



## Development and Characteristics of a Multidisciplinary Colorectal Cancer Clinic

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### Abstract

**Background:** Multidisciplinary cancer clinics deliver streamlined care and facilitate collaboration between specialties. We described patient volume and specialty service utilization, including surgery, of a multidisciplinary colorectal cancer clinic established at a tertiary care academic institution.

**Methods:** We conducted a retrospective observational cohort study of adult patients with colorectal adenocarcinoma from 2012–2017. We performed a descriptive analysis of patient volume, percentage of rectal cancer patients, and the number of patients who saw and received surgery, chemotherapy, and radiation each year.

**Results:** Over 5 years, 1,711 patients were served at the multidisciplinary clinic. Patient volume increased 37%, from n=228 (annualized) to n=312. The percentage of rectal cancer patients increased from 29% in 2013 to 42% in 2017. The highest rate of utilization was for surgery; 792 (46%) patients had surgery at the multidisciplinary clinic institution, and 510 (30%) received chemotherapy there. Out of 635 rectal cancer patients, 114 (18%) received radiation there.

**Conclusions:** Over the five-year experience of a colorectal cancer-focused multidisciplinary clinic, overall patient volume increased by 37%. Over the study period, 63% of patients seen at the multidisciplinary clinic ultimately received at least one treatment modality at the clinic institution. Overall, the clinic's establishment resulted in the increased referral of complex patients.

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## Keywords

multidisciplinary clinic; colorectal cancer; tumor board

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## Introduction

Multidisciplinary care can reduce recurrence and increase survival in both colon and rectal cancer.<sup>1,2</sup> Multidisciplinary approaches are especially critical for patients with rectal cancer, metastatic disease, or other complex cases where treatment decisions require timely coordination between providers. Traditionally, multidisciplinary cancer care has consisted of tumor board evaluation, where a patient is presented by one provider, a treatment plan is reached by consensus, and the patient is referred to specialists as necessary. However, a new model has arisen: the formal multidisciplinary clinic.<sup>3</sup> In a multidisciplinary clinic, specialists are centralized into one physical location, ideally streamlining multiple visits into a single day for patients and facilitating in-person communication between providers. Multidisciplinary clinics promote adherence to evidence-based guidelines, boost clinical trial enrollment, and improve outcomes including survival in various malignancies.<sup>4-9</sup> In colorectal cancer, multidisciplinary clinic evaluation leads to revision of initial diagnoses and management plans, reduces time to treatment, and improves access to multimodal therapy.<sup>10-12</sup>

While multidisciplinary clinics have become commonplace for malignancies such as breast or prostate cancer, they have failed to do so for colorectal cancer. In colorectal cancer, only 55% of patients receive multidisciplinary care of any kind.<sup>13</sup> Increasing multidisciplinary clinic access may help address this shortcoming, but establishing an multidisciplinary clinic requires significant hospital resources and time commitment from clinicians. For surgeons interested in starting or participating in a multidisciplinary clinic, it would be helpful to know the patient volume that might be expected over time and the proportion of patients who may seek surgery at their institution.

At a large, tertiary care academic institution, we established a colorectal cancer multidisciplinary clinic with support from surgeons, medical oncologists, radiation oncologists, and other disciplines. Here, we present this clinic's five-year experience, detailing necessary structural supports and changes in volume over time.

## Methods

### Establishment of the multidisciplinary clinic

In October 2012, a formal multidisciplinary clinic for colorectal cancer was established at the University of Michigan, convening colorectal and hepatobiliary surgeons, medical oncologists, radiation oncologists, pathologists, radiologists, gastroenterologists, clinical geneticists, dietitians, and social workers. We created a detailed plan based on input from clinician leads from each specialty, including structural supports to optimize specialty engagement, care coordination, patient-centeredness, and quality improvement. Through this collaborative process, clinicians participating in the multidisciplinary clinic developed a

strong *esprit de corps* that facilitated patient care, quality improvement, and accrual to research studies.

