

INTRODUCTION

- Rectal cancer is a commonly diagnosed malignancy that costs the U.S. health care system **\$24.3 billion**.<sup>1</sup> The treatment innovations in the past decades in neoadjuvant therapy, surgery, and imaging have undoubtedly improved overall patient outcomes.
- Whereas much of the efforts in support of value-based care has focused on primary care providers (accountable organizations, patient-centered medical homes), **surgeons have a critical role in improving the value of health care in the U.S.**
- Costs of surgical procedures for outweigh primary care services, accounting for nearly half of all Medicare spending. In addition, surgeons often lead the management of patients with complex, potentially costly medical problems.
- Examples of defects in value across health care are abundant, accounting for at least **\$1.3 trillion** in waster spending.<sup>2</sup>
- Opportunities for improvement in rectal cancer surgery are emerging related to avoidable complications, readmissions, overtreatment, no-value-added technology, and lack of specialist care, etc.**

OBJECTIVES

- To discuss the evolution to value-based care in surgery, identify and describe defects in value in rectal cancer treatment, and suggest approaches to improve value

METHODS

Value Defects Framework

- This review examines defects in value in rectal cancer care and describes opportunities to reverse these defects, which compromise quality and the patient experience and can increase costs of care.
- We employed the **value defects framework (Figure 1)** in a cost-effectiveness plane and identified rectal cancer care that provided no value (no clinical benefit and may be harmful to the patient with increased costs) and low value (increased cost with little to no clinical benefit or decreased both cost and quality-adjusted life years) and estimated the opportunity costs that could have been saved by eliminating these defects in value in the U.S. healthcare system.<sup>3,4</sup>
- We used published literature and publicly-reported data to calculate the potential cost savings to the U.S. healthcare system by eliminating the identified value defects in rectal cancer care.

