**Supplemental Content 3.**

**Table S1.** Surgical Codes for Cohort Assembly

|  |  |  |  |
| --- | --- | --- | --- |
| **Surgical Category** | **Surgery Type** | **CCI Code** | **ICD-10-CA codes or Special Notes** |
| **Varicose Vein** | open approach autograft | 1.KR.87.LA-XX-A  |  |
| open approach (no tissue) | 1.KR.87.L A  |  |
| open approach with stripping technique (no tissue) | 1.KR.87.WM  |  |
| open approach with sympathectomy (no tissue) | 1.KR.87.WK  |  |
| open approach with sympathectomy (autograft) | 1.KR.87.WK-XX-A  |  |
| open approach with special (micro) excision technique  | 1.KR.87.WJ  |  |
| **Laparoscopic cholecystectomy** | Lap cholecystectomy alone  | 1.OD.89.DA  |  |
| Lap cholecystectomy with bile duct exploration and no stones extracted  | 1.OD.89.EC  |  |
| Lap calculi using balloon device  | 1.OD.89.DT-BD  |  |
| Lap calculi using basket device  | 1.OD.89.DT-AM  |  |
| Lap calculi using device NEC [e.g. forceps, metal probe]  | 1.OD.89.DT-GX  |  |
| Lap calculi using electrohydraulic probe  | 1.OD.89.DT-AS  |  |
| Lap calculi using laser probe  | 1.OD.89.DT-AG  |  |
| **Open cholecystectomy** | open cholecystectomy alone  | 1.OD.89.L A  |  |
| open cholecystectomy with bile duct exploration and no stones extracted  | 1.OD.89.TP  |  |
| open calculi using balloon device  | 1.OD.89.SM-BD  |  |
| open Calculi using basket device  | 1.OD.89.SM-AM  |  |
| Open Calculi using device NEC [e.g. forceps, metal probe]  | 1.OD.89.SM-GX  |  |
| Open Calculi using electrohydraulic probe  | 1.OD.89.SM-AS  |  |
| Open Calculi using laser probe  | 1.OD.89.SM-AG  |  |
| **Open Appendectomy** | **Open Appendectomy** | 1.NV.89.LA  | \*\*\* Exclude "B" status attribute (incidental to another procedure) \*\*\* |
| **Laparoscopic Appendectomy** | Laparoscopic Appendectomy | 1.NV.89.DA  |
| **Haemorrhoidectomy** | Haemorrhoidectomy (internal) | 1.NQ.87.^^  |  |
| Haemorrhoidectomy (external) - Excision | 1.NT.87.LA  |  |
| Haemorrhoidectomy (external) - using ligature dissection technique | 1.NT.87.UR  |  |
| Haemorrhoidectomy (external) - using ligature dissection and encirclage device [e.g. rubber band ligature]  | 1.NT.87.UR-FA  |  |
| **Thyroidectomy** | **Partial Thyroidectomy** | **1.FU.87.^^**  |  |
| Partial Thyroid - Open | 1.FU.87.NZ |  |
| Partial Thyroid - Open Substernal | 1.FU.87.PZ |  |
| Partial Thyroid - Open Trans-oral | 1.FU.87.QT |  |
| Partial Thyroid - Endoscopic | 1.FU.87.DA |  |
| Partial Thyroid - Open - Laser | 1.FU.87.NZ-AG |  |
| Partial Thyroid - Open Substernal - Laser | 1.FU.87.PZ-AG |  |
| Partial Thyroid - Open Trans-oral - Laser | 1.FU.87.QT-AG |  |
| Partial Thyroid - Endoscopic - Laser | 1.FU.87.DA-AG |  |
| **Total Thyroid** | **1.FU.89.^^**  |  |
| Total Thyroid - Open | 1.FU.89.NZ  |  |
| Total Thyroid - Open Substernal | 1.FU.89.PZ  |  |
| Total Thyroid - Endoscopic | 1.FU.89.DA  |  |
| Total Thyroid - Open - Laser | 1.FU.89.NZ-AG  |  |
| total Thyroid - Open Substernal - Laser | 1.FU.89.PZ-AG  |  |
| Total thyroid - Endoscopic - Laser | 1.FU.89.DA-AG  |  |
| **TURP (Partial Excision Prostate)** | **TURP (Partial Excision Prostate)** | **1.QT.87** |  |
| TURP using device NEC | 1.QT.87.BA-GX |  |
| TURP using laser | 1.QT.87.BA-AG |  |
| TURP using loop electrode | 1.QT.87.BA-AK |  |
| **Parathyroidectomy** | **Partial Parathyroidectomy** | **1.FV.87.^^**  |  |
| Partial Parathyroidectomy - Open Neck | 1.FV .87.NZ  |  |
