

Supplementary Online Content

Chin RI, Otegbeye EE, Kang KH, et al. Cost-effectiveness of total neoadjuvant therapy with short-course radiotherapy for resectable locally advanced rectal cancer. *JAMA Netw Open*. 2022;5(2):e2146312. doi:10.1001/jamanetworkopen.2021.46312

eFigure 1. The Modeled Locoregional Recurrence Rate, Cumulative Distant Metastasis Rate, and Overall Survival For Short-Course Radiotherapy Followed by Total Neoadjuvant Therapy (SCRT-TNT) and Long-Course Chemoradiotherapy (LCCRT)

eFigure 2. Two-Way Deterministic Sensitivity Analysis Varying the Cost of Long-Course Chemoradiotherapy (LCCRT) and the Proportion of Low Anterior Resection (LAR) After LCCRT With a Willingness-to-Pay (WTP) Threshold of \$50 000

eFigure 3. Two-Way Deterministic Sensitivity Analysis Varying the Cost of Long-Course Chemoradiotherapy (LCCRT) and the Proportion of Low Anterior Resection (LAR) After LCCRT With a Willingness-to-Pay (WTP) Threshold of \$100 000

eFigure 4. Two-Way Deterministic Sensitivity Analysis Varying the Cost of Long-Course Chemoradiotherapy (LCCRT) and the Proportion of Low Anterior Resection (LAR) After LCCRT With a Willingness-to-Pay (WTP) Threshold of \$150 000

