E00  | Laparoscopic subtotal hysterectomy                         |
| 7E04312  | Hysterectomy NEC                                          |
| 7E04D00  | Excision of accessory uterus                               |
| 7E04C00  | Laparoscopic hysterectomy                                  |
| 7E04900  | TAH - Tot abdom hysterectomy and BSO - bilat salpingophorect |
| 7E21000  | Open cauterisation of lesion of ovary                     |
| 7E04600  | Radical hysterectomy                                      |
| 7E18000  | Reconstruction of fallopian tube                          |
| 7E26011  | Laparoscopic biopsy of ovary                              |
| 7E16.00  | Other open occlusion of fallopian tube                    |
| 7E23000  | Transposition of ovary                                    |
| 7E1B100  | Open biopsy of fallopian tube                              |
| 7E06112  | Myomectomy                                                |
| 7E15011  | Pomeroy open bilateral ligation of fallopian tubes         |
| 7E28.00  | Operations on other uterine ligaments                     |
| 7E23500  | Oophorotomy and rupture of cyst                           |
| 7E04300  | Total abdominal hysterectomy NEC                           |
| 7E27211  | Open ventrosuspension                                     |
| 7E04A00  | Abdominal hysterectomy with conservation of ovaries       |
| 7F1A000  | Caesarean hysterectomy                                     |
| 7E16311  | Open ringing of fallopian tube NEC                        |
| 7E04511  | Abdominal hysterectomy & bilateral salpingoopherectomy (BSO) |
| 7E04.11  | Abdominal hysterectomy                                    |
| 7E06711  | Endometrial laser ablation                                |
| 7E28011  | Gilliam suspension of uterus                               |
| 7E11z00  | Unilateral excision of adnexa of uterus NOS                |
| 7E04500  | Abdominal hysterectomy and bilateral salpingoopherectomy  |
| 7E26.11  | Laparoscopy of ovary                                      |
| 7E06y00  | Other specified open operation on uterus                   |
| 7E28y00  | Other specified operation on other uterine ligament        |
| 7E28400  | Diathermy lesion uterosacral ligament                      |
| Code    | Description                                                                 |
|---------|-----------------------------------------------------------------------------|
| 7E28100 | Plication of round ligament of uterus                                       |
| 7E18300 | Suture of fallopian tube NEC                                                |
| 7E16000 | Open ligation of remaining solitary fallopian tube                          |
| 7E1B011 | Salpingolysis - open                                                        |
| 7E23300 | Open drainage of cyst of ovary                                              |
| 7E06700 | Endometrectomy                                                              |
| 7E04700 | Abdominal hysterectomy and right salpingoopherectomy                        |
| 7E15100 | Open bilateral clipping of fallopian tubes                                  |
| 7E1..00 | Fallopian tube operations                                                   |
| 7E11900 | Left salpingectomy                                                          |
| 7E11300 | Salpingectomy of remaining solitary fallopian tube NEC                      |
| 7E11600 | Right salpingoopherectomy                                                   |
| 7E17.11 | Open reversal of tubal ligation                                             |
| 7E06600 | Hysterotomy and termination of pregnancy                                     |
| 7E20000 | Excision of wedge of ovary                                                  |
| 7E20300 | Ovarian cystectomy                                                          |
| 7E06300 | Open biopsy of lesion of ovary                                               |
| 7E16.12 | Unilateral occlusion of fallopian tube                                      |
| 7E14200 | Removal of tubal prosthesis from fallopian tube                             |
| 7E15y00 | Other specified open bilateral occlusion of fallopian tubes                  |
| 7E04G00 | Total abdominal hysterectomy with conservation of ovaries                   |
| 7E28600 | Suspension of uterus NEC                                                     |
| 7E20200 | Marsupialisation of lesion of ovary                                          |
| 7E13z00 | Partial excision of fallopian tube NOS                                       |
| 7E13z11 | Partial salpingectomy NEC                                                    |
| 7E06000 | Open removal of products of conception from uterus NEC                       |
| 7E23y00 | Other specified other open operation on ovary                               |
| 7E22z00 | Repair of ovary NOS                                                         |
| 7E18200 | Anastomosis of fallopian tube NEC                                           |
| 7E22200 | Suture rupture corpus luteum                                                |
| 7E19.11 | Salpingotomy                                                                |
| 7E06z00 | Open operation on uterus NOS                                                |
| 7E15.00 | Open bilateral occlusion of fallopian tubes                                  |
| 7E16400 | Open clipping of right fallopian tube                                       |
| 7E15111 | Open bilateral ringing of fallopian tubes                                   |
| 7E20.11 | Partial oophorectomy                                                        |
| 7E23600 | Oophorotomy                                                                 |
| 7E22y00 | Other specified repair of ovary                                             |
| 7E04800 | Abdominal hysterectomy and left salpingoopherectomy                         |
| 7E20y00 | Other specified partial excision of ovary                                   |
| 7E16100 | Open ligation of fallopian tube NEC                                         |
| 7E18.00 | Other repair of fallopian tube                                              |
| 7E11700 | Left salpingoopherctomy                                                     |
| 7E10000 | Bilateral salpingoopherctomy                                                 |
| 7E11500 | Oophorectomy of remaining solitary ovary NEC                               |
| 7E04311 | Bonney abdominal hysterectomy                                               |
| 7E26000 | Diagnostic endoscopic examination and biopsy lesion of ovary                |
| 7E17.00 | Open reversal of female sterilisation                                       |
| Code   | Description                                                                 |
|--------|-----------------------------------------------------------------------------|
| 7E19.00| Incision of fallopian tube                                                    |
| 7E1C.12| Laparoscopic bilateral female sterilisation                                  |
| 7E17y00| Other specified open reversal of female sterilisation                        |
| 7E1y.00| Other specified operations on fallopian tube                                 |
| 7E16300| Open clipping of fallopian tube NEC                                         |
| 7E18100| Replantation of fallopian tube                                              |
| 7E12.00| Other excision of adnexa of uterus                                          |
| 7E04000| Abdominal hysterocolpectomy and excision peritoneal tissue                  |
| 7E18y00| Other specified repair of fallopian tube                                     |
| 7E18z00| Repair of fallopian tube NOS                                                |
| 7E06500| Incision of uterus NEC                                                      |
| 7E19y00| Other specified incision of fallopian tube                                  |
| 7E10100| Bilateral salpingectomy NEC                                                 |
| 7E11400| Unilateral oophorectomy NEC                                                 |
| 7E1A000| Excision of fimbria                                                         |
| 7E1Ay00| Other specified operation on fimbria                                         |
| 7E19000| Removal of products of conception from fallopian tube                       |
| 7E16700| Open ligation of left fallopian tube                                        |
| 7E15z00| Open bilateral occlusion of fallopian tubes NOS                             |
| 7E22000| Replantation of ovary                                                       |
| 7E13000| Excision of lesion of fallopian tube                                        |
| 7E21z00| Open destruction of lesion of ovary NOS                                     |
| 7E1A.00| Operations on fimbria                                                       |
| 7E19012| Fimbrial extraction of tubal pregnancy                                      |
| 7E16600| Open ligation of right fallopian tube                                       |
| 7E1E.11| Laparoscopic reversal of female sterilisation                               |
| 7E27200| Shortening of broad ligament of uterus                                      |
| 7E23z00| Other open operation on ovary NOS                                           |
| 7E27000| Excision of lesion of broad ligament of uterus                             |
| 7E16z00| Other open occlusion of fallopian tube NOS                                  |
| 7E22300| Fixation of ovary NEC                                                       |
| 7E06100| Open myomectomy                                                             |
| 7E11000| Unilateral salpingoophorectomy NEC                                          |
| 7E21y00| Other specified open destruction of lesion of ovary                         |
| 7E2..11| Broad ligament operations                                                   |
| 7E04F00| Subtotal abdominal hysterectomy with conservation of ovaries               |
| 7E10.00| Bilateral excision of adnexa of uterus                                      |
| 7E0..00| Uterus operations                                                           |
| 7E11.00| Unilateral excision of adnexa of uterus                                     |
| 7E18400| Salpingostomy                                                               |
| 7E20100| Excision of lesion of ovary                                                 |
| 7E1By00| Other specified open operation on fallopian tube                            |
| 7E23.00| Other open operations on ovary                                              |
| 7E27z00| Operation on broad ligament of uterus NOS                                   |
| 7E04z00| Abdominal excision of uterus NOS                                            |
| 7E04200| Abdominal hysterocolpectomy NEC                                             |
| 7E27100| Destruction of lesion of broad ligament of uterus                           |
| 7E27.00| Operations on broad ligament of uterus                                      |
| Code    | Description                                          |
|---------|------------------------------------------------------|
| 7E1B300 | Exploration of fallopian tube                        |
| 7E14000 | Insertion of tubal prosthesis into fallopian tube    |
| 7E10200 | Bilateral oophorectomy NEC                           |
| 7E12z00 | Other excision of adnexa of uterus NOS               |
| 7E21.00 | Open destruction of lesion of ovary                  |
| 7E04400 | Subtotal abdominal hysterectomy                       |
| 7E26z00 | Diagnostic endoscopic examination of ovary NOS       |
| 7E04800 | Lapar total abdominal hysterect bil salpingo-oophorect|
| 7E20z00 | Partial excision of ovary NOS                        |
| 7E04y00 | Other specified abdominal excision of uterus         |
| 7E11200 | Unilateral salpingectomy NEC                          |
| 7E15000 | Open bilateral ligation of fallopian tubes            |
| 7E11800 | Right salpingectomy                                  |
| 7E05600 | Lap assist vag hysterectomy with bil salpingo-oophorect|
| 7E0z.00 | Uterus operations NOS                                |
| 7E25211 | Laparoscopic drainage ovarian cyst                    |
| 7E1A200 | Excision of hydatid of Morgagni                      |
| 7E15.11 | Open bilateral female sterilisation                   |
| 7E28z00 | Operation on other uterine ligament NOS              |
| 7E1..11 | Tubal operations - fallopian                         |
| 7E16.11 | Other open female sterilisation                      |
| 7E06800 | Repair of uterus                                     |
| 7E16y00 | Other specified other open occlusion of fallopian tube|
| 7E1z.00 | Fallopian tube operations NOS                         |
| 7E13100 | Excision of ectopic ovarian pregnancy                |
| 7E28500 | Suspension of uterus using mesh                       |
| 7E28311 | Laparoscopic ventrosuspension                         |
| 7E26y00 | Other specified diagnostic endoscopic examination of ovary |
| 7E06011 | Hysterotomy & evacuation retained products conception NEC |
| 7E23200 | Open biopsy of lesion of ovary                        |
| 7E17100 | Open removal of clip from fallopian tube NEC          |
| 7E06.00 | Other open operations on uterus                       |
| 7E12300 | Right oophorectomy NEC                               |
| 7E14100 | Revision of tubal prosthesis in fallopian tube       |
| 7E06111 | Excision fibroid                                     |
| 7E12000 | Salpingoophorectomy NEC                              |
| 7E06200 | Open excision of lesion of uterus NEC                 |
| 7E12400 | Left oophorectomy NEC                                |
| 7E1A200 | Operation on fimbria NOS                              |
| 7E1Bz00 | Open operation on fallopian tube NOS                  |
| 7E19z00 | Incision of fallopian tube NOS                        |
| 7E22100 | Suture of ovary                                      |
| 7E13300 | Excision of ruptured ectopic tubal pregnancy         |
| 7E04100 | Abdominal hysterectomy & excision of periuterine tissue NEC |
| 7E13y00 | Other specified partial excision of fallopian tube    |
| 7E28000 | Suspension of uterus                                 |
| 7E17000 | Reanastomosis of fallopian tube NEC                   |
| 7E22.00 | Repair of ovary                                      |
|    | Description                                                                 |
|----|---------------------------------------------------------------------------|
| 7E1A100 | Burying of fimbria in wall of uterus                                      |
| 7E04512 | TAH - total abdom hysterectomy & bilateral salpingoophorect               |
| 7E04.00 | Abdominal excision of uterus                                              |