The clinic was one full day per week, incorporating the existing tumor board. A shared staff room enabled provider-to-provider communication. Initially, we conducted a weekly administrative meeting to address strategic and logistical issues and a separate weekly telephone huddle with all specialties the night before clinic to review anticipated patient plans. After addressing the most pressing issues, the meeting frequency was decreased to monthly and the pre-clinic huddles were no longer necessary. We created a provider staffing schedule to ensure representation of all specialties, including Genetics and Social Work. In the case of directed consult requests, most specialties opted to share the queue.

We purposely rescheduled tumor board from evening to noon, providing lunch so that clinician participants and trainees did not have to leave the clinic area. While a minor expense, the provided meal facilitated a punctual start and outstanding participation with lively discussion of evidence-based treatment and upcoming protocols. A summary of the tumor board recommendations and rationale was forwarded to referring physicians and patients.

The patient triage process was another important component (Figure 1). Rather than passively receiving referrals, we proactively directed all new colorectal cancer referrals to the multidisciplinary clinic. Using tailored algorithms, patients were scheduled to see the appropriate specialists with the appropriate studies. Critical to this process were a dedicated scheduler and nurse navigator, hired with permission from our Cancer Center leadership. The scheduler obtained outside test results and prior treatment information and scheduled tests and appointments. The nurse navigator contacted each patient before their visit, reviewed outside records, summarized treatment history, and used algorithms based on National Comprehensive Cancer Network (NCCN) guidelines to order necessary studies.<sup>14,15</sup> Visits were scheduled as soon as possible, with missing tests scheduled for that same day.

Patients were scheduled to see all providers they would potentially need for their treatment, based on their likely stage. Patients who were younger than 50, had polyposis, or had a family history of colorectal cancer were also scheduled to see a clinical geneticist. To optimize efficiency, appointments with clinicians for whom the need was less common (thoracic surgery, hepatobiliary surgery, radiation oncology, genetics) were clustered to certain weeks to fit availability. However, there were times when specialty providers saw as few as a single patient in the clinic in a day to accommodate the patient. This process was in stark contrast to referral patterns for colorectal cancer that had previously been in place. Before the multidisciplinary clinic establishment, most colon cancer patients were initially referred to a surgeon for resection, and patients could be directed to colorectal surgeons, surgical oncologists, or general surgeons, representing over 16 surgeons and six divisions of General Surgery. Surgeons would then refer patients as needed for neoadjuvant or adjuvant therapy, rather than having patients seen up front by all disciplines to create a multidisciplinary plan.

## Data Source

A prospective registry of patients seen at the multidisciplinary clinic was maintained using in-person survey and chart review. This registry was deemed exempt by the University of Michigan Institutional Review Board. Data were abstracted by research assistants and validated by research team members with clinical expertise (JVV, ADR, KMH). The database was periodically reviewed to ensure that each patient's record was updated until they reached surveillance, at which time the record was designated as complete.

Patients were included if they had a diagnosis of colon or rectal adenocarcinoma. We excluded patients with other diagnoses from the database, such as anal squamous cell carcinoma, gastrointestinal stromal tumors (GIST), carcinoid, melanoma, or appendiceal cancer, although these patients were also seen in the clinic. Patients were identified as having rectal cancer (versus colon cancer) based on provider history and progress notes, not just on tumor location alone. Thus, some patients with tumors in the rectosigmoid colon who were treated as having colon cancer were designated "colon cancer" while others who were treated according to rectal cancer treatment protocols were designated "rectal cancer".

## Statistical Analysis

We conducted a retrospective cohort study of patients seen from 2012–2017 and used descriptive statistics to analyze patient characteristics and treatment utilization. All analyses were performed using StataSE version 14 (College Station, Texas).

## Results

### Demographics of the Cohort

From October 2012 to December 2017, 1,711 patients were seen in the multidisciplinary clinic (Table 1). Overall, 920 (48%) patients were female. The mean (SD) age was 60 (14) years at initial consultation. There were 700 (41%) patients who sought a second opinion; of these, 246 (35%) patients ultimately converted their care to the multidisciplinary clinic institution. The majority (n=981, 57%) of patients traveled fewer than 50 miles to the multidisciplinary clinic, while 366 (21%) traveled between 50 and 100 miles and 362 (21%) traveled farther than 100 miles.