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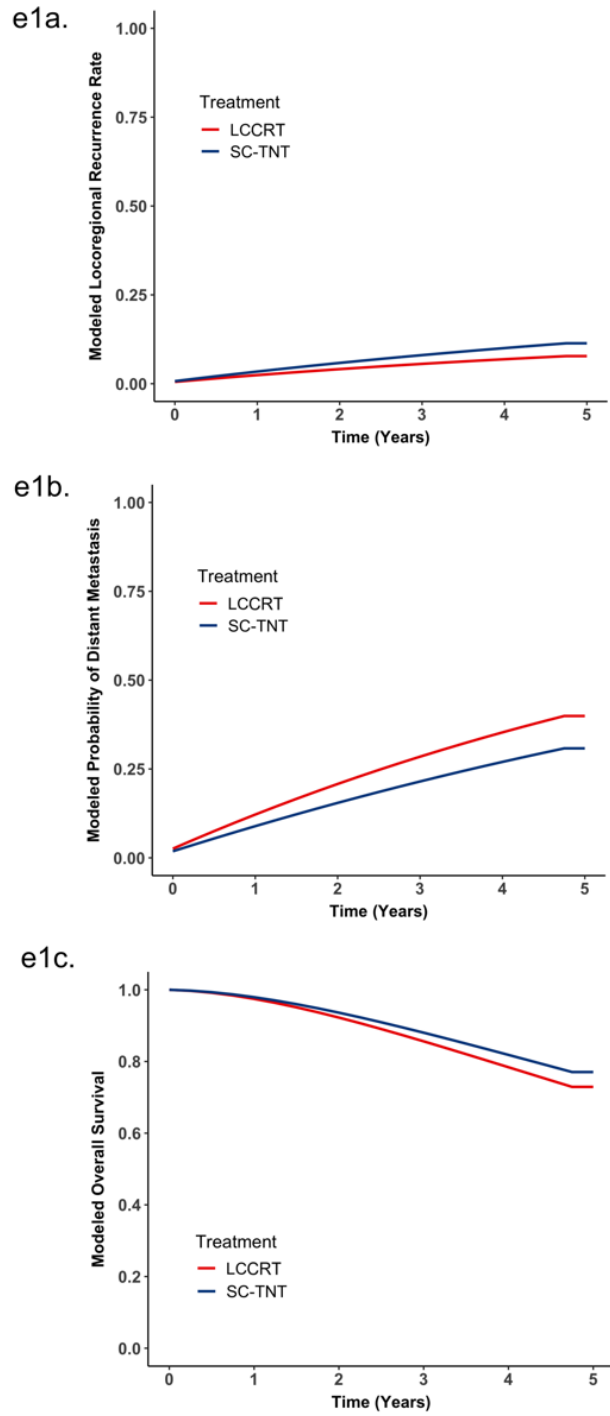
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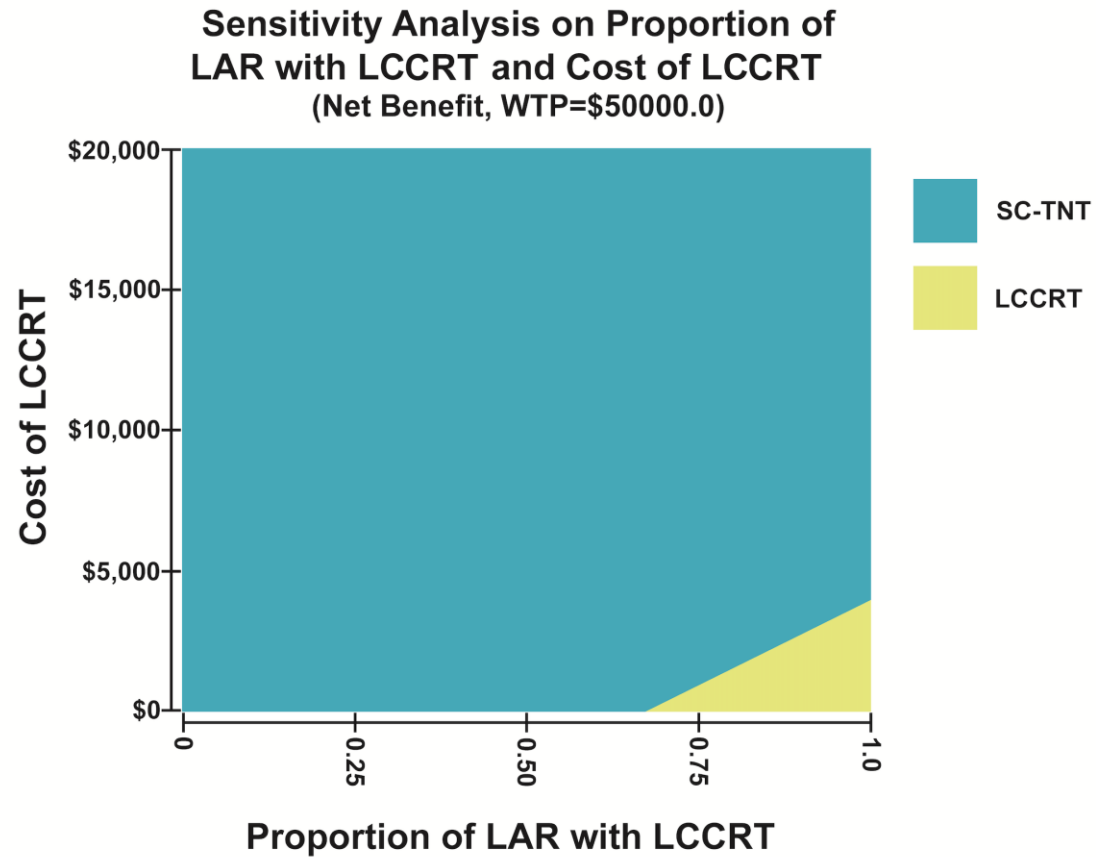
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This supplementary material has been provided by the authors to give readers additional information about their work.