| 7E1B200 | Open dilation of fallopian tube                                            |
| 7E11100 | Salpingoophorectomy remaining solitary fallop tube and ovary              |
| 7E17.12 | Open reversal of female sterilisation                                     |
| 7E23400 | Oophorotomy and drainage of abscess                                       |
| 7E12100 | Salpingectomy NEC                                                         |
| 7E1B.00 | Other open operations on fallopian tube                                   |
| 7E20.00 | Partial excision of ovary                                                 |
| 7E12200 | Oophorectomy NEC                                                          |
| 7A15300 | Emerg bypass infrarenal aorta by anastom aorta to aorta NEC               |
| 7A34K00 | Operation on aneurysm visceral branch of abdominal aorta NEC              |
| 7A1y.00 | Other specified operations on aorta                                       |
| 7A12111 | Aorto bifemoral graft                                                     |
| 7A34G00 | Open embolectomy of visceral branch of abdominal aorta NEC                 |
| 7A13.11 | Emergency repair of aortic aneurysm                                       |
| 7A33H00 | Bypass of visceral branch of abdominal aorta NEC                           |
| 7A15000 | Emerg bypass ascending aorta by anastom aorta to aorta NEC                |
| 7A31z00 | Other open operation on renal artery NOS                                   |
| 7A13400 | Emerg replace aneurysm abdom aorta by anast aorta/aorta NEC               |
| 7A13300 | Emerg replace aneurysm infrarenal aorta by anast aorta/aorta              |
| 7A34y00 | Other open op on other visceral branch abdominal aorta OS                  |
| 7A31y00 | Other specified other open operation on renal artery                       |
| 7A13000 | Emerg replace aneurysm asc aorta by anastom aorta to aorta                |
| 7A34.13 | Other open operations on superior mesenteric artery                        |
| 7A10z00 | Extraanatomic bypass of aorta NOS                                         |
| 7A30211 | Replantation of renal artery                                              |
| 7A13y00 | Emergency replacement of aneurysmal segment of aorta OS                   |
| 7A19300 | Operation on aortic body                                                  |
| 7A12100 | Bypass bifurc aorta by anastom aorta to femoral artery NEC                 |
| 7A34000 | Open embolectomy of coeliac artery NEC                                     |
| 7A31100 | Ligation of renal artery                                                  |
| 7A12y00 | Other specified other bypass of bifurcation of aorta                      |
| 7A11.00 | Replacement of aneurysmal bifurcation of aorta                            |
| 7A31300 | Operation on aneurysm of renal artery                                      |
| 7A31.00 | Other open operations on renal artery                                     |
| 7A14000 | Replace aneurysm ascend aorta by anast of aorta/aorta NEC                  |
| 7A34E00 | Operation on aneurysm of inferior mesenteric artery NEC                    |
| 7A34800 | Open embolisation of coeliac artery NEC                                    |
| 7A34J00 | Ligation of visceral branch of abdominal aorta NEC                         |
| 7A12112 | Dacron aortofemoral Y graft                                               |
| 7A30100 | Bypass of renal artery                                                    |
| 7A30000 | Plastic repair and end to end anastomosis of renal artery                  |
| 7A16y00 | Other specified other bypass of segment of aorta                          |
| 7A14.11 | Aortic aneurysm repair                                                    |
| 7A33.12 | Reconstruction of inferior mesenteric artery                              |
| 7A1z.00 | Aorta operations NOS                                                      |
| Code   | Description                                                                 |
|--------|-----------------------------------------------------------------------------|
| 7A12300 | Bypass bifurcation aorta by anastomosis to iliac artery                     |
| 7A11100 | Replace aneurysm bifurcation aorta by anastomosis to femoral artery         |
| 7A14200 | Other replacement of aneurysmal segment of aorta NOS                         |
| 7A16200 | Other bypass of segment of aorta NOS                                         |
| 7A19y00 | Other specified other open operations on aorta                              |
| 7A39900 | Endarterectomy & patch repair superior mesenteric artery NEC                 |
| 7A19200 | Open embolectomy of bifurcation of aorta                                    |
| 7A34.00 | Other open operations other visceral branch abdominal aorta                  |
| 7A10300 | Axillo-unifemoral PTFE bypass graft                                          |
| 7A34.12 | Other open operations on inferior mesenteric artery                          |
| 7A10100 | Bypass aorta by anastomosis axillary to femoral artery NEC                   |
| 7A13111 | Tube graft abdominal Aortic aneurysm (emergency)                            |
| 7A12200 | Other bypass of bifurcation of aorta NOS                                     |
| 7A12312 | Dacron aortoiliac Y graft                                                   |
| 7A14300 | Replace aneurysms infrarenal aorta by anastomosis to aorta NEC              |
| 7A30y00 | Other specified reconstruction of renal artery                               |
| 7A16000 | Bypass of ascending aorta by anastomosis aorta to aorta NEC                 |
| 7A15.00 | Other emergency bypass of segment of aorta                                  |
| 7A10y00 | Other specified extraanatomic bypass of aorta                               |
| 7A12311 | Aorto biiliac graft                                                         |
| 7A19.00 | Other open operations on aorta                                               |
| 7A1..11 | Dacron graft operations on aorta                                             |
| 7A18300 | Release of vascular ring of aorta                                            |
| 7A34A00 | Open embolisation of inferior mesenteric artery NEC                          |
| 7A13111 | Y graft abdominal Aortic aneurysm                                            |
| 7A33y00 | Reconstruction of other visceral branch abdominal aorta OS                   |
| 7A16400 | Bypass of abdominal aorta by anastomosis aorta to aorta NEC                 |
| 7A34100 | Open embolectomy of superior mesenteric artery NEC                           |
| 7A18500 | Plastic repair of aorta and insertion of tube graft                          |
| 7A18.00 | Plastic repair of aorta                                                      |
| 7A34D00 | Operation on aneurysm of superior mesenteric artery NEC                      |
| 7A18600 | Repair of interrupted aortic arch                                           |
| 7A18100 | Plastic repair of aorta using subclavian flap                               |
| 7A17000 | Revision of prosthesis of thoracic aorta                                    |
| 7A19200 | Other open operation on aorta NOS                                           |
| 7A14200 | Replace aneurysms suprarenal aorta by anastomosis to aorta NEC              |
| 7A33.11 | Reconstruction of coeliac artery                                            |
| 7A11200 | Emerg repl aneurysm bifurcation aorta by anastomosis to iliac a              |
| 7A18000 | Plastic repair of aorta and end to end anastomosis of aorta                 |
| 7A11300 | Replace aneurysm bifurcation aorta by anastomosis to iliac artery            |
| 7A14111 | Tube graft of Abdominal aortic aneurysm                                     |
| 7A17200 | Attention to prosthesis of aorta NOS                                        |
| 7A18200 | Plastic repair of aorta NOS                                                  |
| 7A11200 | Replacement of aneurysmal bifurcation of aorta NOS                           |
| 7A18y00 | Other specified plastic repair of aorta                                      |
| 7A1..00 | Aorta operations                                                            |
| 7A31200 | Open embolisation of renal artery                                            |
| 7A33.13 | Reconstruction of superior mesenteric artery                                |
| Code   | Description                                                                 |
|--------|-----------------------------------------------------------------------------|
| 7A3.00 | Branches of abdominal aorta operations                                      |
| 7A33000| Bypass of coeliac artery NEC                                                 |
| 7A14y00| Other replacement of aneurysmal segment of aorta OS                         |
| 7A19400| Operation on aneurysm of aorta NEC                                          |
| 7A18200| Plastic repair of aorta using patch graft                                    |
| 7A17200| Revision of prosthesis of abdominal aorta NEC                               |
| 7A14400| Replace aneurysm abdominal aorta by anast aorta to aorta NEC                |
| 7A30.00| Reconstruction of renal artery                                              |
| 7A33100| Bypass of superior mesenteric artery NEC                                    |
| 7A11211| Y graft of abdominal Aortic aneurysm (emergency)                            |
| 7A30400| Translocation of branch of renal artery                                     |
| 7A14.00| Other replacement of aneurysmal segment of aorta                           |
| 7A16.00| Other bypass of segment of aorta                                            |
| 7A34600| Ligation of inferior mesenteric artery NEC                                  |
| 7A31000| Open embolectomy of renal artery                                            |
| 7A30200| Reconstruction of renal artery NOS                                          |
| 7A14100| Replace aneurysm thoracic aorta by anast of aorta/aorta NEC                 |
| 7A13100| Emerg replace aneurysm thor aorta by anastom aorta to aorta                 |
| 7A10200| Axillo-bifemoral bypass graft                                               |
| 7A12000| Emerg bypass bifurc aorta by anast aorta to femoral artery                  |
| 7A34.11| Other open operations on coeliac artery                                     |
| 7A33.00| Reconstruction of other visceral branch of abdominal aorta                   |
| 7A12.00| Other bypass of bifurcation of aorta                                        |
| 7A13.00| Emergency replacement of aneurysmal segment of aorta                        |
| 7A10.00| Extraanatomic bypass of aorta                                               |
| 7A30200| Reimplantation of renal artery                                              |
| 7A16300| Bypass of infrarenal aorta by anastomosis aorta to aorta NEC                |
| 7A18111| Hamilton repair coarctation of aorta using subclavian flap                  |
| 7A17100| Revision of prosthesis of bifurcation of aorta                             |
| 7A13z00| Emergency replacement of aneurysmal segment of aorta NOS                    |
| 7H28z00| Therapeutic endoscopic operation on peritoneum NOS                          |
| 7H23100| Excision of lesion of omentum                                               |
| 7H23z00| Operation on omentum NOS                                                    |
| 7H24000| Excision of lesion of mesentery of small intestine                          |
| 7H23400| Creation of omental flap                                                    |
| 7H24.00| Operations on mesentery of small intestine                                  |
| 7H23.00| Operations on omentum                                                      |
| 7H24z00| Operation on mesentery of small intestine NOS                               |
| 7H22y00| Other specified opening of peritoneal cavity                                |
| 7H29400| Diagnostic endo ultras exam perit biop intraabdominal organ                 |
| 7H28y00| Therapeutic endoscopic operation on peritoneum OS                          |
| 7H23511| Morison omentopexy                                                         |
| 7H26200| Biopsy of lesion of posterior peritoneum                                   |
| 7H25000| Excision of lesion of mesentery of colon                                    |
| 7H22400| Open instillation therapeutic substance in abdominal cavity                 |
| 7H26200| Operation on posterior peritoneum NOS                                       |
| 7H22000| Exploratory laparotomy                                                     |
| 7H29z00| Diagnostic endoscopic examination of peritoneum NOS                         |
7H2C500  Biopsy of abdominal mass
7H28300  Endoscopic removal of foreign body from peritoneum
7H28000  Endoscopic resection of lesion of peritoneum
7H28.00  Therapeutic endoscopic operations on peritoneum
7H22700  Reopen abdomen and reexplore intraabdominal op site NEC
7H26.00  Operations on posterior peritoneum
7H29100  Diag endoscopy of peritoneum & biopsy intraabdom organ NEC
7H28100  Endoscopic destruction of lesion of peritoneum
7H29.13  Diagnostic laparoscopy
7H28.11  Therapeutic laparoscopic operations on peritoneal cavity
7H22600  Reopen abdo reexplore intraabd op site surg arr postop bleed
7H22100  Laparotomy and removal of foreign body from abdominal cavity
7H23300  Biopsy of lesion of omentum
7H23y00  Other specified operation on omentum
7H25z00  Operation on mesentery of colon NOS
7H22z00  Opening of peritoneal cavity NOS
7H2z.00  Peritoneum operations NOS
7H22112  Removal of pack from peritoneal cavity
7H22300  Reopening of laparotomy site
7H25200  Biopsy of lesion of mesentery of colon
7H2Cz00  Other operation on peritoneum NOS
7H2y.00  Other specified operations on peritoneum
7H29200  Diagnostic laparoscopy of female pelvis
7H23500  Omentopexy
7H25.00  Operations on mesentery of colon
7H25300  Repair of mesentery of colon
7H27000  Open biopsy of lesion of peritoneum NEC
7H2C600  Biopsy of pelvic mass
7H29y00  Diagnostic endoscopic examination of peritoneum OS
7H29211  Gynaecological laparoscopy NEC
7H23000  Omentectomy
7H29000  Diagnostic endoscopic exam and biopsy lesion of peritoneum
7H22.11  Opening of abdomen
7H24y00  Other specified operation on mesentery of small intestine
7H29300  Diagnostic endoscopic ultrasound examination of peritoneum
7H22011  Laparotomy
7H29011  Laparoscopic biopsy peritoneum
7H29.11  Diagnostic laparoscopic examination of peritoneal cavity
7H24200  Biopsy of lesion of mesentery of small intestine
7H22111  Removal of pack from abdominal cavity
7H22.00  Opening of peritoneal cavity
7H22200  Opening of abdomen and exploration of groin
7H26000  Excision of lesion of posterior peritoneum
7H27.00  Other open operations on peritoneum
7H29.12  Peritoneoscopy