Overall, 1,076 (63%) patients had colon cancer and 635 (37%) had rectal cancer. Of those diagnosed with colon cancer, 939 (87%) patients were seen for a new diagnosis, while 121 (11%) had recurrent cancer. For rectal cancer, 555 (87%) patients had primary and 70 (11%) patients had recurrent disease (Table 2). Out of the 1,494 patients with primary disease, 178 (12%) patients had Stage I cancer, 239 (16%) had Stage II, 426 (29%) had Stage 3, and 456 (31%) had stage IV cancer.

### Utilization of Specialty Consultation and Treatment

At the first multidisciplinary clinic visit, 1,121 (65%) of patients saw a colorectal surgeon in initial consultation, 1,024 (60%) saw a medical oncologist, 220 (13%) saw a radiation oncologist, and 205 (12%) saw a hepatobiliary surgeon. Over the study period, 967 (57%) patients saw only one specialist, 471 (28%) saw two, 214 (13%) saw three, and 57 (4%) saw

four or more specialists at their initial multidisciplinary clinic visit. In addition, 369 (22%) patients saw Genetics at the multidisciplinary clinic institution, either on their first clinic day or at a later date.

Over five years, 1,085 (63%) patients who were seen at the multidisciplinary clinic received at least one treatment modality at the multidisciplinary clinic institution (surgery, chemotherapy, or radiation), with 79 (5%) patient receiving all three. The highest rate of utilization was for surgery; 792 (46%) patients had surgery at the multidisciplinary clinic institution, and 510 (30%) received chemotherapy there. Out of 635 rectal cancer patients, 114 (18%) received radiation there.

Among the 792 patients who had surgery, 47 (6%) patients received a liver resection only, while 19 (2%) patients received a concurrent colon or rectal operation. In addition to the patients who underwent a concurrent liver resection, 96 (12%) patients underwent a concurrent gynecologic, neurosurgical or orthopedic, urologic (not including ureteral stent placement), or plastic surgery operation. Eighty-seven (11%) patients had a multivisceral resection, where other organs (or portions of organs) were removed along with the primary tumor (not including omentum or gallbladder if performed during a liver resection).

Overall, 148 (77%) patients with Stage I, 168 (62%) patients with Stage II, 264 (58%) patients with Stage III, and 138 (25%) patients with Stage IV disease ultimately underwent surgery. Among 560 patients with Stage IV disease, 235 (42%) saw only a medical oncologist at the first visit; 157 (28%) saw a provider from medical oncology and colorectal and/or hepatobiliary surgery, and 40 (7%) saw providers from medical oncology, colorectal and/or hepatobiliary surgery, and radiation oncology. In addition to the 25% of patients with Stage IV disease who underwent surgery, 225 (40%) received chemotherapy, and 33 (6%) received radiation.

### Volume Changes Over Time

At inception in the final quarter of 2012, the multidisciplinary clinic served 57 patients (annualized n=228). The multidisciplinary clinic volume increased annually until 2016, serving 305 patients 2013, and increased by 37% to 389 patients served in 2016. In 2017, volume decreased by 20%, serving 312 patients. In 2017, we intentionally began to see patients with anal squamous cell carcinoma and other malignancies, which likely accounted for some additional volume of patients seen that year that was not reflected in our database. Over time, the percentage of rectal cancer patients increased from 29% of all patients in 2013 to 42% in 2017 (Figure 2). Stage mix stayed relatively constant over time. The percentage of patients seen each year by Genetics at the multidisciplinary clinic fluctuated over time, starting with 20% of patients in 2013 and peaking at 28% of patients in 2014. However, the volume decreased after 2014, and in 2017, 16% of patients were seen by Genetics.