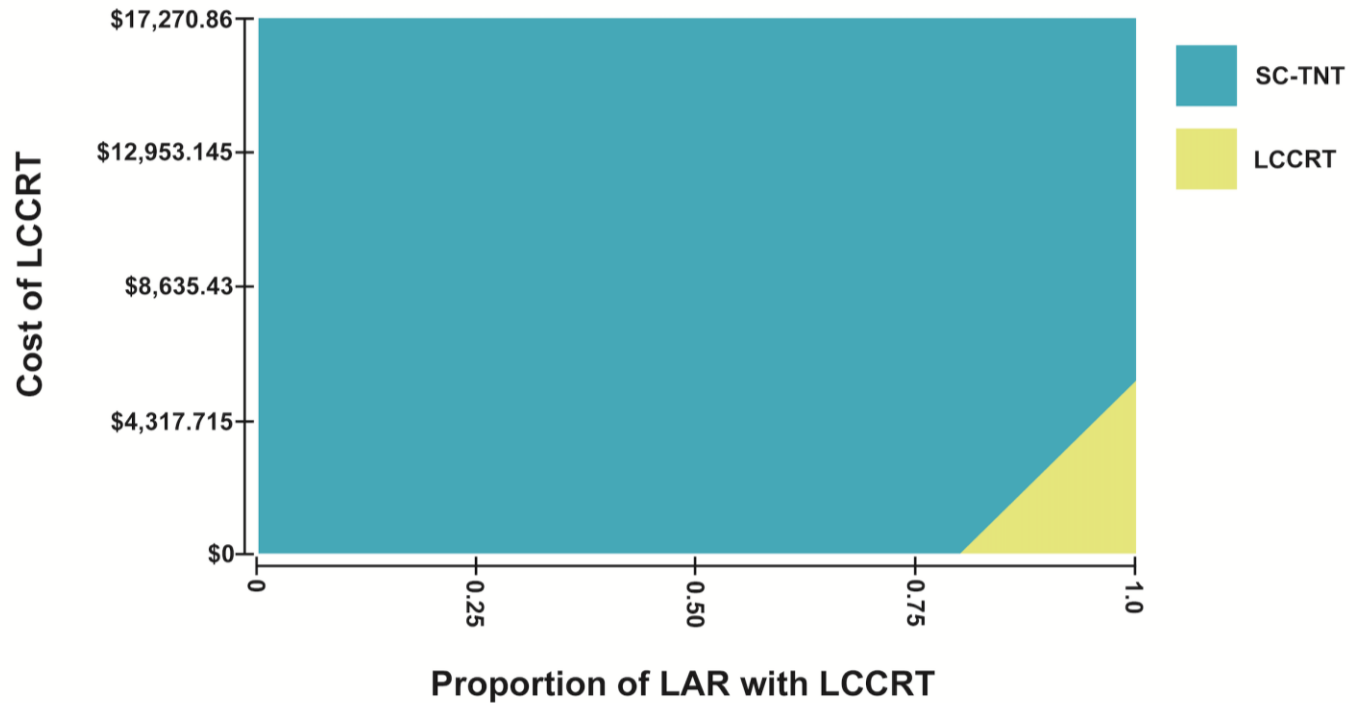


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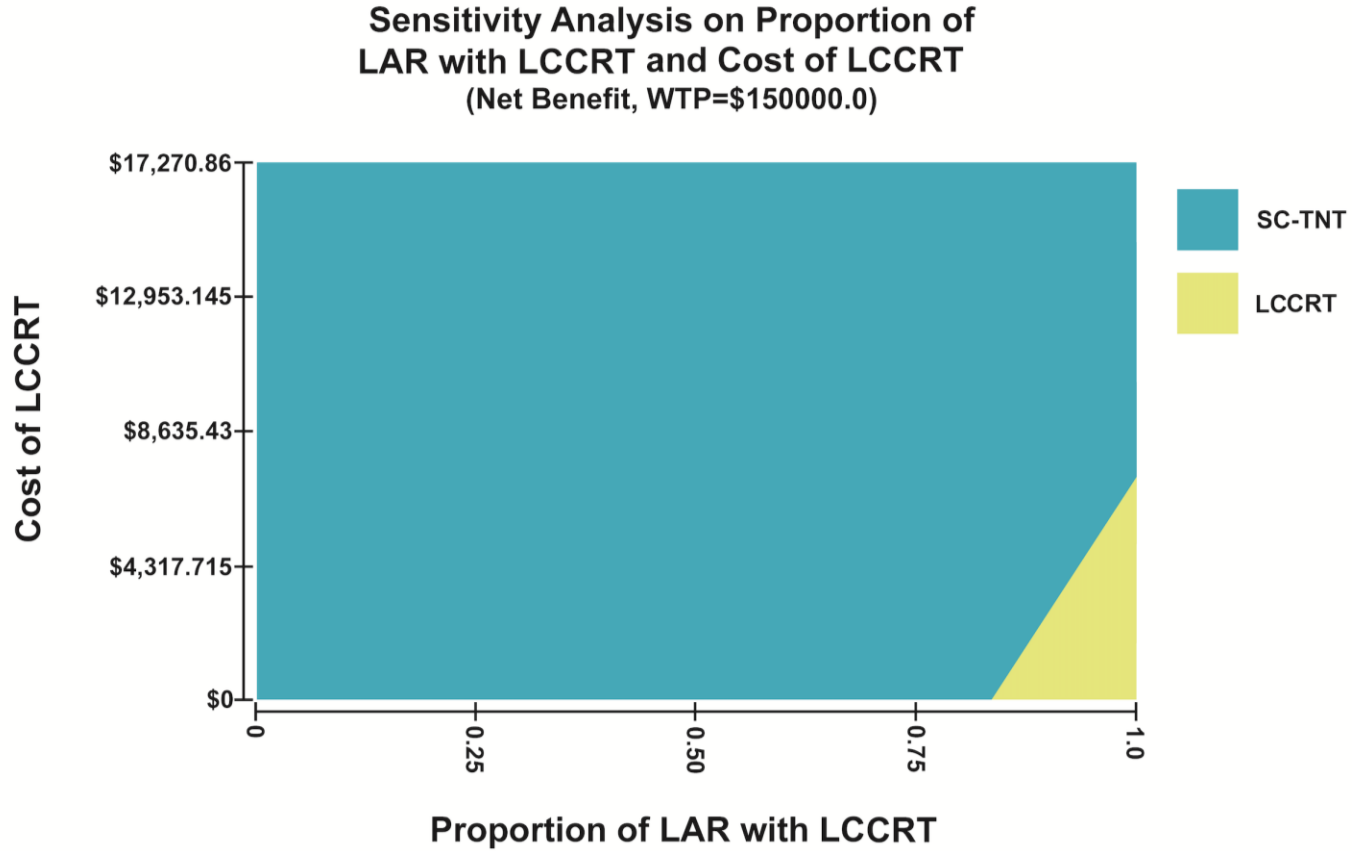


