

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Cohort Selection

Cancer type	Diagnosis codes (ICD-9)	Procedure codes (ICD-9)
Prostate	185	603: Suprapubic prostatectomy ¹ 604: Retropubic prostatectomy ¹ 605: Radical prostatectomy ¹ 6061: Local excision of lesion of prostate ¹ 6062: Perineal prostatectomy ¹ 6069: Other prostatectomy ¹
Bladder	188 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889	576: Partial cystectomy ² 577: Total cystectomy ³ 5771: Radical cystectomy ³ 5779: Other total cystectomy ³
Esophagus	150 1500 1501 1502 1503 1504 1505 1508 1509	424: Excision of esophagus ⁴ 4240: Esophagectomy, not otherwise specified ⁴ 4241: Partial esophagectomy ⁴ 4242: Total esophagectomy ⁵ 4399: Other total gastrectomy ⁵
Pancreas	157 1570 1571 1572 1573 1574 1575 1576 1577 1578 1579	5251: Proximal pancreatectomy ⁶ 5252: Distal pancreatectomy ⁶ 5253: Radical subtotal pancreatectomy ⁶ 525: Partial Pancreatectomy ⁶ 5259: Other partial pancreatectomy ⁶ 5222: Other excision or destruction of lesion or tissue of pancreas or pancreatic duct ⁶ 526: Total pancreatectomy ⁷ 527: Radical pancreaticoduodenectomy ⁷
Lung	162 1620 1621 1622 1623 1624 1625 1626 1627 1628 1629	322: Local Excision Or Destruction Of Lesion Or Tissue Of Lung ⁸ 329: Other excision of lung ⁸ 3229: Other local excision or destruction of lesion or tissue of lung ⁸ 3239: Other and unspecified segmental resection of lung ⁸ 3220: Thoracoscopic excision of lesion or tissue of lung ⁹ 3230: Thoracoscopic segmental resection of lung ⁹ 324: Lobectomy Of Lung ¹⁰ 3249: Other lobectomy of lung ¹⁰ 3241: Thoracoscopic lobectomy of lung ¹¹ 3529: Other and unspecified pneumonectomy ¹² 325: Complete Pneumonectomy ¹² 3250: Thoracoscopic pneumonectomy ¹³
Liver	155 1550 1551 1552	5022: Partial hepatectomy ¹⁴ 503: Lobectomy of liver ¹⁴

		502: Local Excision Or Destruction Of Liver Tissue Or Lesion ¹⁴ 5029: Other destruction of lesion of liver ¹⁴ 504: Total hepatectomy ¹⁵ 5059: Other transplant of liver ¹⁶
Kidney	189 1890 18900 18901 1898 1891 23691	554: Partial nephrectomy ¹⁷ 5532: Open ablation of renal lesion or tissue ¹⁷ 5551: Nephroureterectomy ¹⁸ 5552: Nephrectomy of remaining kidney ¹⁸ 555: Complete Nephrectomy ¹⁸ 5554: Bilateral nephrectomy ¹⁸ 5534: Laparoscopic ablation of renal lesion or tissue ¹⁹
Colorectal	1530 1531 1532 1533 1534 1535 1536 1537 1538 1539 1540 1541	457: Open And Other Partial Excision Of Large Intestine ²⁰ 4571: Open and other multiple segmental resection of large intestine ²⁰ 4572: Open and other cecectomy ²⁰ 4573: Open and other right hemicolectomy ²⁰ 4574: Open and other resection of transverse colon ²⁰ 4575: Open and other left hemicolectomy ²⁰ 4576: Open and other sigmoidectomy ²⁰ 4579: Other and unspecified partial excision of large intestine ²⁰ 458: Total Intra-Abdominal Colectomy ²¹ 4582: Open total intra-abdominal colectomy ²¹ 4583: Other and unspecified total intra-abdominal colectomy ²¹ 4859: Other abdominoperineal resection of the rectum ²² 4861: Transsacral rectosigmoidectomy ²² 4862: Anterior resection of rectum with synchronous colostomy ²² 4863: Other anterior resection of rectum ²² 4864: Posterior resection of rectum ²² 4865: Duhamel resection of rectum ²² 4869: Other resection of rectum ²² 4840: Pull-through resection of rectum, not otherwise specified ²² 486: Other Resection Of Rectum ²² 484: Pull-Through Resection Of Rectum ²² 4841: Soave submucosal resection of rectum ²² 4852: Open abdominoperineal resection of the rectum ²² 4843: Open pull-through resection of rectum ²² 4849: Other pull-through resection of rectum ²² 4850: Abdominoperineal resection of the rectum, not otherwise specified ²² 485: Abdominoperineal Resection Of Rectum ²²