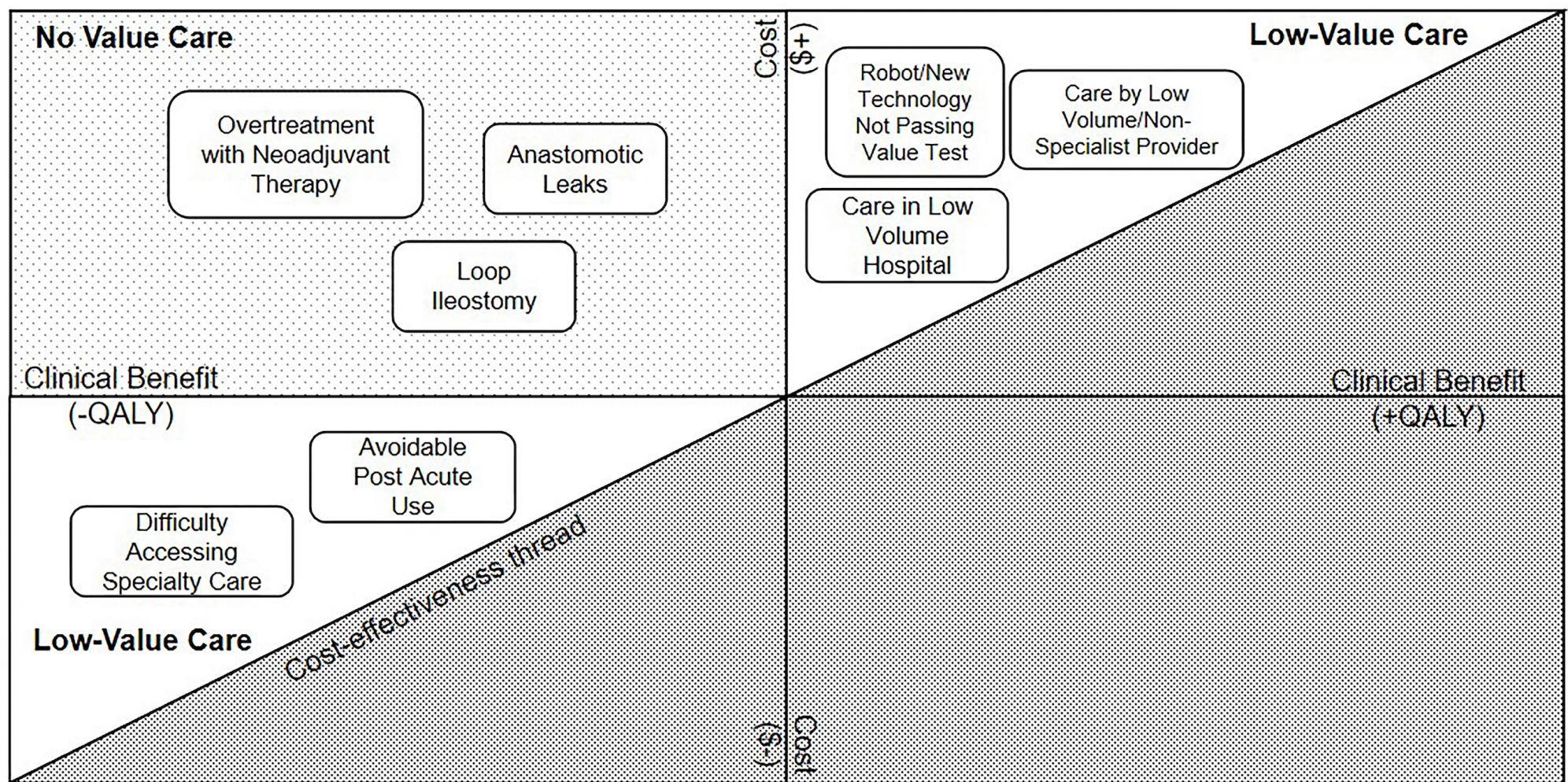


Figure 1. Value Defects Framework. QALY, quality-adjusted life years.

RESULTS: Defects in Value in Rectal Cancer Surgery and Opportunities for Reversal

Overtreatment of Neoadjuvant Therapy

- It is well-accepted that neoadjuvant therapy in addition to surgery reduces the overall incidence of local tumor recurrence in rectal cancer patients compared to surgery alone.
- However, the absolute chance of reduction is highly dependent on the tumor stage and location in the rectum, varying from <1% in early-stage upper rectal cancers to up to 10% in stage III tumors in the lower rectum.<sup>5</sup>
- This variation in efficacy along with associated morbidity, inconvenience, and cost makes the **limited use of neoadjuvant therapy to patients who will derive meaningful clinical benefit an ideal strategy to improve value in rectal cancer care.**
- In addition, overtreatment also wastes costs for subsequent, mandatory adjuvant chemotherapy administered to patients whose initial tumor stage may have been over-staged.
- By applying the MRI-based classification of rectal cancers into low- and high-risk tumors may eliminate neoadjuvant therapy up to 40% of clinical stage II and III patients without compromising outcomes. This will generate an annual cost saving of **\$166 million (Table 1)**.<sup>3</sup>

Loop Ileostomy

- With fewer patients treated with unnecessary neoadjuvant therapy, the number of loop ileostomy created can be reduced accordingly, as most surgeons consider fecal diversion mandatory in radiated patients.
- Loop ileostomy causes defects in value from hospital readmissions, expenses for nursing support and stoma supplies, and decreased quality of life.<sup>6</sup>
- Appling a selective approach for neoadjuvant therapy, but still assuming surgeons would divert non-radiated patients with middle or lower third tumors, would decrease annual loop ileostomies to 21,870.
- The calculated costs of loop ileostomy closure in each patient group yields an estimated annual savings of over **\$18 million (Table 1)**.