Diagnostic codes were identified within the READ code system representing procedures within the abdomen. A total of 1435 codes were identified.
**Table 2. Diagnostic Codes used to identify surgical events in Optum Clinformatics**

| ICD 9 Surgical Codes and Their Description |
|--------------------------------------------|
| 44.38 | Laparoscopic gastroenterostomy |
| 44.67 | Laparoscopic procedures for creation of esophaogastic sphincteric competence |
| 44.68 | Laparoscopic gastroplasty |
| 44.95 | Laparoscopic gastric restrictive procedure |
| 44.96 | Laparoscopic revision of gastric restrictive procedure |
| 44.97 | Laparoscopic removal of gastric restrictive device(s) |
| 44.98 | (Laparoscopic) adjustment of size of adjustable gastric restrictive device |
| 45.81 | Laparoscopic total intra-abdominal colectomy |
| 47.01 | Laparoscopic appendectomy |
| 47.11 | Laparoscopic incidental appendectomy |
| 48.51 | Laparoscopic abdominoperineal resection of the rectum |
| 50.14 | Laparoscopic liver biopsy |
| 50.25 | Laparoscopic ablation of liver lesion or tissue |
| 51.23 | Laparoscopic cholecystectomy |
| 51.24 | Laparoscopic partial cholecystectomy |
| 53.42 | Laparoscopic repair of umbilical hernia with graft or prosthesis |
| 53.43 | Other laparoscopic umbilical herniorrhaphy |
| 53.62 | Laparoscopic incisional hernia repair with graft or prosthesis |
| 53.63 | Other laparoscopic repair of other hernia of anterior abdominal wall with graft or prosthesis |
| 53.71 | Laparoscopic repair of diaphragmatic hernia, abdominal approach |
| 53.83 | Laparoscopic repair of diaphragmatic hernia, with thoracic approach |
| 54.11 | Exploratory laparotomy |
| 54.12 | Reopening of recent laparotomy site |
| 54.19 | Other laparotomy |
| 54.21 | Laparoscopy |
| 54.51 | Laparoscopic lysis of peritoneal adhesions |
| 65.01 | Laparoscopic oophorotomy |
| 65.13 | Laparoscopic biopsy of ovary |
| 65.14 | Other laparoscopic diagnostic procedures on ovaries |
| 65.23 | Laparoscopic marsupialization of ovarian cyst |
| 65.24 | Laparoscopic wedge resection of ovary |
| 65.25 | Other laparoscopic local excision or destruction of ovary |
| 65.31 | Laparoscopic unilateral oophorectomy |
| 65.41 | Laparoscopic unilateral salpingo-oophorectomy |
| 65.53 | Laparoscopic removal of both ovaries at same operative episode |
| 65.54 | Laparoscopic removal of remaining ovary |
| 65.63 | Laparoscopic removal of both ovaries and tubes at same operative episode |
| 65.64 | Laparoscopic removal of remaining ovary and tube |
| 65.74 | Laparoscopic simple suture of ovary |
| 65.75 | Laparoscopic reimplantation of ovary |
| 65.76 | Laparoscopic salpingo-oophoroplasty |
| 65.81 | Laparoscopic lysis of adhesions of ovary and fallopian tube |
| 68.31 | Laparoscopic supracervical hysterectomy [LSH] |
| 68.41 | Laparoscopic total abdominal hysterectomy |
| 68.61 | Laparoscopic radical abdominal hysterectomy |
| 42.42 | Esophagectomy |
| 42.51 | Intrathoracic esophagoesophagostomy |
| 42.52 | Intrathoracic esophagogastrostomy |
| Code | Description |
|------|-------------|
| 42.53 | Intrathoracic esophageal anastomosis with interposition of small bowel |
| 42.54 | Other intrathoracic esophagoenterostomy |
| 42.55 | Intrathoracic esophageal anastomosis with interposition of colon |
| 42.56 | Other intrathoracic esophagocolostomy |
| 42.58 | Intrathoracic esophageal anastomosis with other interposition |
| 42.59 | Other intrathoracic anastomosis of esophagus |
| 42.61 | Antesternal esphagoesophagostomy |
| 42.62 | Antesternal esophagogastrostomy |
| 42.63 | Antesternal esophageal anastomosis with interposition of small bowel |
| 42.64 | Other antesternal esophagoenterostomy |
| 42.65 | Antesternal esophageal anastomosis with interposition of colon |
| 42.66 | Other antesternal esophagocolostomy |
| 42.68 | Other antesternal esophageal anastomosis with interposition |
| 42.69 | Other antesternal anastomosis of esophagus |
| 43.0 | Gastrotomy |
| 43.11 | Percutaneous [endoscopic] gastrostomy [PEG] |
| 43.19 | Other gastrostomy |
| 43.3 | Pyloromyotomy |
| 43.41 | Endoscopic excision or destruction of lesion or tissue of stomach |
| 43.42 | Local excision of other lesion or tissue of stomach |
| 43.49 | Other destruction of lesion or tissue of stomach |
| 43.5 | Partial gastrectomy with anastomosis to esophagus |
| 43.6 | Partial gastrectomy with anastomosis to duodenum |
| 43.7 | Partial gastrectomy with anastomosis to jejunum |
| 43.81 | Partial gastrectomy with jejunal transposition |
| 43.89 | Other partial gastrectomy |
| 43.91 | Total gastrectomy with intestinal interposition |
| 43.99 | Other total gastrectomy |
| 44.00 | Vagotomy, not otherwise specified |
| 44.01 | Truncal vagotomy |
| 44.02 | Highly selective vagotomy |
| 44.03 | Other selective vagotomy |
| 44.11 | Transabdominal gastroscopy |
| 44.15 | Open biopsy of stomach |
| 44.31 | High gastric bypass |
| 44.32 | Percutaneous [endoscopic] gastrojejunostomy |
| 44.39 | Other gastroenterostomy without gastrectomy |
| 44.40 | Suture of peptic ulcer, not otherwise specified |
| 44.41 | Suture of gastric ulcer site |
| 44.42 | Suture of duodenal ulcer site |
| 44.45 | Revision of gastric anastomosis |
| 44.61 | Suture of laceration of stomach |
| 44.62 | Closure of gastrostomy |
| 44.63 | Closure of other gastric fistula |
| 44.64 | Gastropexy |
| 44.65 | Esophagagastroplasty |
| 44.69 | Other repair of stomach |
| 44.99 | Other operations on stomach |
| 45.00 | Incision of intestine, not otherwise specified |
| 45.01 | Incision of duodenum |
| 45.02 | Other incision of small intestine |
| 45.03 | Incision of large intestine |
| Code  | Description |
|-------|-------------|
| 45.11 | Transabdominal endoscopy of small intestine |
| 45.15 | Open biopsy of small intestine |
| 45.16 | Esophagogastroduodenoscopy (EGD) with closed biopsy |
| 45.19 | Other diagnostic procedures on small intestine |
| 45.21 | Transabdominal endoscopy of large intestine |
| 45.26 | Open biopsy of large intestine |
| 45.27 | Intestinal biopsy, site unspecified |
| 45.32 | Other destruction of lesion of duodenum |
| 45.34 | Other destruction of lesion of small intestine, except duodenum |
| 45.41 | Excision of lesion or tissue of large intestine |
| 45.49 | Other destruction of lesion of large intestine |
| 45.50 | Isolation of intestinal segment, not otherwise specified |
| 45.51 | Isolation of segment of small intestine |
| 45.52 | Isolation of segment of large intestine |
| 45.61 | Multiple segmental resection of small intestine |
| 45.62 | Other partial resection of small intestine |
| 45.63 | Total removal of small intestine |
| 45.71 | Open and other multiple segmental resection of large intestine |
| 45.72 | Open and other cecectomy |
| 45.73 | Open and other right hemicolectomy |
| 45.74 | Open and other resection of transverse colon |
| 45.75 | Open and other left hemicolectomy |
| 45.76 | Open and other sigmoidectomy |
| 45.79 | Other and unspecified partial excision of large intestine |
| 45.82 | Open total intra-abdominal colectomy |
| 45.83 | Other and unspecified total intra-abdominal colectomy |
| 45.90 | Intestinal anastomosis, not otherwise specified |
| 45.91 | Small-to-small intestinal anastomosis |
| 45.92 | Anastomosis of small intestine to rectal stump |
| 45.93 | Other small-to-large intestinal anastomosis |
| 45.94 | Large-to-large intestinal anastomosis |
| 45.95 | Anastomosis to anus |
| 46.01 | Exteriorization of small intestine |
| 46.02 | Resection of exteriorized segment of small intestine |
| 46.03 | Exteriorization of large intestine |
| 46.04 | Resection of exteriorized segment of large intestine |
| 46.10 | Colostomy, not otherwise specified |
| 46.11 | Temporary colostomy |
| 46.13 | Permanent colostomy |
| 46.14 | Delayed opening of colostomy |
| 46.20 | Ileostomy, not otherwise specified |
| 46.21 | Temporary ileostomy |
| 46.22 | Continent ileostomy |
| 46.23 | Other permanent ileostomy |
| 46.24 | Delayed opening of ileostomy |
| 46.31 | Delayed opening of other enterostomy |
| 46.32 | Percutaneous (endoscopic) jejunostomy (PEJ) |
| 46.39 | Other enterostomy |
| 46.40 | Revision of intestinal stoma, not otherwise specified |
| 46.41 | Revision of stoma of small intestine |
| 46.42 | Repair of pericolecstomy hernia |
| 46.43 | Other revision of stoma of large intestine |
| Code   | Description                                                                 |
|--------|-----------------------------------------------------------------------------|
| 46.50  | Closure of intestinal stoma, not otherwise specified                        |
| 46.51  | Closure of stoma of small intestine                                         |
| 46.52  | Closure of stoma of large intestine                                         |
| 46.60  | Fixation of intestine, not otherwise specified                              |
| 46.61  | Fixation of small intestine to abdominal wall                               |
| 46.62  | Other fixation of small intestine                                          |
| 46.63  | Fixation of large intestine to abdominal wall                               |
| 46.64  | Other fixation of large intestine                                           |
| 46.71  | Suture of laceration of duodenum                                           |
| 46.72  | Closure of fistula of duodenum                                              |
| 46.73  | Suture of laceration of small intestine, except duodenum                    |
| 46.74  | Closure of fistula of small intestine, except duodenum                      |
| 46.75  | Suture of laceration of large intestine                                     |
| 46.76  | Closure of fistula of large intestine                                       |
| 46.79  | Other repair of intestine                                                   |
| 46.80  | Intra-abdominal manipulation of intestine, not otherwise specified          |
| 46.81  | Intra-abdominal manipulation of small intestine                             |
| 46.82  | Intra-abdominal manipulation of large intestine                             |
| 46.85  | Dilation of intestine                                                      |
| 46.93  | Revision of anastomosis of small intestine                                  |
| 46.94  | Revision of anastomosis of large intestine                                  |
| 46.97  | Transplant of intestine                                                    |
| 46.99  | Other operations on intestines                                              |
| 47.09  | Other appendectomy                                                         |
| 47.19  | Other incidental appendectomy                                               |
| 47.2   | Drainage of appendiceal abscess                                            |
| 47.91  | Appendicostomy                                                             |
| 47.92  | Closure of appendiceal fistula                                              |
| 47.99  | Other operations on appendix                                                |
| 48.0   | Proctotomy                                                                  |
| 48.1   | Proctostomy                                                                 |
| 48.21  | Transabdominal proctosigmoidoscopxy                                        |
| 48.43  | Open pull-through resection of rectum                                       |
| 48.49  | Other pull-through resection of rectum                                      |
| 48.50  | Abdominoperineal resection of the rectum, not otherwise specified          |
| 48.52  | Open abdominoperineal resection of the rectum                              |
| 48.59  | Other abdominoperineal resection of the rectum                             |
| 48.61  | Transsacral rectosigmoidectomy                                              |
| 48.62  | Anterior resection of rectum with synchronous colostomy                   |
| 48.63  | Other anterior resection of rectum                                         |
| 48.64  | Posterior resection of rectum                                               |
| 48.65  | Duhamel resection of rectum                                                 |
| 48.69  | Other resection of rectum                                                  |
| 48.71  | Suture of laceration of rectum                                              |
| 48.72  | Closure of proctostomy                                                     |
| 48.73  | Closure of other rectal fistula                                             |
| 48.74  | Rectorectostomy                                                            |
| 48.75  | Abdominal proctopexy                                                       |
| 48.76  | Other proctopexy                                                           |
| 48.79  | Other repair of rectum                                                     |
| 48.81  | Incision of perirectal tissue                                               |
| 48.82  | Excision of perirectal tissue                                               |