eFigure 2. Two-Way Deterministic Sensitivity Analysis Varying the Cost of Long-Course Chemoradiotherapy (LCCRT) and the Proportion of Low Anterior Resection (LAR) After LCCRT With a Willingness-to-Pay (WTP) Threshold of \$50 000

Sensitivity Analysis on Proportion of LAR with LCCRT and Cost of LCCRT
 (Net Benefit, WTP=\$100000.0)



eFigure 3. Two-Way Deterministic Sensitivity Analysis Varying the Cost of Long-Course Chemoradiotherapy (LCCRT) and the Proportion of Low Anterior Resection (LAR) After LCCRT With a Willingness-to-Pay (WTP) Threshold of \$100 000



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eTable 1. Cost of Definitive Radiotherapy: 3D Conformal and IMRT

Description	CPT/HCPCS Code	Cost/Unit	SCRT Qt	SCRT Cost Subtotal	LCCRT Qt	LCCRT Subtotal	Reirradiation Qt	Reirradiation Subtotal	References
3D Conformal									
Consultation									
New outpatient consultation (level 5)	99245	\$196.69	1	\$196.69	1	\$196.69			CMS 2020 ³⁸
Simulation									
Complex simulation	77290	\$508.14	1	\$508.14	1	\$508.14			CMS 2020 ³⁸
Complex treatment device	77334	\$130.28	1	\$130.28	1	\$130.28			CMS 2020 ³⁸
Clinical Treatment Planning									
Treatment planning, complex	77263	\$174.31	1	\$174.31	1	\$174.31			CMS 2020 ³⁸
Medical									
Physics/Dosimetry						\$0.00			
Basic dose calculation	77300	\$67.85	3	\$203.55	3	\$203.55			CMS 2020 ³⁸
Physics QA (weekly)	77336	\$81.20	1	\$81.20	6	\$487.20			CMS 2020 ³⁸
3D planning	77295	\$498.04	1	\$498.04	1	\$498.04			CMS 2020 ³⁸
Complex treatment device	77334	\$130.28	3	\$390.84	3	\$390.84			CMS 2020 ³⁸
Treatment/Management									
Treatment management (weekly)	77427	\$196.33	1	\$196.33	6	\$1,177.98			CMS 2020 ³⁸
Treatment delivery, 3D (daily)	G6012	\$262.73	5	\$1,313.65	28	\$7,356.44			CMS 2020 ³⁸
Verification simulation CT (CBCT) (daily)	77014	\$124.51	5	\$622.55	28	\$3,486.28			CMS 2020 ³⁸
Total Cost				\$4,315.58		\$14,609.75			
Intensity-modulated Radiation Therapy (IMRT)									
Consultation									
New outpatient consultation (level 5)	99245	\$196.69	1	\$196.69	1	\$196.69	1	\$196.69	CMS 2020 ³⁸