| Partial Parathyroidectomy - Open substernal | 1.FV .87.PZ  |  |
| Partial Parathyroidectomy - Open Neck - Laser | 1.FV .87.NZ-AG  |  |
| Partial Parathyroidectomy - Open substernal - Laser | 1.FV .87.PZ-AG  |  |
| **Total Parathyroidectomy** | **1.FV.89.^^**  |  |
| Total Parathyroidectomy - Open Neck | 1.FV .89.NZ  |  |
| Total Parathyroidectomy - Open substernal | 1.FV .89.PZ  |  |
| Total Parathyroidectomy - Open Neck - Laser | 1.FV .89.NZ-AG  |  |
| Total Parathyroidectomy - Open substernal - Laser | 1.FV .89.PZ-AG  |  |
| **Reimplantation parathyroidectomy** | **1.FV.83.^^**  |  |
| Re-Implant Parathyroidectomy - Open Neck | 1.FV .83.NZ  |  |
| Re-implantation Parathyroidectomy - Open substernal | 1.FV .83.PZ  |  |
| Re-Implantation Parathyroidectomy - Open Neck - Laser | 1.FV .83.NZ-AG  |  |
| Re-implantation Parathyroidectomy - Open substernal - Laser | 1.FV .83.PZ-AG  |  |
| **Carpal Tunnel Repair** | **Carpal Tunnel** | **1.BN.72.^^**  |  |
| Carpal Tunnel - Open | 1.BN.72.DA |  |
| Carpal Tunnel - Endoscopic | 1.BN.72.LA  |  |
| **Laparoscopic Hysterectomy** | Total Hysterectomy - using combined laparoscopic and vaginal approach | 1.RM.89.AA |  |
| Total Hysterectomy - vaginal approach | 1.RM.89.CA |  |
| Total Hysterectomy - using endoscopic (laparoscopic) approach | 1.RM.89.DA |  |
| Radical Hysterectomy - using combined laparoscopic and vaginal approach | 1.RM.91.AA  |  |
| Radical Hysterectomy - vaginal approach | 1.RM.91.CA  |  |
| Radical Hysterectomy - using endoscopic (laparoscopic) approach | 1.RM.91.DA |  |
| **Laparoscopic Colectomy** | Total Colectomy - Lap - ileorectal [endorectal, ileoproctostomy] anastomosis technique  | 1.NM.89.DF  |  |
| Total Colectomy - Lap - stoma formation with distal closure | 1.NM.89.DX  |  |
| Partial Colectomy - Lap - simple excisional technique  | 1.NM.87.LA  |  |
| Partial Colectomy - Lap - colocolostomy anastomosis technique  | 1.NM.87.RN  |  |
| Partial Colectomy - Lap - colorectal anastomosis technique  | 1.NM.87.RD  |  |
| Partial Colectomy - Lap - enterocolostomy anastomosis technique  | 1.NM.87.RE  |  |
| Partial Colectomy - Lap - stoma formation and distal closure  | 1.NM.87.TF  |  |
| Partial Colectomy - Lap - stoma formation with creation of mucous fistula  | 1.NM.87.TG  |  |
| Partial Colectomy - Lap - special excisional technique (without anastomosis)  | 1.NM.87.WJ  |  |
| **Open Colectomy** | Total Colectomy - Open - ileorectal [endorectal, ileoproctostomy] anastomosis technique  | 1.NM.89.RN  |  |
| Total Colectomy - Open - stoma formation with distal closure | 1.NM.89.TF  |  |
| Partial Colectomy - Open - simple excisional technique  | 1.NM.87.DA  |  |
| Partial Colectomy - Open - colocolostomy anastomosis technique  | 1.NM.87.DF  |  |
| Partial Colectomy - Open - colorectal anastomosis technique  | 1.NM.87.DE  |  |
| Partial Colectomy - Open - enterocolostomy anastomosis technique  | 1.NM.87.DN  |  |
| Partial Colectomy - Open - stoma formation and distal closure  | 1.NM.87.DX  |  |
| Partial Colectomy - Open - stoma formation with creation of mucous fistula  | 1.NM.87.DY  |  |
| Partial Colectomy - Open - special excisional technique (without anastomosis)  | 1.NM.87.GB  |  |
| **Reflux Surgery** | **Repair Esophagus** | **1.NA.80**  | K21 Gastroesophageal Reflux Disease |
| Esophagus - Suturing - using combined endoscopic thoracoabdominal approach | 1.NA.80.FA |