© 2021 Scott Fl et al. JAMA Network Open.
| Code   | Description                                      |
|--------|--------------------------------------------------|
| 48.91  | Incision of rectal stricture                     |
| 48.92  | Anorectal myectomy                               |
| 48.93  | Repair of perirectal fistula                     |
| 48.99  | Other operations on rectum and perirectal tissue |
| 50.12  | Open biopsy of liver                             |
| 50.21  | Marsupialization of lesion of liver              |
| 50.22  | Partial hepatectomy                              |
| 50.23  | Open ablation of liver lesion or tissue          |
| 50.24  | Percutaneous ablation of liver lesion or tissue  |
| 50.26  | Other and unspecified ablation of liver lesion or tissue |
| 50.29  | Other destruction of lesion of liver             |
| 50.3   | Lobectomy of liver                               |
| 50.4   | Total hepatectomy                                |
| 50.51  | Auxiliary liver transplant                       |
| 50.59  | Other transplant of liver                        |
| 50.61  | Closure of laceration of liver                   |
| 50.69  | Other repair of liver                            |
| 51.02  | Trocar cholecystostomy                           |
| 51.03  | Other cholecystostomy                            |
| 51.04  | Other cholecystotomy                             |
| 51.13  | Open biopsy of gallbladder or bile ducts         |
| 51.21  | Other partial cholecystectomy                    |
| 51.22  | Cholecystectomy                                  |
| 51.31  | Anastomosis of gallbladder to hepatic ducts      |
| 51.32  | Anastomosis of gallbladder to intestine           |
| 51.33  | Anastomosis of gallbladder to pancreas           |
| 51.34  | Anastomosis of gallbladder to stomach            |
| 51.35  | Other gallbladder anastomosis                    |
| 51.36  | Choledochoenterostomy                            |
| 51.37  | Anastomosis of hepatic duct to gastrointestinal tract |
| 51.39  | Other bile duct anastomosis                      |
| 51.41  | Common duct exploration for removal of calculus  |
| 51.42  | Common duct exploration for relief of other obstruction |
| 51.51  | Exploration of common duct                       |
| 51.61  | Excision of cystic duct remnant                  |
| 51.62  | Excision of ampulla of Vater (with reimplantation of common duct) |
| 51.63  | Other excision of common duct                    |
| 51.91  | Repair of laceration of gallbladder              |
| 51.92  | Closure of cholecystostomy                       |
| 51.93  | Closure of other biliary fistula                 |
| 51.94  | Revision of anastomosis of biliary tract         |
| 51.99  | Other operations on biliary tract                |
| 52.12  | Open biopsy of pancreas                          |
| 52.51  | Proximal pancreatectomy                          |
| 52.52  | Distal pancreatectomy                            |
| 52.53  | Radical subtotal pancreatectomy                  |
| 52.59  | Other partial pancreatectomy                     |
| 52.6   | Total pancreatectomy                             |
| 52.7   | Radical pancreaticoduodenectomy                 |
| 52.80  | Pancreatic transplant, not otherwise specified   |
| 52.81  | Reimplantation of pancreatic tissue             |
| 52.82  | Homotransplant of pancreas                      |