Simulation									
Complex treatment device	77334	\$130.28	1	\$130.28	1	\$130.28	1	\$130.28	CMS 2020 ³⁸
Clinical Treatment Planning									
Treatment planning, complex	77263	\$174.31	1	\$174.31	1	\$174.31	1	\$174.31	CMS 2020 ³⁸
Special treatment procedure	77470	\$136.78	0	\$0.00	0	\$136.78	1	\$136.78	CMS 2020 ³⁸
Medical									
Physics/Dosimetry									
Basic dose calculation	77300	\$67.85	3	\$203.55	3	\$203.55	3	\$203.55	CMS 2020 ³⁸
Physics QA (weekly)	77336	\$81.20	1	\$81.20	6	\$487.20	5	\$406.00	CMS 2020 ³⁸
IMRT planning	77301	\$1,949.20	1	\$1,949.20	1	\$1,949.20	1	\$1,949.20	CMS 2020 ³⁸
Multileaf collimator (MLC) device for IMRT	77338	\$497.31	1	\$497.31	1	\$497.31	1	\$497.31	CMS 2020 ³⁸
Treatment/Management									
Treatment management (weekly)	77427	\$196.33	1	\$196.33	6	\$1,177.98	5	\$981.65	CMS 2020 ³⁸
Treatment delivery, IMRT (daily)	G6015	\$369.92	5	\$1,849.60	28	\$10,357.76	26	\$9,617.92	CMS 2020 ³⁸
Verification simulation cone-beam CT (daily)	77014	\$124.51	5	\$622.55	28	\$3,486.28	26	\$3,237.26	CMS 2020 ³⁸
Total Cost				\$5,278.47		\$18,797.34		\$17,530.95	

Based on Current Procedural Terminology (CPT) Centers for Medicare & Medicaid Services (CMS) national fee schedule using facility price (MPFS). Data last updated 10/30/2020. Reirradiation was performed with hyperfractionated salvage radiotherapy with 3D-conformal technique to 39 Gy in 26 fractions twice a day. CT, computed tomography; HCPCS, healthcare common procedure coding system; IMRT, intensity-modulated radiation therapy; LCCRT, long-course chemoradiation; SCRT, short-course radiation therapy; QA, quality assurance.

eTable 2. Cost of Capecitabine

Description	CPT/HCPCS Code(s)	HCPCS Code Dosage	Cost/Unit	Units	Subtotal	References
Capecitabine (during LCCRT)						
History and physical and follow-up Labs	99213		\$52.33	2	\$104.66	CMS 2020 ³⁸
Complete Blood Count (CBC)	85025		\$7.77	2	\$15.54	CMS CLAB 2020 ⁴⁰
Complete Metabolic Panel (CMP)	80053		\$10.56	2	\$21.12	CMS CLAB 2020 ⁴⁰
Chemotherapy and supportive care agents						
Capecitabine, 825 mg/m ² BID 5 days per week x 5 weeks	J8521	500 mg	\$2.41	165	\$397.32	CMS ASP 2020 ³⁹
Prochlorperazine 10 mg PO, BID (28 days)	Q0164	5 mg	\$0.26	112	\$28.67	CMS ASP 2020 ³⁹
Total cost (during LCCRT)					\$567.31	
Capecitabine (during reirradiation)						
History and physical and follow-up Labs	99213		\$52.33	1	\$52.33	CMS 2020 ³⁸
Complete Blood Count (CBC)	85025		\$7.77	1	\$7.77	CMS CLAB 2020 ⁴⁰
Complete Metabolic Panel (CMP)	80053		\$10.56	1	\$10.56	CMS CLAB 2020 ⁴⁰
Chemotherapy and supportive care agents						
Capecitabine, 825 mg/m ² BID 5 days per week x 5 weeks	J8521	500 mg	\$2.41	82.5	\$198.66	CMS ASP 2020 ³⁹
Prochlorperazine 10 mg PO, BID (28 days)	Q0164	5 mg	\$0.26	112	\$28.67	CMS ASP 2020 ³⁹
Total cost (during reirradiation)					\$269.32	
Capecitabine (palliative, annual)						
History and physical and follow-up Labs	99213		\$52.33	4	\$209.32	CMS 2020 ³⁸
Complete Blood Count (CBC)	85025		\$7.77	4	\$31.08	CMS CLAB 2020 ⁴⁰
Complete Metabolic Panel (CMP)	80053		\$10.56	4	\$42.24	CMS CLAB 2020 ⁴⁰
Chemotherapy and supportive care agents						
Capecitabine, 825 mg/m ² BID 5 days per week x 5 weeks	J8521	500 mg	\$2.41	1716	\$4,132.13	CMS ASP 2020 ³⁹
Prochlorperazine 10 mg PO, BID (28 days)	Q0164	5 mg	\$0.26	400	\$102.40	CMS ASP 2020 ³⁹
Total cost (annual)					\$4,517.17	