		4581: Laparoscopic total intra-abdominal colectomy ²³ 1732: Laparoscopic cecectomy ²³ 1733: Laparoscopic right hemicolectomy ²³ 1734: Laparoscopic resection of transverse colon ²³ 1735: Laparoscopic left hemicolectomy ²³ 1736: Laparoscopic sigmoidectomy ²³ 1739: Other laparoscopic partial excision of large intestine ²³ <hr/> 4842: Laparoscopic pull-through resection of rectum ²⁴ 4851: Laparoscopic abdominoperineal resection of the rectum ²⁴
Ovarian	1830	652: Local Excision Or Destruction Of Ovarian Lesion Or Tissue ²⁵ 6539: Other unilateral oophorectomy ²⁵ 6551: Other removal of both ovaries at same operative episode ²⁵ 6552: Other removal of remaining ovary ²⁵ 6549: Other unilateral salpingo-oophorectomy ²⁵ 6561: Other removal of both ovaries and tubes at same operative episode ²⁵ 6562: Other removal of remaining ovary and tube ²⁵ 664: Total unilateral salpingectomy ²⁵ 665: Total Bilateral Salpingectomy ²⁵ 654: Unilateral Salpingo-Oophorectomy ²⁵ 656: Bilateral Salpingo-Oophorectomy ²⁵ 541: Laparotomy ²⁵ 5411: Exploratory laparotomy ²⁵ 544: Excision or destruction of peritoneal tissue ²⁵ <hr/> 6531: Laparoscopic unilateral oophorectomy ²⁶ 6553: Laparoscopic removal of both ovaries at same operative episode ²⁶ 6554: Laparoscopic removal of remaining ovary ²⁶ 6541: Laparoscopic unilateral salpingo-oophorectomy ²⁶ 6563: Laparoscopic removal of both ovaries and tubes at same operative episode ²⁶ 6564: Laparoscopic removal of remaining ovary and tube ²⁶ <hr/> 6831: Laparoscopic supracervical hysterectomy [LSH] ²⁷ 6841: Laparoscopic total abdominal hysterectomy ²⁷ 6851: Laparoscopically assisted vaginal hysterectomy (LAVH) ²⁷ 6861: Laparoscopic radical abdominal hysterectomy ²⁷ 6871: Laparoscopic radical vaginal hysterectomy [LRVH] ²⁷ 5421: Laparoscopy ²⁷ <hr/> 688: Pelvic evisceration ²⁸ 683: Subtotal Abdominal Hysterectomy ²⁸ 6839: Other and unspecified subtotal abdominal hysterectomy ²⁸

		684: Total Abdominal Hysterectomy ²⁸ 6849: Other and unspecified total abdominal hysterectomy ²⁸ 685: Vaginal Hysterectomy ²⁸ 6859: Other and unspecified vaginal hysterectomy ²⁸ 686: Radical Abdominal Hysterectomy ²⁸ 6869: Other and unspecified radical abdominal hysterectomy ²⁸ 687: Radical Vaginal Hysterectomy ²⁸ 6879: Other and unspecified radical vaginal hysterectomy ²⁸ 689: Other and unspecified hysterectomy ²⁸
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¹⁻²⁸ Sensitivity analysis (eTable 6) includes adjustment for type and extent of surgical operation based on these 28 groups

eTable 2. Logistic Regression Analysis of Risk-Adjusted 30-Day Postoperative Overall and Within-Hospital Mortality Trends for Cancer Surgery

	Overall Mortality ¹ (2007-2008)	Yearly Odds Ratio (95% Confidence Interval)		Overall Mortality (2015-2016)
		Overall Mortality	Within-Hospital Mortality	
Black	4.84%	0.97 (0.95-0.98)	0.97 (0.96-0.99)	3.81%
White	4.29%	0.96 (0.95-0.96)	0.96 (0.96-0.97)	3.09%
Odds Ratios (95%CI) for Mortality, Blacks vs Whites	1.14 (1.02-1.26) p=0.016	1.01 (0.99-1.03) p=0.22	1.01 (0.99-1.03) p=0.20	1.24 (1.09-1.41) p=0.001

¹Overall mortality rates are from the linear probability model while the odds ratios, confidence interval and p-values are from the analogous logistic regression model.

eTable 3. Risk-Adjusted 30-Day Postoperative Overall and Within-Hospital Mortality for Cancer Surgery; County Level SES Variables (Educational Attainment and MHI) Changed Over Time¹

	Overall Mortality (2007-08)	Average Annual Change (95% Confidence Interval)		Overall Mortality (2015-16)
		Overall Mortality	Within-Hospital Mortality	
Black	4.79%	-0.10% (-0.15%, -0.05%)	-0.10% (-0.15%, -0.05%)	3.91%
White	4.24%	-0.13% (-0.14%, -0.11%)	-0.13% (-0.14%, -0.11%)	3.19%
Difference	0.56% (0.21%, 0.90%) p=0.002	0.02% (-0.03, 0.08%) p=0.38	0.03% (-0.02, 0.08%) p=0.28	0.72% (0.39%, 1.06%) p<0.001