© 2021 Scott Fl et al. JAMA Network Open.
| Code  | Description                                           |
|-------|-------------------------------------------------------|
| 52.83 | Heterotransplant of pancreas                          |
| 52.95 | Other repair of pancreas                              |
| 52.96 | Anastomosis of pancreas                               |
| 52.99 | Other operations on pancreas                          |
| 53.00 | Unilateral repair of inguinal hernia, not otherwise specified |
| 53.01 | Other and open repair of direct inguinal hernia        |
| 53.02 | Other and open repair of indirect inguinal hernia      |
| 53.03 | Other and open repair of direct inguinal hernia with graft or prosthesis |
| 53.04 | Other and open repair of indirect inguinal hernia with graft or prosthesis |
| 53.05 | Repair of inguinal hernia with graft or prosthesis, not otherwise specified |
| 53.10 | Bilateral repair of inguinal hernia, not otherwise specified |
| 53.11 | Other and open bilateral repair of direct inguinal hernia |
| 53.12 | Other and open bilateral repair of indirect inguinal hernia |
| 53.13 | Other and open bilateral repair of inguinal hernia, one direct and one indirect |
| 53.14 | Other and open bilateral repair of direct inguinal hernia with graft or prosthesis |
| 53.15 | Other and open bilateral repair of indirect inguinal hernia with graft or prosthesis |
| 53.16 | Other and open bilateral repair of inguinal hernia, one direct and one indirect, with graft or prosthesis |
| 53.17 | Bilateral inguinal hernia repair with graft or prosthesis, not otherwise specified |
| 53.41 | Other and open repair of umbilical hernia with graft or prosthesis |
| 53.49 | Other open umbilical herniorrhaphy                     |
| 53.51 | Incisional hernia repair                              |
| 53.59 | Repair of other hernia of anterior abdominal wall      |
| 53.60 | Other incisional hernia repair with graft or prosthesis |
| 53.69 | Other and open repair of other hernia of anterior abdominal wall with graft or prosthesis |
| 53.72 | Other and open repair of diaphragmatic hernia, abdominal approach |
| 53.75 | Repair of diaphragmatic hernia, abdominal approach, not otherwise specified |
| 53.80 | Repair of diaphragmatic hernia with thoracic approach, not otherwise specified |
| 53.81 | Plication of the diaphragm                            |
| 53.82 | Repair of parasternal hernia                          |
| 53.84 | Other and open repair of diaphragmatic hernia, with thoracic approach |
| 53.9  | Other hernia repair                                   |
| 54.0  | Incision of abdominal wall                            |
| 54.23 | Biopsy of peritoneum                                  |
| 54.3  | Excision or destruction of lesion or tissue of abdominal wall or umbilicus |
| 54.4  | Excision or destruction of peritoneal tissue          |
| 54.59 | Other lysis of peritoneal adhesions                   |
| 54.61 | Reclosure of postoperative disruption of abdominal wall |
| 54.62 | Delayed closure of granulating abdominal wound        |
| 54.63 | Other suture of abdominal wall                        |
| 54.64 | Suture of peritoneum                                  |
| 54.71 | Repair of gastroschisis                               |
| 54.72 | Other repair of abdominal wall                        |
| 54.73 | Other repair of peritoneum                            |
| 54.74 | Other repair of omentum                               |
| 54.75 | Other repair of mesentery                             |
| 54.92 | Removal of foreign body from peritoneal cavity        |
| 54.95 | Incision of peritoneum                                |
| 54.96 | Injection of air into peritoneal cavity               |
| 65.09 | Other oophorotomy                                     |
| 65.19 | Other diagnostic procedures on ovaries                |
| 65.21 | Marsupialization of ovarian cyst                       |
| 65.22 | Wedge resection of ovary                              |
| CPT Code | Description |
|----------|-------------|
| 65.29    | Other local excision or destruction of ovary |
| 65.39    | Other unilateral oophorectomy |
| 65.49    | Other unilateral salpingo-oophorectomy |
| 65.51    | Other removal of both ovaries at same operative episode |
| 65.52    | Other removal of remaining ovary |
| 65.61    | Other removal of both ovaries and tubes at same operative episode |
| 65.62    | Other removal of remaining ovary and tube |
| 65.71    | Other simple suture of ovary |
| 65.72    | Other reimplantation of ovary |
| 65.73    | Other salpingo-oophoroplasty |
| 65.79    | Other repair of ovary |
| 65.89    | Other lysis of adhesions of ovary and fallopian tube |
| 65.91    | Aspiration of ovary |
| 65.92    | Transplantation of ovary |
| 65.93    | Manual rupture of ovarian cyst |
| 65.94    | Ovarian denervation |
| 65.95    | Release of torsion of ovary |
| 65.99    | Other operations on ovary |
| 66.01    | Salpingotomy |
| 66.02    | Salpingostomy |
| 66.11    | Biopsy of fallopian tube |
| 66.19    | Other diagnostic procedures on fallopian tubes |
| 68.01    | Closed biopsy of uterus |
| 68.02    | Closed biopsy of uterine ligaments |
| 68.03    | Closed biopsy of uterus |
| 68.13    | Open biopsy of uterus |
| 68.14    | Open biopsy of uterine ligaments |
| 68.15    | Closed biopsy of uterine ligaments |
| 68.16    | Closed biopsy of uterus |
| 68.39    | Other and unspecified subtotal abdominal hysterectomy |
| 68.49    | Other and unspecified total abdominal hysterectomy |
| 68.69    | Other and unspecified radical abdominal hysterectomy |
| 68.9     | Other and unspecified hysterectomy |
| 69.29    | Other repair of uterus and supporting structures |
| 70.72    | Repair of colovaginal fistula |
| 70.73    | Repair of rectovaginal fistula |
| 17.11    | Laparoscopic repair of direct inguinal hernia with graft or prosthesis |
| 17.12    | Laparoscopic repair of indirect inguinal hernia with graft or prosthesis |
| 17.13    | Laparoscopic repair of inguinal hernia with graft or prosthesis, not otherwise specified |
| 17.21    | Laparoscopic bilateral repair of direct inguinal hernia with graft or prosthesis |
| 17.22    | Laparoscopic bilateral repair of indirect inguinal hernia with graft or prosthesis |
| 17.23    | Laparoscopic bilateral repair of one direct and one indirect inguinal hernia with graft or prosthesis |
| 17.24    | Laparoscopic bilateral repair of inguinal hernia with graft or prosthesis, not otherwise specified |
| 17.31    | Laparoscopic multiple segmental resection of large intestine |
| 17.32    | Laparoscopic cecectomy |
| 17.33    | Laparoscopic-assisted right colectomy |
| 17.34    | Laparoscopic resection of transverse colon |
| 17.35    | Laparoscopic left hemicolectomy |
| 17.36    | Laparoscopic sigmoidectomy |
| 17.39    | Other laparoscopic partial excision of large intestine |