Based on Centers for Medicare & Medicaid Services (CMS) Average Sales Price (ASP) payment allowance limits for Medicare Part B Drugs (Oct 2020). Chemotherapy dose was based on 2.0 m² body surface area adult. BID, bis in die (twice a day); CPT, current procedural terminology; HCPCS, healthcare common procedure coding system; LCCRT, long-course chemoradiation; PO, per os (by mouth).

eTable 3. Cost of mFOLFOX and CAPOX per Cycle

Description	CPT/HCPCS Code(s)	HCPCS Code Dosage	Cost/Unit	Units/Cycle	Subtotal	References
mFOLFOX (per cycle)						
History and physical and follow-up	99213		\$52.33	1	\$52.33	CMS 2020 ³⁸
Labs						
Complete Blood Count (CBC)	85025		\$7.77	1	\$7.77	CMS CLAB 2020 ⁴⁰
Complete Metabolic Panel (CMP)	80053		\$10.56	1	\$10.56	CMS CLAB 2020 ⁴⁰
Chemotherapy and supportive care agents						
5-FU, 400 mg/m ² bolus d1, 2400 mg/m ² , CIVI	J9190	500 mg	\$1.53	11.2	\$17.11	CMS ASP 2020 ³⁹
Leucovorin, 400 mg/m ²	J0640	50 mg	\$2.80	16	\$44.80	CMS ASP 2020 ³⁹
Oxaliplatin, 85 mg/m ²	J9263	0.5 mg	\$0.12	340	\$39.78	CMS ASP 2020 ³⁹
Dexamethasone, 10 mg IV	J1100	1 mg	\$0.13	10	\$1.28	CMS ASP 2020 ³⁹
Ondansetron, 8 mg IV	J2405	1 mg	\$0.09	8	\$0.73	CMS ASP 2020 ³⁹
Prochlorperazine 10 mg PO, BID (14 days)	Q0164	5 mg	\$0.26	56	\$14.34	CMS ASP 2020 ³⁹
Normal Saline, 1L IV	J7030	1000 ml	\$2.54	1	\$2.54	CMS ASP 2020 ³⁹
Drug administration						
Chemo IV infusion (1 hour) Oxaliplatin (x1)	96413		\$142.55	1	\$142.55	CMS 2020 ³⁸
Chemo IV infusion (additional hour) Oxaliplatin (x1) Leucovorin (x2)	96415		\$30.68	3	\$92.04	CMS 2020 ³⁸
Chemo IV push additional drug 5-FU bolus	96411		\$59.91	1	\$59.91	CMS 2020 ³⁸
Chemo prolong infusion with pump 5-FU CIVI	96416		\$142.55	1	\$142.55	CMS 2020 ³⁸
IV infusion initial Dexamethasone	96367		\$31.40	1	\$31.40	CMS 2020 ³⁸
Injection new drug add-on Ondansetron	96375		\$16.60	1	\$16.60	CMS 2020 ³⁸