¹ 2007-2009, 2010-2012, 2013-2014, 2015-16

eTable 4. Risk-Adjusted 30-Day Postoperative Overall and Within-Hospital Mortality for Cancer Surgery; Without County-Level SES variables (Educational Attainment and MHI)

	Overall Mortality (2007-08)	Average Annual Change (95% Confidence Interval)		Overall Mortality (2015-16)
		Overall Mortality	Within-Hospital Mortality	
Black	4.89%	-0.12% (-0.17%, -0.07%)	-0.10% (-0.15%, -0.05%)	3.85%
White	4.29%	-0.14% (-0.16%, -0.13%)	-0.13% (-0.14%, -0.11%)	3.08%
Difference	0.60% (0.26%, 0.95%) p=0.006	0.03% (-0.03, 0.08%) p=0.36	0.03% (-0.02, 0.08%) p=0.28	0.78% (0.44%, 1.12%) p<0.001

eTable 5. Risk-Adjusted 30-Day Postoperative Overall and Within-Hospital Mortality for Cancer Surgery; Including Adjustment for Frailty/Functional Status¹

	Overall Mortality (2010)	Average Annual Change (95% Confidence Interval)		Overall Mortality (2016)
		Overall Mortality	Within-Hospital Mortality	
Black	5.89%	-0.24%	-0.18%	3.57%
White	3.41%	-0.13%	-0.11%	3.04%
Difference	2.48% (0.07%, 4.90%) p=0.0438	-0.11% (-0.31%, 0.10%) p=0.3100	-0.07% (-0.26%, 0.11%) p=0.4319	0.52% (0.03%, 1.02%) p=0.0393

¹In order to adjust for frailty, we could only use a 5% sample in years 2010-2011, a 20% sample in 2012-2013, and a 100% sample in 2014-2016.

eTable 6. Risk-Adjusted 30-Day Postoperative Overall and Within-Hospital Mortality for Cancer Surgery; Including Adjustment for Type and Extent of Surgery

	Overall Mortality (2007-08)	Average Annual Change (95% Confidence Interval)		Overall Mortality (2015-16)
		Overall Mortality	Within-Hospital Mortality	
Black	4.42%	-0.06%	-0.05%	3.92%
White	3.96%	-0.09%	-0.08%	3.23%
Difference	0.46% (0.12%, 0.81%) p=0.009	0.03% (-0.02%, 0.08%) p=0.289	0.03% (-0.02%, 0.09%) p=0.211	0.69% (0.35%, 1.03%) p<0.001

eTable 7. Surgical Complications

Complication	Codes
Hemorrhage	Intraoperative hemorrhage 998.11 Postoperative hematoma 998.12
Anastomotic complication	Leak 998.6 Percutaneous abdominal drainage 54.91
Wound complication	Infection 998.5, 998.51, 998.59 Seroma 998.13 Dehiscence 998.3
Pulmonary complication	Respiratory tract complications 997.3 Acute bacterial pneumonia 481, 482.0-482.9, 485, 486 Acute respiratory failure 518.81 Tracheotomy 31.1, 31.29
Cardiac complication	Complications 997.1 Acute myocardial infarction 410.0-410.9
Neurological complication	Central nervous system complications 997.01-997.03 Acute cerebrovascular accident 431.00-431.91, 433.00-433.91, 434.00-434.91, 436, 437.1
Genitourinary tract complication	Urinary tract complications 997.5 Acute renal failure 584.1-584.9 Acute dialysis 38.95 Insertion of short-term dialysis catheter 39.95
Thromboembolic complication	Acute pulmonary embolism 415.1, 415.11, 415.19 Acute deep venous thrombosis 453.8, 453.9
Shock	Postoperative 998.0
Unexpected reoperations for surgical complications	Wound dehiscence 54.61 Removal of foreign body 54.92 Laparotomy 54.12

eTable 8. Overall and Within-Hospital Complications for Cancer Surgery

	Overall Complications (2007-08)	Average Annual Change (95% Confidence Interval)		Overall Complications (2015-16)
		Overall Complications	Within-Hospital Complications ¹	
Black	27.09%	-0.37%	-0.32%	24.45%
White	23.24%	-0.41%	-0.37%	19.98%
Difference	3.85% (3.85%, 4.55%) p<0.001	0.04% (-0.08%, 0.15%) p=0.53	0.05% (-0.06, 0.16%) p=0.36	4.48% (3.69%, 5.27%) p<0.001

¹Between-hospital trends can be calculated as overall trends minus within-hospital trends