### Discussion

This paper describes the structure, utilization, and growth of a formal multidisciplinary clinic for colorectal cancer over five years. Over time, the volume of patients served by the

clinic increased, and a higher proportion of patients with rectal cancer were seen in later years. Over half the patients seen had Stage III or IV disease and greater than 10% underwent multivisceral resection. Over the study period, 63% of patients seen at the multidisciplinary clinic received at least one treatment modality there, most often surgery. The clinic clearly served complex patients, and this increased over time.

While there are similar studies describing multidisciplinary clinic experiences in prostate, breast, and other gastrointestinal cancers, this study is the first to do so for colorectal cancer.<sup>16–22</sup> Studies of prostate cancer multidisciplinary clinics demonstrate that the majority of patients ultimately receive treatment at the multidisciplinary clinic institution.<sup>17</sup> In one institution's 15-year experience, over 75% of the patients received their care at the multidisciplinary clinic institution, and the ten-year institutional survival rate exceeded that in national databases.<sup>19</sup> We saw a similar pattern, as well as programmatic growth over time. Importantly, our patient volume increased in the absence of any marketing efforts about the establishment of the multidisciplinary clinic. For clinicians considering starting a colorectal cancer multidisciplinary clinic, our findings suggest that such a clinic may yield an increased patient volume for the institution, drawing patients with a high rate of specialty service utilization, including complex surgery.

We learned many lessons in the establishment and maintenance of our multidisciplinary clinic. First, a strong buy-in to the mission of the multidisciplinary clinic from the leaders of all involved disciplines is essential. For our multidisciplinary clinic, clinicians invested time into the weekly clinic without additional remuneration or other incentive. Other clinicians, including radiologists and pathologists, made substantial commitments to attend tumor board and take part in quality improvement projects. An emphasis on the clinic's common goal, face-to-face interactions, and co-located clinic space promoted collaboration and strengthened relationships between clinicians. Other lessons in promoting a positive culture included generating equity between the surgical partners in the multidisciplinary clinic. Using a group practice model, patients were scheduled with the next available multidisciplinary clinic surgeon. By not relying on direct referrals, both senior and junior surgeons grew their experience in both common and complex colorectal cancer surgery.

Other essential elements include sufficient space for multiple providers to see patients, availability in each provider's schedule, and representation from the various disciplines at the weekly tumor board. In our multidisciplinary clinic, we removed some barriers to tumor board attendance by changing the time from the evening to the middle of the clinic day and providing lunch for everyone's convenience. Finally, the presence of a dedicated clinic nurse navigator to screen patients for the multidisciplinary clinic was indispensable, as has been seen in other multidisciplinary clinics.<sup>5,19,21,23</sup>

We did encounter challenges in the maintenance of the multidisciplinary clinic. Although engagement among specialties remained high, clinical growth in the medical center also contributed to structural barriers. For example, constraints of the clinic day affected the medical oncologists' capacity, who also saw return patients during the day. As the number of returning patients increased, we managed this constraint in three ways. First, for patients seeing Medical Oncology, we prioritized patients who likely qualified for open clinical

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trials. Second, we deprioritized patients who were on standard-of-care treatment seeking a second opinion, as our evaluation would not change their treatment plan. Third, we established a separate survivorship clinic run by physician assistants to decrease the number of return patients to be seen at the clinic. As another challenge, patients who were referred to the multidisciplinary clinic often had incomplete workups, necessitating tradeoffs between waiting for all necessary testing and scheduling patients into clinic as quickly as possible. We opted to expedite scheduling to improve the patient experience, with missing tests scheduled for the same day as the clinic visit.

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As capacity of any multidisciplinary clinic is limited, one important recommendation is to prioritize patients who are most likely to benefit from evaluation at a multidisciplinary clinic, including patients with rectal cancer, patients with Stage IV disease, and patients with tumors involving additional organs. In our clinic at an academic tertiary care center, we can offer patients clinical trial enrollment and highly specialized, multidisciplinary surgical care, which may allow patients to get treatment that they would not be offered elsewhere. For example, we routinely collaborate with other surgical specialties to offer pelvic exenteration and other multivisceral resections. As another example, 25% of Stage IV patients underwent surgery at the multidisciplinary clinic. Prior work demonstrates that surgery for colorectal metastases remains underutilized, with a survey of medical oncologists in our region reporting broad variation in surgical referral practice for colorectal liver metastases.<sup>24</sup> As such, evaluation in an multidisciplinary clinic may be able to deliver Stage IV patients appropriate surgical care for a chance of cure.