Hydration IV infusion initial Normal Saline, 1L IV	96360		\$34.65	1	\$34.65	CMS 2020 ³⁸
Total cost per cycle					\$710.94	
CAPOX (per cycle)						
History and physical and follow-up	99213		\$52.33	1	\$52.33	CMS 2020 ³⁸
Labs						
Complete Blood Count (CBC)	85025		\$7.77	1	\$7.77	CMS 2020 ³⁸
Complete Metabolic Panel (CMP)	80053		\$10.56	1	\$10.56	CMS 2020 ³⁸
Chemotherapy and supportive care agents						
Capecitabine, 1000 mg/m ² BID (every 3 weeks)	J8521	500 mg	\$2.41	112	\$269.70	CMS ASP 2020 ³⁹
Oxaliplatin, 85 mg/m ²	J9263	0.5 mg	\$0.12	340	\$39.78	CMS ASP 2020 ³⁹
Dexamethasone, 10 mg IV	J1100	1 mg	\$0.13	10	\$1.28	CMS ASP 2020 ³⁹
Ondansetron, 8 mg IV	J2405	1 mg	\$0.09	8	\$0.73	CMS ASP 2020 ³⁹
Prochlorperazine 10 mg PO, BID (14 days)	Q0164	5 mg	\$0.26	56	\$14.34	CMS ASP 2020 ³⁹
Normal Saline, 1L IV	J7030	1000 ml	\$2.54	1	\$2.54	CMS ASP 2020 ³⁹
Drug administration						
Chemo IV infusion (1 hour) Oxaliplatin (x1)	96413		\$142.55	1	\$142.55	CMS 2020 ³⁸
Chemo IV infusion (additional hour) Oxaliplatin (x1)	96415		\$30.68	1	\$30.68	CMS 2020 ³⁸
IV infusion initial Dexamethasone	96367		\$31.40	1	\$31.40	CMS 2020 ³⁸
Injection new drug add-on Ondansetron	96375		\$16.60	1	\$16.60	CMS 2020 ³⁸
Hydration IV infusion initial Normal Saline, 1L IV	96360		\$34.65	1	\$34.65	CMS 2020 ³⁸
Total cost per cycle					\$654.90	

Based on Centers for Medicare & Medicaid Services (CMS) Average Sales Price (ASP) payment allowance limits for Medicare Part B Drugs (Oct 2020). Chemotherapy dose was based on 2.0 m² body surface area adult. BID, bis in die (twice a day); CAPOX, capecitabine/oxaliplatin; CIVI, continuous intravenous infusion; CPT, current procedural terminology; HCPCS, healthcare common procedure coding system; mFOLFOX, modified leucovorin calcium (folinic acid), fluorouracil, and oxaliplatin; PO, per os (by mouth).

eTable 4. Cost of Surgery

Description	CPT/MS-DRG Code(s)	Cost	References
Admission			
Admission for rectal resection	334	\$9,596.63	CMS MS-DRG 2017 ⁴¹
Admission for rectal resection with cc	333	\$15,170.16	CMS MS-DRG 2017 ⁴¹
Admission for rectal resection with mcc	332	\$29,531.13	CMS MS-DRG 2017 ⁴¹
Admission for major small/large bowel procedure	331	\$9,903.25	CMS MS-DRG 2017 ⁴¹
Admission for major small/large bowel procedure with cc	330	\$15,867.49	CMS MS-DRG 2017 ⁴¹
Admission for major small/large bowel procedure with mcc	329	\$33,512.92	CMS MS-DRG 2017 ⁴¹
Primary Total Mesorectal Excision (TME)			
Abdominoperineal Resection (APR)			
APR with permanent colostomy, open	45110	\$1,917.44	CMS 2020 ³⁸
APR with permanent colostomy, laparoscopic	45395	\$2,052.78	CMS 2020 ³⁸
Low Anterior Resection (LAR)			
LAR without ostomy			
LAR without ostomy, open	44145	\$1,734.47	CMS 2020 ³⁸
LAR without ostomy, laparoscopic	44207	\$1,901.56	CMS 2020 ³⁸
LAR with ostomy			
LAR with diverting ileostomy, open	44146	\$2,211.21	CMS 2020 ³⁸
LAR with diverting ileostomy, laparoscopic	44208	\$2,070.82	CMS 2020 ³⁸
Ileostomy reversal			
Ileostomy reversal and anastomosis, open	44625	\$1,679.25	CMS 2020 ³⁸
Ileostomy reversal and anastomosis, laparoscopic	44227	\$1,746.74	CMS 2020 ³⁸
Pelvic exenteration	45126	\$2,892.94	CMS 2020 ³⁸
Palliative diverting ostomy	44320	\$1,259.89	CMS 2020 ³⁸

Based on Current Procedural Terminology (CPT) Centers for Medicare & Medicaid Services (CMS) national fee schedule using facility price (MPFS). cc, complication, or comorbidities; MS-DRG, Medicare severity-diagnosis related group; mcc, major complications or comorbidities.