**CPT Surgical Codes and Their Description**

- **43644** Surgical laparoscopy with gastric bypass and Roux-en-Y gastroenterostomy
- **1007372** Laparoscopic Procedures on the Stomach
- **43842** Gastric restrictive procedure, without gastric bypass, for morbid obesity; other than vertical-banded gastroplasty
- **43774** Laparoscopy, surgical, gastric restrictive procedure; removal of adjustable gastric restrictive device and subcutaneous port components
| Procedure Description | Code |
|------------------------|------|
| Laparoscopy, surgical, gastric restrictive procedure; removal of adjustable gastric restrictive device and subcutaneous port components | 43771 |
| Laparoscopy, surgical; colectomy, total, abdominal, with proctectomy, with ileostomy | 44212 |
| Laparoscopic appendectomy | 44970 |
| Laparoscopic appendectomy | 44970 |
| Excisional Laparoscopic Procedures on the Rectum | 1007664 |
| Surgical laparoscopy with biopsy | 49321 |
| Laparoscopy, surgical, ablation of 1 or more liver tumor(s) | 1007835 |
| Cholecystectomy, Laparoscopic | 47562 |
| Cholecystectomy, Laparoscopic | 47562 |
| Laparoscopy, surgical, repair, ventral, umbilical, spigelian or epigastric hernia (includes mesh insertion, when performed); reducible | 49652 |
| Surgical laparoscopy with herniorrhaphy | 49659 |
| Laparoscopy, surgical, repair, incisional hernia (includes mesh insertion, when performed); reducible | 49654 |
| Repair of abdominal muscle herniation | 49540 |
| Repair of diaphragmatic hernia | 39503 |
| Exploratory laparotomy | 49000 |
| Reopening of recent laparotomy | 49002 |
| Incision Procedures on the Abdomen | 1007953 |
| Laparoscopic lysis of adhesions | 58660 |
| Laparoscopy procedure on ovary | 58679 |
| Surgical laparoscopy with biopsy | 49321 |
| Laparoscopy procedure on ovary | 58679 |
| Surgical laparoscopy with partial oophorectomy | 58681 |
| Unilateral partial/complete salpingo-oophorectomy | 58720 |
| Gynecologic Surgical Procedures | 1008681 |
| Laparoscopy procedure on ovary | 58679 |
| Surgical laparoscopy with supracervical hysterectomy | 58541 |
| Surgical laparoscopy with partial oophorectomy | 58570 |
| Surgical hysterectomy with complete hysterectomy | 58570 |
| Hysterectomy | 1013911 |
| Surgical Procedure on the Esophagus | 1007214 |
| Esophagogastrostomy by transthoracic approach | 43320 |
| Esophagogastrostomy by transabdominal approach | 43320 |
| Gastrostomy | 1007346 |
| Cutting of pyloric muscle | 43520 |
| Excision of lesion of stomach | 43601 |
| Gastrectomy, total with esophagoenterostomy | 43620 |
| Gastrectomy, partial, distal; with gastroduodenostomy | 43631 |
| Gastrectomy, partial, distal; with gastrojejunostomy | 43632 |
| Gastrectomy, partial, distal | 1007363 |
| Gastrectomy, total | 1007359 |
| Vagotomy, truncal | 43640 |
| Vagotomy, truncal | 43640 |
| Selective vagotomy | 43640 |
| Gastric restrictive procedure, with gastric bypass for morbid obesity | 1014146 |
| Gastrojejunostomy | 43820 |
| Suture of bleeding stomach ulcer | 43501 |
| Suture of duodenal injury | 43840 |
| Revision of gastroduodenal anastomosis with reconstruction | 1007410 |
| Suture of gastric injury | 43840 |
| Closure of gastrostomy | 43870 |
| Operation on stomach | 43999 |
| Incision Procedure on Intestines | 1007423 |
| Code       | Description                                                                 |
|------------|-----------------------------------------------------------------------------|
| 1006964    | Digestive System Surgical Procedures                                         |
| 1007427    | Enterotomy, small intestine, other than duodenum                             |
| 1007423    | Incision Procedure on Intestines                                             |
| 44799      | Procedure on small intestine                                                 |
| 45399      | Large bowel procedure                                                        |
| 1007422    | Surgical Procedures on the Intestines                                        |
| 44799      | Procedure on small intestine                                                 |
| 44110      | enterotomy and excision of lesion of large intestine                         |
| 1007433    | Excision Procedures on the Intestines                                        |
| 44130      | Anastomosis of the Intestine                                                 |
| 44799      | Procedure on small intestine                                                 |
| 44320      | Colostomy Procedure                                                          |
| 44310      | ileostomy or jejunostomy, non-tube                                            |
| 44300      | Open placement of enterostomy tube                                           |
| 44372      | small intestinal endoscopy; with placement of percutaneous jejunostomy tube  |
| 1007496    | Enterostomy- external fistulization of intestines procedure                  |
| 1007545    | Repair procedures on the intestines (except rectum)                          |
| 44346      | Repair of paracolostomy hernia                                               |
| 1007545    | Repair procedures on the intestines (except rectum)                          |
| 44620      | Closure of stoma of small intestine                                          |
| 1007422    | Surgical Procedures on the Intestines                                        |
| 43840      | Suture of duodenal wound                                                     |
| 1007546    | Sulture of small intestine for perforated ulcer, diverticulum, wound, injury or rupture |
| 44799      | Procedure on small intestine                                                 |
| 44604      | Suture of large intestine for perforated ulcer, diverticulum, wound, injury or rupture |
| 1007545    | Repair procedures on the intestines (except rectum)                          |
| 1007422    | Surgical Procedures on the Intestines                                        |
| 44130      | Anastomosis of small intestine                                               |
| 44136      | Transplantation of donor small bowel                                         |
| 1007652    | Other operations on intestines                                               |
| 44950      | Appendectomy                                                                 |
| 44955      | Appendectomy; when done for indicated purpose at time of other major procedure (not as separate procedure) (List separately in addition to code for primary procedure) |
| 44900      | Incision and drainage of appendiceal abscess, open                           |
| 45399      | Large bowel procedure                                                        |
| 1007578    | Operation on appendix                                                        |
| 1007592    | Incision of rectum                                                           |
| 45999      | Procedure on rectum                                                          |
| 45111      | Proctectomy; partial resection of rectum, transabdominal approach            |
| 45135      | Repair of prolapsed rectum                                                   |
| 1007591    | Surgical Procedures on the Colon and Rectum                                 |
| 45540      | Repair of rectal prolapse by abdominal approach                              |
| 1007671    | Repair of rectum                                                             |
| 1007596    | Excision Procedures on the Rectum                                            |
| 1007795    | Surgical Procedures on the Liver                                              |
| 47300      | Marsupialization of cyst of abscess of liver                                 |
| 47120      | Partial hepatectomy                                                          |
| 1007840    | Ablation, open, of 1 or more liver tumor(s)                                  |
| 4783       | Ablation, 1 or more liver tumor(s), percutaneous, cryoablation              |
| 1007840    | Ablation, open, of 1 or more liver tumor(s)                                  |
| 1007795    | Surgical Procedures on the Liver                                              |
| 1007806    | Hepatectomy, resection of liver                                               |
| 1007811    | Transplantation of liver                                                     |
| Code       | Description                                                                 |
|------------|-----------------------------------------------------------------------------|
| 1007845    | Biliary Tract surgical Procedures                                           |
| 1007827    | Repair of liver                                                             |
| 47600      | Cholecystectomy procedure                                                   |
| 47612      | Cholecystectomy with exploration of common duct with choledochoenterostomy  |
| 1007878    | Biliary tract excision                                                       |
| 48148      | Excision of ampulla of vater                                                |
| 1007892    | Biliary Tract repair                                                        |
| 47600      | Cholecystectomy procedure                                                   |
| 48100      | Open biopsy of pancreas                                                     |
| 1007914    | Pancreatectomy                                                               |
| 48140      | Distal subtotal pancreatectomy                                               |
| 48999      | Pancreas Procedure                                                          |
| 1007944    | Pancreas Transplantation                                                    |
| 1007934    | Repair of pancreas                                                          |
| 48999      | Procedures on Pancreas                                                      |
| 49521      | Repair of incarcerated or strangulated recurrent inguinal hernia            |
| 1008001    | Hernioplasty, Herniorrhaphy, Herniotomy Procedures                           |
| 49560      | Repair of incisional or abdominal hernia                                     |
| 39503      | Repair of diaphragmatic hernia                                               |
| 1007953    | Abdomen, Peritoneum and Omentum: Incision                                   |
| 49999      | Procedure on abdomen, peritoneum, and omentum                               |
| 1007971    | Excision and Destruction Procedures on the Abdomen, Peritoneum and Omentum  |
| 1008054    | Suture Procedures on the Abdomen, Peritoneum, and Omentum                   |
| 49605      | Repair of gastrochisis                                                       |
| 100800     | Abdomen, Peritoneum and Omentum: Repair                                     |
| 1007570    | Surgical Procedures on Meckel's Diverticulum and Mesentery                   |
| 49402      | Removal of foreign body from peritoneal cavity                              |
| 1007953    | Abdomen, Peritoneum and Omentum: incision                                   |
| 49400      | Injection of air or contrast into peritoneal cavity                          |
| 1008915    | Incision of ovary                                                           |
| 1008914    | Operation on Ovary                                                          |
| 58925      | Removal of ovarian cysts                                                    |
| 58920      | Wedge resection of ovary                                                    |
| 58940      | Unilateral oophorectomy                                                     |
| 58720      | Salpingo-oophorectomy, complete or partial, unilateral or bilateral (separate procedure) |
| 58970      | Aspiration of eggs from ovaries                                              |
| 1008919    | drainage of ovarian abscess                                                  |
| 1008890    | Incision Procedures on the Oviduct/Ovary                                     |
| 558770     | Salpingostomy                                                               |
| 1008681    | Surgical Procedures on the Female Genital System                             |
| 58100      | Endometrial sampling (biopsy) with or without endocervical sampling (biopsy), without cervical dilation, any method (separate procedure) |
| 59525      | This is for partial hysterectomy                                             |
| 58150      | Complete abdominal hysterectomy                                              |
| 1013911    | Hysterectomy                                                                 |
| 1008681    | Surgical Procedures on the Female Genital System                             |
| 59300      | Repair of vagina                                                            |
| 49650      | Surgical laparoscopy with repair of inguinal hernia                          |
| 44238      | Laparoscopy procedure on intestine                                           |
| 1007479    | Laparoscopic excision procedures on the intestines                            |
**Table 3. Baseline characteristics of the study cohort within THIN stratified by the presence of adhesion-related complications**