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We note several limitations to this work. First, while patients were followed longitudinally until completion of therapy, loss to follow-up, or death, our data only included the specialty of providers seen at the initial consultation, not subsequent visits. For example, if a patient only met with a medical oncologist at the first visit and later did not go on to have surgery, we do not know whether that patient saw a surgeon at a later date and opted to undergo surgery elsewhere, or if they were ineligible for surgical resection. Thus, we underestimated the proportion of eligible patients receiving each treatment from the multidisciplinary clinic institution. Second, we did not systematically collect staging and management decisions made at other institutions before the patients were seen in the multidisciplinary clinic, and thus cannot draw any conclusions about whether the multidisciplinary clinic changed patients' diagnoses or treatment plans. This lack of clinical and management information is an important limitation of our dataset, as we can only report basic descriptive findings about patient demographics, diagnoses, and attributes over time. Third, as we excluded patients with any diagnosis other than colorectal adenocarcinoma, the patient volumes for each year may be underestimated, especially for 2017, when a greater proportion of patients with other diagnoses were seen in the multidisciplinary clinic. Fourth, we did not collect patient satisfaction or experience measures. Before the multidisciplinary clinic was started, patients were seen separately by many different groups of surgeons and providers from other specialist groups, and collecting patient-reported outcomes data was not attempted before or after clinic initiation. However, multidisciplinary clinics for other malignancies have been shown to deliver increased patient satisfaction.<sup>19,25,26</sup> Finally, our data is from a single institution's experience, and the generalizability to other institutions' unique environments is limited by many factors, such as our high proportion of patients with private insurance.

## Conclusions

We established a formal colorectal cancer multidisciplinary clinic and saw substantial programmatic growth over five years. One real concern that surgeons may have about participating in an multidisciplinary clinic is that it is a relatively inefficient use of their time.<sup>22,27</sup> However, we found that almost half of patients underwent surgery from our institution, and surgery was the most commonly utilized treatment modality. Streamlining the patient workup and triage process may result in high-value visits for clinicians. In addition, our experience echoes that of other multidisciplinary clinics, finding that despite the time commitment, clinicians derive increased professional satisfaction in the ability to deliver a coordinated, patient-centered treatment plan.<sup>22,27</sup> Ultimately, the benefits of a colorectal cancer multidisciplinary clinic may go beyond the immediate clinical gain for individual patients, including high-quality care through a improvement in patient-centered processes, and a more efficient, rewarding experience for clinicians.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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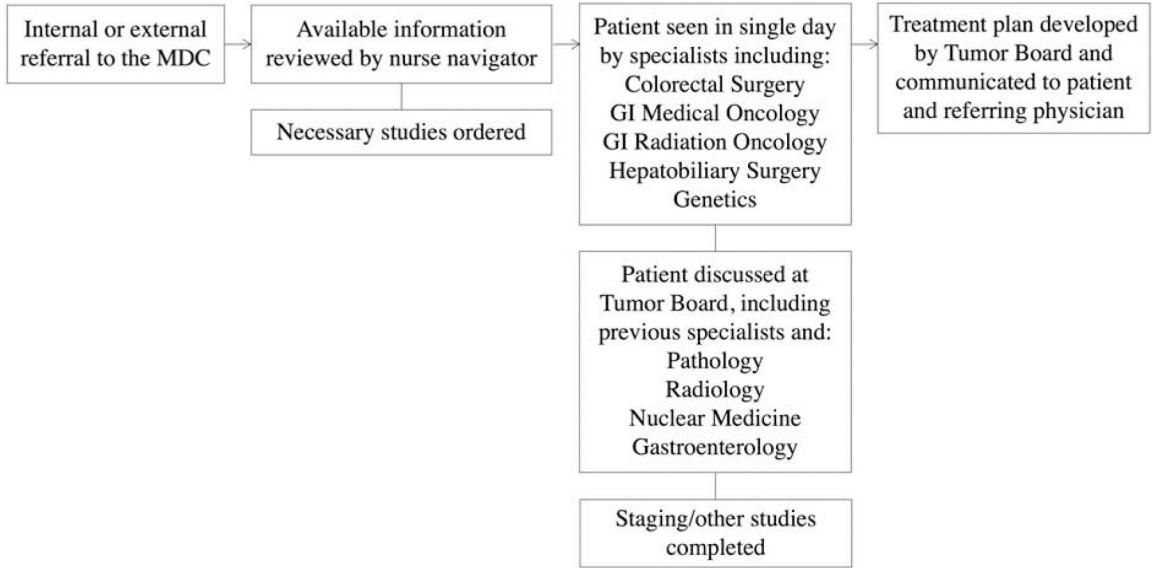
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### Highlights