| Esophagus - Suturing - using combined open thoracoabdominal approach | 1.NA.80.QG |
| Esophagus - Suturing - using endoscopic abdominal approach  | 1.NA.80.DB |
| Esophagus - Suturing - using endoscopic per orifice approach | 1.NA.80.BA |
| Esophagus - Suturing - using endoscopic thoracic approach  | 1.NA.80.EZ |
| Esophagus - Suturing - using open abdominal approach  | 1.NA.80.LB |
| Esophagus - Suturing - using open cervical approach | 1.NA.80.LP |
| Esophagus - Suturing - using open thoracic approach  | 1.NA.80.QB |
| Esophagus - Free Flap - using combined endoscopic thoracoabdominal approach | 1.NA.80.FA-XX-F |
| Esophagus - Free Flap - using combined open thoracoabdominal approach | 1.NA.80.QG-XX-F |
| Esophagus - Free Flap - using endoscopic abdominal approach  | 1.NA.80.DB-XX-F |
| Esophagus - Free Flap - using open abdominal approach  | 1.NA.80.LB-XX-F |
| Esophagus - Free Flap - using open cervical approach | 1.NA.80.LP-XX-F |
| Esophagus - Free Flap - using open thoracic approach  | 1.NA.80.QB-XX-F |
| Esophagus - Fundoplication - using combined endoscopic thoracoabdominal approach | 1.NA.80.FA-XX-E |
| Esophagus - Fundoplication - using combined open thoracoabdominal approach | 1.NA.80.QG-XX-E |
| Esophagus - Fundoplication - using endoscopic abdominal approach  | 1.NA.80.DB-XX-E |
| Esophagus - Fundoplication - using endoscopic thoracic approach  | 1.NA.80.EZ-XX-E |
| Esophagus - Fundoplication - using open abdominal approach  | 1.NA.80.LB-XX-E |
| Esophagus - Fundoplication - using open thoracic approach  | 1.NA.80.QB-XX-E |
| Esophagus - Pedicle - using combined endoscopic thoracoabdominal approach | 1.NA.80.FA-XX-G |
| Esophagus - Pedicle - using combined open thoracoabdominal approach | 1.NA.80.QG-XX-G |
| Esophagus - Pedicle - using open thoracic approach  | 1.NA.80.QB-XX-G |
| **Repair Diaphragm** | **1.GX.80**  |
| Diaphragm - Combined Flap - open abdominal approach | 1.GX.80.LB-XX-Q |
| Diaphragm - Combined Flap -open thoracic approach | 1.GX.80.QB-XX-Q |
| Diaphragm - Combined Flap - open thoracoabdominal approach | 1.GX.80.QF-XX-Q |
| Diaphragm - Distal Flap - open abdominal approach | 1.GX.80.LB-XX-F |
| Diaphragm - Distal Flap - open thoracic approach | 1.GX.80.QB-XX-F |
| Diaphragm - Distal Flap - open thoracoabdominal approach | 1.GX.80.QF-XX-F |
| Diaphragm - Free Flap - open abdominal approach | 1.GX.80.LB-XX-F |
| Diaphragm - Free Flap - open thoracic approach | 1.GX.80.QB-XX-F |
| Diaphragm - Free Flap - open thoracoabdominal approach | 1.GX.80.QF-XX-F |
| Diaphragm - Synthetic - open abdominal approach | 1.GX.80.LB |
| Diaphragm - Synthetic - open thoracic approach | 1.GX.80.QB |
| Diaphragm - Synthetic - open thoracoabdominal approach | 1.GX.80.QF |
| Diaphragm - Synthetic - endoscopic [thoracoscopic, laparoscopic] approach | 1.GX.80.DA |
| Diaphragm - Simple - open abdominal approach | 1.GX.80.LB |
| Diaphragm - Simple - open thoracic approach | 1.GX.80.QB |
| Diaphragm - Simple - open thoracoabdominal approach | 1.GX.80.QF |
| Diaphragm - Simple - endoscopic [thoracoscopic, laparoscopic] approach | 1.GX.80.DA |
| **Lap Ventral Hernia Repair** | Hernia - Lap - without tissue [e.g. suturing or stapling] | 1.SY .80.DA | [K43](https://www.icd10data.com/ICD10CM/Codes/K00-K95/K40-K46/K43-/K43) Ventral hernia [K43.0](https://www.icd10data.com/ICD10CM/Codes/K00-K95/K40-K46/K43-/K43.0) Incisional hernia with obstruction, without gangrene [K43.1](https://www.icd10data.com/ICD10CM/Codes/K00-K95/K40-K46/K43-/K43.1) Incisional hernia with gangrene [K43.2](https://www.icd10data.com/ICD10CM/Codes/K00-K95/K40-K46/K43-/K43.2) Incisional hernia without obstruction or gangrene |