Anastomotic Leaks

- Anastomotic leaks are **a catastrophic complication of rectal cancer surgery, increasing local recurrence rates and decrease survival.**
- It also adversely impact patient experience such as increase the length of hospital stay, extend time in a skilled nursing facility, require revision surgery, prolong the time with a temporary stoma, or worse yet, lead to permanent stoma, and add financial and social hardships for patients and their families.
- The total costs of care for patients experiencing an anastomotic leak are reported to be much higher, with their index hospitalization alone costs \$30,000 higher per patient.<sup>7</sup>
- Based on these data alone, a reduction in the anastomotic leaks after restorative rectal cancer surgery from 15% to 10% would save nearly **\$15 million** annually and a further reduction from 10% to 8% would save an additional **\$6 million** in cost of care.

Value Defects in Rectal Surgery and Potential United States Health Care Cost Impact		
Rectal Cancer Value Defect	Domain(s)	U.S. Societal Cost
Overtreatment with neoadjuvant therapy	Inappropriate care	\$166,078,880 <sup>a</sup>
	Difficulty Supporting Shared Decision-Making	
Loop ileostomy	Inappropriate care	\$18,001,170 <sup>a,b</sup>
	Preventable post-discharge care	
Anastomotic leaks	Care with avoidable complications	\$23,343,450 <sup>a</sup>
	Preventable post-discharge care	
Robotic surgery	Inappropriate care	\$5,888,938 <sup>a,c</sup>
Care by non-specialist provider in low-volume hospital	Difficulty accessing specialty care	\$2,512,602 <sup>a</sup>
	Care at low-volume hospital by low-volume surgeon	

Table 1. Value Defects in Rectal Surgery and Potential United States Health Care Cost Impact  
<sup>a</sup> Applied estimates from the American College of Surgeons National Cancer Database from cases diagnosed January 1, 2021, [https://www.facs.org/-/media/files/qualityprograms/cancer/ncdb/store\\_manual\\_2021.ashx](https://www.facs.org/-/media/files/qualityprograms/cancer/ncdb/store_manual_2021.ashx)  
<sup>b</sup> Used 24,750 loop ileostomy estimate, given NCCN guideline recommendations for neoadjuvant therapy for all clinical stage II and III patients and a mandatory policy of fecal diversion in treated patients.  
<sup>c</sup> Cost of a laparoscopic procedure served as the comparator.

Robotic-Assisted Rectal Cancer Surgery

- The widespread adoption of robotics for rectal cancer surgery is one example of how technology can create significant friction in the shift towards value-based care.
- While improved outcomes were reported in the REAL study from China<sup>8</sup>, the data from the US-based randomized ROLLAR trial and real-world research failed to demonstrate any significant clinical advantage of robotic surgery over the conventional laparoscopy in the treatment of rectal cancer.<sup>9-10</sup>
- An annual saving of **\$5 million** would be potentially generated if replacing unnecessary robotic surgery with conventional care.

Current and Future of Rectal Cancer Care in the U.S.

- Examination of the Commission on Cancer’s National Cancer Database reveals that **most rectal cancer patients are treated in low-volume hospitals by non-specialist providers**.<sup>11</sup>
- The current state of the U.S. rectal cancer care is similar to care that existed 20 years ago in several European countries where national efforts were made to improve the quality of care through provider training, followed by consolidation and standardization of care.
- It is estimated that achieving similar improvements as these European countries in the U.S. could reduce total costs of rectal cancer care by 16%, or **\$528 million annually**, and save **6,000 patient-lives/year**.
- We also calculated that we could save **\$2.5 million** if having more patients treated in high-volume centers by multidisciplinary teams of rectal cancer specialists.

CONCLUSIONS & LIMITATIONS

- Significant opportunities exist to improve the value of rectal cancer care and surgeons have an important role in achieving high-value care that provide high quality outcomes at lower costs with increase in patient satisfaction.**

Limitations

- By no means all-inclusive, these examples are meant to stimulate rectal cancer providers to critically assess the cost0benefit ratio of each step of treatment algorithms with the goal of providing the highest value care possible for each patient.
- The parameters used in the cost calculations were solely based on what is reported in published literature, thus warranting further research using valid real-world data sources such as claims data to capture the comprehensive cost savings.

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