Establishing a multidisciplinary cancer clinic requires shared resources, oversight, and buy-in from the beginning from multiple specialties and professions.

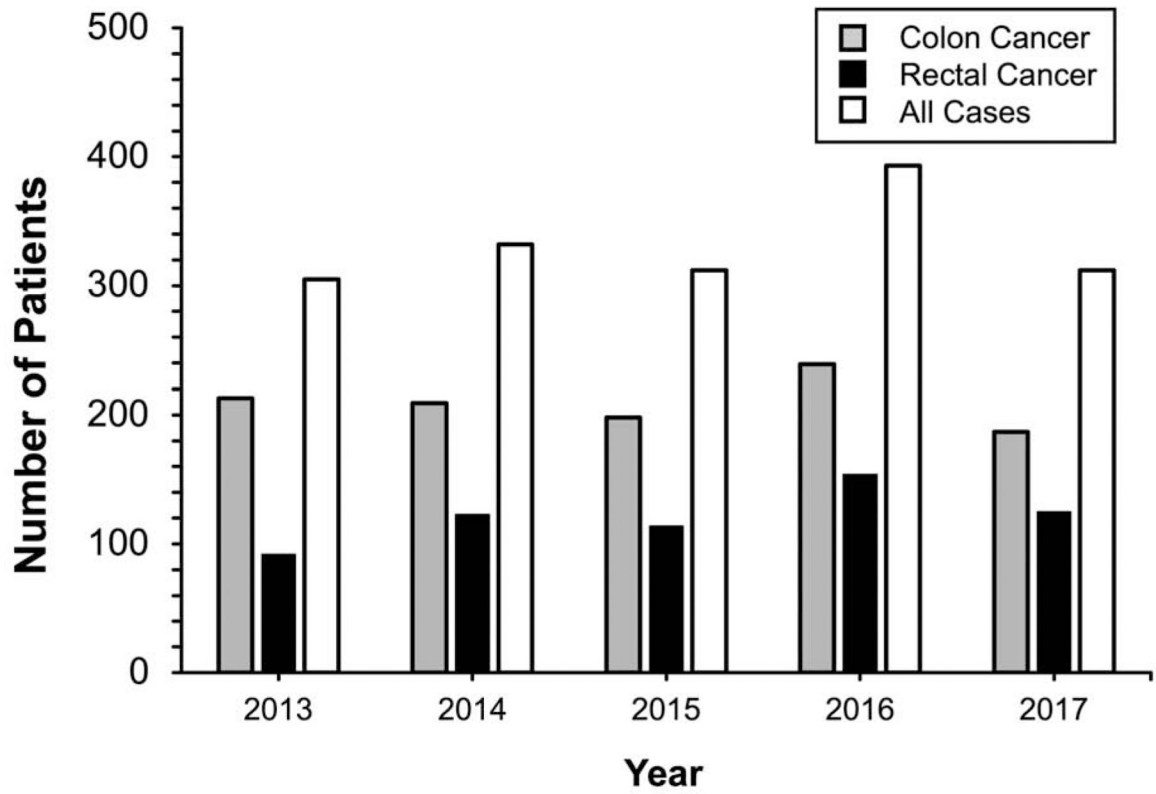
Complex patient volume may increase over time after establishment of a multidisciplinary clinic for colorectal cancer.