| Variable | No adhesion-related complication | Any adhesion-related complication | Small bowel obstruction* |
|----------|----------------------------------|-----------------------------------|--------------------------|
|          | N | 2,060 (1.39%) | 0.29 (0.28, 0.31) | 1,489 (1.0%) | 0.21 (0.20, 0.22) |
| **Sex** | | | | |
| Male     | 43,645 (29.8%) | 805 (39.1%) | 0.42 (0.40, 0.46) | 722 (48.5%) | 0.38 (0.35, 0.41) |
| Female   | 102,896 (70.2%) | 1,255 (60.9%) | 0.24 (0.23, 0.26) | 767 (51.5%) | 0.15 (0.14, 0.16) |
| **Age** | | | | |
| 18-44    | 66,613 (45.5%) | 612 (29.7%) | 0.18 (0.17, 0.20) | 199 (13.4%) | 0.06 (0.05, 0.07) |
| 45-64    | 46,211 (31.5%) | 642 (31.2%) | 0.28 (0.26, 0.30) | 535 (35.9%) | 0.23 (0.21, 0.25) |
| 65+      | 33,717 (23.0%) | 806 (39.1%) | 0.60 (0.56, 0.64) | 755 (50.7%) | 0.56 (0.52, 0.60) |
| **Medical comorbidities prior to surgery** | | | | |
| Diabetes | 11,783 (8.0%) | 152 (7.4%) | 0.35 (0.30, 0.41) | 134 (9%) | 0.31 (0.26, 0.37) |
| Obesity  | 40,997 (28.0%) | 437 (21.2%) | 0.27 (0.22, 0.32) | 318 (21.4%) | 0.19 (0.16, 0.23) |
| Hyperlipidemia | 6,840 (4.7%) | 111 (5.4%) | 0.48 (0.30, 0.77) | 93 (6.3%) | 0.36 (0.21, 0.63) |
| Hypertension | 22,856 (15.6%) | 385 (18.7%) | 0.40 (0.36, 0.44) | 341 (22.9%) | 0.36 (0.32, 0.40) |
| Tobacco use | 87,918 (60%) | 1,315 (63.8%) | 0.33 (0.31, 0.34) | 960 (64.5%) | 0.24 (0.22, 0.25) |
| Cancer history | 16,342 (11.2%) | 508 (24.7%) | 0.86 (0.79, 0.94) | 463 (31.1%) | 0.79 (0.72, 0.86) |
| **Surgical site** | | | | |
| Bowel surgery | 32,453 (22.2%) | 857 (41.6%) | 0.61 (0.57, 0.65) | 754 (50.6%) | 0.54 (0.50, 0.58) |
| Non-bowel surgery | 114,088 (77.9%) | 1,203 (58.4%) | 0.21 (0.57, 0.65) | 735 (49.4%) | 0.13 (0.12, 0.14) |
| **Medication use at the time of surgery** | | | | |
| Statin use | 17,096 (11.7%) | 281 (13.6%) | 0.43 (0.38, 0.49) | 251 (16.9%) | 0.39 (0.34, 0.44) |
| Fibrate use | 856 (0.6%) | 14 (0.7%) | 0.47 (0.28, 0.79) | 13 (0.9%) | 0.43 (0.25, 0.75) |
| Former Statin use | 3,428 (2.3%) | 51 (2.5%) | 0.74 (0.56, 0.97) | 46 (3.1%) | 0.66 (0.50, 0.89) |
| ACE/ARB use | 18,722 (12.6%) | 312 (15.2%) | 0.42 (0.38, 0.47) | 278 (18.7%) | 0.37 (0.33, 0.42) |

*Small bowel obstructions were a subgroup of any adhesion-related complications.*
Table 4. Association between statin use and covariates with small bowel obstruction in THIN

| Exposure                                      | Completely adjusted model (HR, 95% CI) | Parsimonious model* (HR, 95% CI) |
|-----------------------------------------------|---------------------------------------|----------------------------------|
| Statin use at the time of surgery            | 0.83 (0.71, 0.96)                     | 0.80 (0.70, 0.92)                |
| Female gender                                 | 0.85 (0.76, 0.95)                     |                                  |
| Age (reference: 18-44)                        |                                       |                                  |
| 45-64                                         | 3.70 (3.13, 4.37)                     | 3.71 (3.15, 4.38)                |
| 65+                                           | 6.29 (5.29, 7.47)                     | 6.27 (5.30, 7.42)                |
| Hypertension                                  | 0.91 (0.80, 1.04)                     |                                  |
| Diabetes                                      | 0.88 (0.73, 1.06)                     |                                  |
| Hyperlipidemia                                | 1.05 (0.60, 1.81)                     |                                  |
| Obesity                                       | 0.93 (0.75, 1.15)                     |                                  |
| Tobacco use                                   | 1.20 (1.08, 1.34)                     | 1.21 (1.09, 1.35)                |
| Surgical site involving the bowel            | 2.75 (2.46, 3.08)                     | 2.86 (2.57, 3.18)                |
| History of malignancy                        | 1.72 (1.52, 1.94)                     | 1.74 (1.54, 1.96)                |

*Parsimonious model created through stepwise backwards elimination, with remaining covariates
Table 5. Baseline characteristics of surgical cohort within Optum, stratified by the presence of adhesion related complications

| Variable                      | No adhesion-related complication | Any adhesion-related complication | Small bowel obstruction* |
|-------------------------------|-----------------------------------|-----------------------------------|--------------------------|
|                               | N                                 | Unadjusted incidence rate         | N                        | Unadjusted incidence rate |
|                               | 1,134,081                         | 54,136 (4.6%)                    | 1.36 (1.35, 1.37)        | 29,364 (2.5%)             | 0.72 (0.72, 0.73)         |

Sex

|       | Male                               | Female                             |
|-------|------------------------------------|------------------------------------|
| Sex   |                                    |                                    |
| Male  | 310,849 (27.4%)                    | 823,232 (72.6%)                    |
|       | 14,690 (27.1%)                     | 39,446 (72.9%)                     |
|       | 1.36 (1.34, 1.38)                  | 1.36 (1.34, 1.37)                  |
|       | 11,507 (39.2%)                     | 17,857 (60.8%)                     |
|       | 1.06 (1.04, 1.08)                  | 0.60 (0.59, 0.61)                  |
| Female|                                    |                                    |
|       | 448,295 (39.5%)                    | 78%                                |
|       | 18,459 (34.1%)                     | 39%                                |
|       | 1.22 (1.21, 1.24)                  | 1.36 (1.34, 1.37)                  |
|       | 5,915 (20.1%)                      | 1.06 (1.04, 1.08)                  |
|       | 0.38 (0.37, 0.39)                  |                                    |

Age

|     | 18-44                              | 45-64                              |
|-----|------------------------------------|------------------------------------|
| Age |                                    |                                    |
| 18-44| 448,295 (39.5%)                    | 507,649 (44.8%)                    |
|     | 18,459 (34.1%)                     | 21,955 (40.6%)                     |
|     | 2.09 (2.06, 2.13)                  | 12,372 (42.1%)                     |
|     | 0.67 (0.66, 0.68)                  | 1.06 (1.04, 1.08)                  |
| 45-64| 178,137 (15.7%)                    | 158,937 (14.0%)                    |
|     | 13,722 (25.3%)                     | 9,692 (17.9%)                      |
|     | 2.09 (2.06, 2.13)                  | 1.36 (1.34, 1.37)                  |
|     | 0.67 (0.66, 0.68)                  | 1.06 (1.04, 1.08)                  |
| 65+  | 178,137 (15.7%)                    | 158,937 (14.0%)                    |
|     | 13,722 (25.3%)                     | 9,692 (17.9%)                      |
|     | 2.09 (2.06, 2.13)                  | 1.36 (1.34, 1.37)                  |
|     | 0.67 (0.66, 0.68)                  | 1.06 (1.04, 1.08)                  |

Medical comorbidities prior to surgery

| Medical comorbidity                        | No adhesion-related complication | Any adhesion-related complication | Small bowel obstruction* |
|--------------------------------------------|----------------------------------|-----------------------------------|--------------------------|
|                                            | N                                 | Unadjusted incidence rate         | N                        | Unadjusted incidence rate |
| Hypertension                               | 306,237 (27.0%)                  | 19,275 (35.6%)                    | 1.78 (1.76, 1.81)        | 12,589 (42.9%)             | 1.15 (1.13, 1.17)         |
| Diabetes                                   | 163,090 (14.4%)                  | 10,610 (19.6%)                    | 1.94 (1.90, 1.97)        | 6,886 (23.5%)              | 1.23 (1.20, 1.26)         |
| Obesity                                    | 158,977 (14.0%)                  | 9,692 (17.9%)                     | 1.88 (1.84, 1.91)        | 5,261 (17.9%)              | 1.00 (0.97, 1.02)         |
| Hyperlipidemia                             | 470,581 (41.5%)                  | 25,418 (47.0%)                    | 1.53 (1.51, 1.54)        | 15,899 (54.1%)             | 0.94 (0.92, 0.95)         |
| Tobacco use                                | 100,630 (8.9%)                   | 6,164 (11.4%)                     | 1.94 (1.89, 1.99)        | 3,843 (13.1%)              | 1.19 (1.15, 1.23)         |
| Cancer history                             | 115,800 (10.2%)                  | 10,935 (20.2%)                    | 2.69 (2.64, 2.74)        | 8,142 (27.7%)              | 1.97 (1.92, 2.01)         |

Surgical site

| Surgical site                          | No adhesion-related complication | Any adhesion-related complication | Small bowel obstruction* |
|----------------------------------------|----------------------------------|-----------------------------------|--------------------------|
|                                        | N                                 | Unadjusted incidence rate         | N                        | Unadjusted incidence rate |
| Bowel Surgery                          | 156,748 (13.8%)                  | 12,773 (23.6%)                    | 2.41 (2.37, 2.45)        | 9,560 (32.6%)             | 1.78 (1.74, 1.81)         |
| Non-bowel surgery                      | 977,333 (86.2%)                  | 41,363 (76.4%)                    | 1.120 (1.18, 1.21)       | 19,804 (67.4%)             | 0.56 (0.56, 0.57)         |

Medication use at the time of surgery

| Medication use at the time of surgery | No adhesion-related complication | Any adhesion-related complication | Small bowel obstruction* |
|--------------------------------------|----------------------------------|-----------------------------------|--------------------------|
| Statin use                            | 121,504 (10.7%)                  | 6,722 (12.4%)                     | 1.59 (1.55, 1.62)        | 4,498 (15.3%)             | 1.05 (1.01, 1.08)         |
| Fibrate use                           | 4,322 (0.4%)                     | 236 (0.4%)                        | 1.67 (1.47, 1.90)        | 164 (0.6%)                | 1.15 (0.99, 1.34)         |
| Former Statin use                     | 95,207 (8.4%)                    | 5,580 (10.3%)                     | 1.71 (1.66, 1.75)        | 3,811 (13.0%)             | 1.15 (1.11, 1.19)         |