| Hernia - Lap -using synthetic tissue [e.g. mesh, sponge] | 1.SY .80.DA-XX-N |
| Hernia - Lap -using autograft [e.g. fascia, skin] | 1.SY .80.DA-XX-A |
| Hernia - Lap -using xenograft [e.g. Surgisis, SIS (small intestine submucosa)] | 1.SY .80.DA-XX-L |
| Hernia - Lap -using free flap [e.g. free myocutaneous flap] | 1.SY .80.DA-XX-F |
| Hernia - Lap -using pedicled flap [e.g. abdominis rectus or deltopectoral] | 1.SY .80.DA-XX-G |
| Hernia - Open - without tissue [e.g. suturing or stapling] | 1.SY.80.LA |
| **Open Ventral Hernia Repair** | Hernia - Open - using synthetic tissue [e.g. mesh, sponge] | 1.SY .80.LA-XX-N |
| Hernia - Open - using special excisional technique | 1.SY .80.WJ |
| Hernia - Open - using autograft [e.g. fascia, skin] | 1.SY .80.LA-XX-A |
| Hernia - Open - using xenograft [e.g. Surgisis, SIS (small intestine submucosa)] | 1.SY .80.LA-XX-L |
| Hernia - Open - using free flap [e.g. free myocutaneous flap] | 1.SY .80.LA-XX-F |
| Hernia - Open - using pedicled flap [e.g. abdominis rectus or deltopectoral] | 1.SY .80.LA-XX-G |
| Hernia - Open - using zipper [temporary] [for repeat access to abdomen] | 1.SY .80.LA-TZ |
| Hernia - Open - using combined sources of tissue [e.g. mesh with autograft] | 1.SY .80.LA-XX-Q |
| Hernia - Open - using temporary abdominal closure device | 1.SY .80.LA-FF |
| Open Gastric Bypass | Gastric Bypass - Open - using vertical banded technique  | 1.NF.78.XP |  |
| Gastric Bypass - Open - using adjustable banding technique  |  |  |
| Gastric Bypass - Open - using vertical (sleeve) gastrectomy technique  | 1.NF.78.WJ  |  |
| Gastric Bypass - Open - using gastric bypass technique with gastroenterostomy [e.g. Roux-en-Y]  | 1.NF.78.SH  |  |
| Gastric Bypass - Open - using gastric bypass technique with gastroenterostomy and biliopancreatic bypass [to terminal ileum] [e.g. biliopancreatic diversion]  | 1.NF.78.SJ  |  |
| Gastric Bypass - Open - using gastric bypass technique with enteroenterostomy and biliopancreatic bypass [to terminal ileum] [e.g. duodenal switch]  | 1.NF.78.SI  |  |
| Gastric Bypass - Transanal - using circular stapling or suturing [plication] technique  | 1.NF.78.BN  |  |
| Gastric Bypass - Open - using circular stapling or suturing [plication] technique  | 1.NF.78.VT  |  |
| Laparoscopic Gastric Bypass | Gastric Bypass - Lap - using vertical banded technique  | 1.NF.78.XO  |  |
| Gastric Bypass - Lap - using adjustable banding technique  | 1.NF.78.EJ  |  |
| Gastric Bypass - Lap - using vertical (sleeve) gastrectomy technique  | 1.NF.78.GB  |  |
| Gastric Bypass - Lap - using gastric bypass technique with gastroenterostomy [e.g. Roux-en-Y]  | 1.NF.78.DQ  |  |
| Gastric Bypass - Lap - using gastric bypass technique with gastroenterostomy and biliopancreatic bypass [to terminal ileum] [e.g. biliopancreatic diversion]  | 1.NF.78.DO  |  |
| Gastric Bypass - Lap - using gastric bypass technique with enteroenterostomy and biliopancreatic bypass [to terminal ileum] [e.g. duodenal switch]  | 1.NF.78.DI  |  |
| Gastric Bypass - Lap - using circular stapling or suturing [plication] technique  | 1.NF.78.DW  |  |
| Gastric Bypass - Lap - using combined techniques [e.g. adjustable banding technique and plication]  | 1.NF.78.EI  |  |