Many patients seen at a multidisciplinary colorectal cancer clinic may undergo surgery at the clinic institution, representing a return on investment for surgeons.



**Figure 1. Multidisciplinary clinic Patient Triage Summary.**

After referral, the multidisciplinary clinic nurse navigator reviewed each patient’s history and scheduled them for multidisciplinary clinic consultation with specialty provider visits according to NCCN guideline-based algorithms. Tumor board was held that same day and a treatment plan was developed and relayed to each patient.



**Figure 2. Patient Volume Over Time.**

Starting in 2013 (the first full year of the multidisciplinary clinic), overall volume and rectal cancer patient volume increased.

**Table 1.**

## Patient Characteristics

	N	% <sup>a</sup>
Total patients	1,711	100
Age (years)		
<40	110	6
40–50	251	15
50–60	469	27
60–70	455	27
70+	424	25
Sex		
Male	891	52
Female	820	48
Race		
White	1,416	83
Black	135	8
Other	84	5
Unknown	66	4
Insurance Status		
Uninsured	45	3
Private	796	47
Private/Government combination	578	34
Medicare	108	6
Medicaid	82	5
Dual eligible	73	4
Other or Unknown	4	0
Marital Status		
Married/partnered	1,165	68
Single	234	14
Divorced/separated/widowed	273	16
Unknown	29	2
Sought second opinion	700	41
Converted care after second opinion <sup>b</sup>	246	35
Distance traveled (miles)		
20	465	27
21–50	516	30
51–100	366	21
101–150	211	12
151–200	66	4

	N	% <sup>a</sup>
201–500	68	4
501–1000	9	1
>1000	8	0
Tumor location		
Cecum	145	8
Right-sided	284	16
Transverse	110	6
Left-sided	109	6
Sigmoid	277	16
Rectosigmoid	577	34
Rectum	139	8
Multiple	48	3
Unknown	22	1
Underwent surgery at multidisciplinary clinic institution	792	46
Procedure <sup>c</sup>		
Local excision	12	2
Right colectomy	192	24
Transverse colectomy	14	2
Left colectomy	45	6
Sigmoid colectomy	66	8
Low anterior resection	213	27
Abdominoperineal resection	78	10
Subtotal/total colectomy	17	2
Total proctocolectomy	27	3
Liver resection only	42	5
Primary resection/liver resection	17	2
Diverting ostomy	13	2
Other	38	5
Unknown	3	0
Concurrent procedure (including liver resection) <sup>c</sup>	115	15
Multivisceral resection <sup>c</sup>	87	11

<sup>a</sup>Percentages may not add to 100 due to rounding to nearest percent.

<sup>b</sup>Denominator for this percentage is n=700, the number of patients who sought second opinion.

<sup>c</sup>Denominator for these percentages is n=792, the number of patients who had an operation at the multidisciplinary clinic institution. Some patients had

**Table 2.**

Disease characteristics between colon and rectal cancer patients.

	Colon Cancer (N, %)	Rectal Cancer (N, %)
Total patients	1,076 (63)	635 (37)
Cancer type <sup>a</sup>		
Primary	939 (87)	555 (87)
Recurrent	121 (11)	70 (11)
Unknown	16 (1)	10 (2)
Stage <sup>a</sup>		
I	108 (12)	70 (13)
II	144 (16)	95 (17)
III	245 (26)	181 (33)
IV	298 (32)	158 (28)
Unknown	144 (15)	51 (8)
Underwent surgery at multidisciplinary clinic Institution	489 (45)	303 (47)

<sup>a</sup>Percentages obtained using the type of cancer (colon or rectal), for primary disease only, as the denominator.

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