Baseline characteristics for those in Optum without an outcome of interest and those with adhesion-related complication (ARC) or small bowel obstruction (SBO). Incidence rates presented per 100 person years. *SBOs are a subgroup of ARCs.
Table 6. Association between statin use and covariates with small bowel obstruction in Optum

| Exposure                                         | Fully Adjusted model* (HR, 95% CI) |
|-------------------------------------------------|------------------------------------|
| Statin use at the time of surgery               | 0.88 (0.85, 0.91)                  |
| Male gender                                     | 1.16 (1.13, 1.19)                  |
| Age (reference: 18-44)                          | Ref                                |
| 45-64                                           | 1.63 (1.58, 1.68)                  |
| 65+                                             | 3.08 (2.97, 3.19)                  |
| Hypertension                                    | 1.23 (1.19, 1.26)                  |
| Diabetes                                        | 1.16 (1.12, 1.19)                  |
| Hyperlipidemia                                  | 0.93 (0.91, 0.96)                  |
| Obesity                                         | 1.34 (1.29, 1.38)                  |
| Tobacco use                                     | 1.41 (1.37, 1.46)                  |
| Surgical site involving the bowel              | 2.51 (2.45, 2.58)                  |
| History of malignancy                          | 1.99 (1.94, 2.05)                  |

*Backwards elimination was not performed given findings of fully adjusted model in Optum
Table 7. Multivariable model assessing the association between former statin use, fibrate use, and adhesion-related complications (ARCs) and small bowel obstruction (SBO) after surgery in Optum's Clinformatics® Data Mart

| Exposure                        | Parsimonious model in Optum* |                  |
|---------------------------------|------------------------------|------------------|
|                                 | Any adhesion-related complication (HR, 95% CI) | Small bowel obstruction (HR, 95% CI) |
| Never statin use                | Ref                          | Ref              |
| Former statin use               | 0.99 (0.96, 1.02)            | 1.01 (0.97, 1.05) |
| Statin use at the time of surgery| 0.92 (0.89, 0.95)            | 0.89 (0.85, 0.92) |
| Fibrate use at the time of surgery| 0.96 (0.84, 1.09)            | 0.96 (0.82, 1.12) |
| Male Gender                     | 0.79 (0.77, 0.80)            | 1.16 (1.13, 1.19) |
| Age: 18-44                      | Ref                          | Ref              |
| 45-64                           | 0.94 (0.93, 0.96)            | 1.63 (1.58, 1.68) |
| 65+                             | 1.37 (1.34, 1.41)            | 3.07 (2.96, 3.19) |
| Diabetes                        | 1.17 (1.14, 1.20)            | 1.16 (1.12, 1.19) |
| Obesity                         | 1.28 (1.25, 1.31)            | 1.34 (1.29, 1.38) |
| Hyperlipidemia                  | 0.96 (0.94, 0.98)            | 0.93 (0.91, 0.96) |
| Hypertension                    | 1.21 (1.19, 1.24)            | 1.23 (1.19, 1.26) |
| Tobacco use                     | 1.31 (1.27, 1.34)            | 1.41 (1.37, 1.46) |
| History of malignancy           | 1.82 (1.78, 1.86)            | 1.99 (1.94, 2.05) |
| Surgical site involving the bowel| 1.87 (1.83, 1.91)          | 2.51 (2.45, 2.58) |

*Parsimonious model developed via backwards elimination in primary analyses. Multivariable model from primary analysis was used with the addition of variables for former statin use and fibrate use to assess their association with the outcome and effect on concurrent statin use.
**Table 8. Multivariable model assessing the association between statin dose intensity and adhesion-related complications (ARCs) and small bowel obstruction (SBO) after surgery in The Health Improvement Network**

| Exposure                                      | Adhesion-related complications (HR, 95%CI) | Small Bowel Obstruction (HR, 95% CI) |
|-----------------------------------------------|------------------------------------------|-------------------------------------|
| Statin use at the time of surgery             |                                          |                                     |
| Low intensity                                 | 0.95 (0.68, 1.32)                        | 0.94 (0.66, 1.33)                   |
| Moderate Intensity                            | 0.78 (0.67, 0.91)                        | 0.79 (0.67, 0.93)                   |
| High Intensity                                | 0.77 (0.52, 1.14)                        | 0.69 (0.44, 1.07)                   |
| Age (reference: 18-44)                        |                                          |                                     |
| 45-64                                         | 1.45 (1.29, 1.62)                        | 3.72 (3.15, 4.38)                   |
| 65+                                           | 2.27 (2.01, 2.56)                        | 6.26 (5.29, 7.41)                   |
| Tobacco use                                   | 1.21 (1.11, 1.33)                        | 1.21 (1.09, 1.35)                   |
| Surgical site involving the bowel             | 2.17 (1.98, 2.38)                        | 2.86 (2.57, 3.19)                   |
| History of malignancy                         | 1.81 (1.61, 2.02)                        | 1.74 (1.54, 1.96)                   |

*Parsimonious model developed via backwards elimination in primary analyses. Multivariable model from primary analysis was used with the addition of statin use stratified by LDL lowering intensity.*
### Table 9. Multivariable model assessing the association between statin use at the time of surgery and adhesion-related complications (ARCs) and small bowel obstruction (SBO) after surgery in The Health Improvement Network, adjusting for year of initial surgery and country of origin

| Exposure                                         | Adhesion-related complications (HR, 95%CI) | Small Bowel Obstruction (HR, 95%CI) |
|--------------------------------------------------|------------------------------------------|-------------------------------------|
| Statin use at the time of surgery                | 0.84 (0.73, 0.96)                        | 0.86 (0.74, 0.99)                   |
| Age (reference: 18-44)                           |                                          |                                     |
| 45-64                                            | 1.45 (1.29, 1.62)                        | 3.71 (3.14, 4.37)                   |
| 65+                                              | 2.25 (1.99, 2.53)                        | 6.16 (5.21, 7.29)                   |
| Tobacco use                                      | 1.21 (1.11, 1.33)                        | 1.23 (1.11, 1.38)                   |
| Surgical site involving the bowel                | 2.17 (1.98, 2.38)                        | 2.86 (2.57, 3.18)                   |
| History of malignancy                            | 1.82 (1.63, 2.05)                        | 1.78 (1.57, 2.01)                   |
| Year of incident surgery                         | 0.98 (0.97, 0.99)                        | 0.96 (0.95, 0.98)                   |
| Country (reference: England)                     |                                          |                                     |
| Wales                                            | 0.81 (0.67, 0.98)                        | 0.74 (0.58, 0.94)                   |
| Scotland                                         | 1.10 (0.95, 1.29)                        | 1.17 (0.98, 1.40)                   |
| Northern Ireland                                 | 0.92 (0.72, 1.17)                        | 0.88 (0.66, 1.18)                   |

*Parsimonious model developed via backwards elimination in primary analyses. Multivariable model from primary analysis was used with the addition of surgical year, included as a continuous variable including all years within THIN, and country of origin. The cohort of interest within THIN includes data from England (81.1%), Wales (6.4%), Scotland (8.8%), and Northern Ireland (3.7%).

© 2021 Scott FI et al. JAMA Network Open.
eTable 10. Association between statin use at the time of surgery and ARCs and SBOs occurring within 5, 4, 3, 2, and 1 years of the incident surgical event

| Number of events in each time window | Required window for outcome to have occurred |
|--------------------------------------|---------------------------------------------|
|                                       | Any time during follow-up | 5 years | 4 years | 3 years | 2 years | 1 year |
| ARCst                                | 2,060                        | 1,764   | 1,638   | 1,494   | 1,255   | 874    |
| SBOs                                 | 1,489                        | 1,270   | 1,184   | 1,078   | 916     | 645    |

| HR of statins | HR (95% CI) | HR (95% CI) | HR (95% CI) | HR (95% CI) | HR (95% CI) |
|---------------|-------------|-------------|-------------|-------------|-------------|
| ARCs          | 0.79 (0.69, 0.91) | 0.80 (0.70, 0.93) | 0.80 (0.69, 0.93) | 0.81 (0.68, 0.95) | 0.82 (0.68, 0.998) |
| SBOs          | 0.79 (0.68, 0.91) | 0.79 (0.68, 0.93) | 0.79 (0.68, 0.93) | 0.80 (0.68, 0.96) | 0.85 (0.96, 1.03) |

Association between statin use at the time of surgery and ARCs and SBOs occurring at any time during follow-up, as well as only considering events that occurred within 5, 4, 3, 2, or 1 years of the incident surgical event. HRs presented here were calculated in parsimonious adjusted model.
Covariate balance with 1:1 matching in propensity score analyses

Covariate balance between statin exposed and unexposed individuals at the time of surgery, prior to and after propensity score matching.
eReferences
1. Leuven E, Sianesi B. PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing. Boston College Department of Economics. [https://ideas.repec.org/c/boc/bocode/s432001.html](https://ideas.repec.org/c/boc/bocode/s432001.html). Published 2016. Accessed 2020.
2. Garrido MM, Kelley AS, Paris J, et al. Methods for Constructing and Assessing Propensity Scores. *Health Services Research*. 2014;49(5):1701-1720.
3. Vajravelu RK, Osterman MT, Aberra FN, et al. Indeterminate QuantiFERON-TB Gold Increases Likelihood of Inflammatory Bowel Disease Treatment Delay and Hospitalization. *Inflamm Bowel Dis*. 2017;24(1):217-226.
4. VanderWeele TJ, Ding P. Sensitivity Analysis in Observational Research: Introducing the E-Value. *Ann Intern Med*. 2017;167(4):268-274.