eTable 5. Cost of Rectal Cancer Annual Surveillance by Test Type

Description	CPT/HCPCS Code(s)	Unit Cost	NED Quantity/Year	NED Subtotal	With Disease Quantity/Year	With Disease Subtotal	References
History and physical (follow-up visits) (per year)	99213	\$52.33					CMS 2020 ³⁸
Year 1-2 (every 3 months)			4	\$209.32	4	\$209.32	NCCN 2020 ¹⁸
Year 3-5 (every 6 months)			2	\$104.66	4	\$209.32	NCCN 2020 ¹⁸
CEA	82378	\$18.96					CMS ASP 2020 ³⁹
Year 1-2 (every 3 months)			4	\$75.84	4	\$75.84	NCCN 2020 ¹⁸
Year 3-5 (every 6 months)			2	\$37.92	4	\$75.84	NCCN 2020 ¹⁸
CT chest, abdomen, and pelvis with IV contrast	71260, 74177	\$531.60					CMS 2020 ³⁸
Year 1-2 (every 6 months)			2	\$1,063.20	4	\$2,126.40	NCCN 2020 ¹⁸
Year 3-5 (every 12 months)			1	\$531.60	4	\$2,126.40	NCCN 2020 ¹⁸
Diagnostic colonoscopy	45378	\$193.08					
Year 1			1	\$193.08	0	\$0.00	NCCN 2020 ¹⁸
Year 4			1	\$193.08	0	\$0.00	NCCN 2020 ¹⁸

Based on Current Procedural Terminology (CPT) Centers for Medicare & Medicaid Services (CMS) national fee schedule using facility price on the Medicare Physician Fee Schedule (MPFS). Data last updated 10/30/2020. CEA, carcinoembryonic antigen; CT, computed tomography; IV, intravenous; HCPCS, healthcare common procedure coding system; NED, no evidence of disease.

eTable 6. Cost of Rectal Cancer Annual Follow-Up by Year after Treatment Completion

Description	H&P and FU	CEA	CT C/A/P	Colonoscopy	Total
Year 1	\$209.32	\$75.84	\$1,063.20	\$193.08	\$1,541.44
Year 2	\$209.32	\$75.84	\$1,063.20	\$0.00	\$1,348.36
Year 3	\$104.66	\$37.92	\$531.60	\$0.00	\$674.18
Year 4	\$104.66	\$37.92	\$531.60	\$193.08	\$867.26
Year 5	\$104.66	\$37.92	\$531.60	\$0.00	\$674.18

C/A/P, chest/abdomen/pelvis; CEA, carcinoembryonic antigen; CT, computed tomography; FU, follow up; H&P, history and physical.

eTable 7. Cost of Restaging Workup for Recurrent Rectal Cancer

Description	CPT/HCPCS Code(s)	Unit Cost	Quantity	Subtotal	References
Locoregionally recurrent rectal cancer					
History and physical (level 5 consult: medical oncology, radiation oncology, colorectal surgery)	99205	\$172.51	1	\$172.51	CMS 2020 ³⁸
CEA	82378	\$18.96	1	\$18.96	CMS CLAB 2020 ⁴⁰
CT chest, abdomen, and pelvis with IV contrast	71260, 74177	\$531.60	1	\$531.60	CMS 2020 ³⁸
MRI pelvis with and without IV contrast	72197	\$396.62	1	\$396.62	CMS 2020 ³⁸
Diagnostic colonoscopy with biopsy/biopsies	45380	\$208.96	1	\$208.96	CMS 2020 ³⁸
Total cost				\$1,328.65	
Distantly recurrent rectal cancer					
History and physical (level 5 consult: medical oncology, radiation oncology, colorectal surgery)	99205	\$172.51	1	\$172.51	CMS 2020 ³⁸
CEA	82378	\$18.96	1	\$18.96	CMS CLAB 2020 ⁴⁰
CT chest, abdomen, and pelvis with IV contrast	71260, 74177	\$531.60	1	\$531.60	CMS 2020 ³⁸
MRI pelvis with and without IV contrast	72197	\$396.62	1	\$396.62	CMS 2020 ³⁸
Percutaneous core needle lung biopsy with CT guidance	32405, 77012	\$247.21	0.5	\$123.61	CMS 2020 ³⁸
Percutaneous core needle liver biopsy with US guidance	47000, 76942	\$150.86	0.5	\$75.43	CMS 2020 ³⁸
Total cost				\$1,318.73	

Based on Current Procedural Terminology (CPT) Centers for Medicare & Medicaid Services (CMS) national fee schedule using facility price on the Medicare Physician Fee Schedule (MPFS). Data last updated 10/30/2020. CEA, carcinoembryonic antigen; CT, computed tomography; IV, intravenous; HCPCS, healthcare common procedure coding system, MRI, magnetic resonance imaging; US, ultrasound.