Implementation of a Performance Improvement Initiative in Colorectal Cancer Care

By John L. Marshall, MD, Thomas H. Cartwright, MD, Carolyn A. Berry, PhD, Stephanie A. Stowell, MPhil, and Sara C. Miller, MS

Georgetown University Hospital, Washington, DC; Ocala Oncology Center, Ocala, FL; New York University, New York, NY; and Med-IQ, Baltimore, MD

Abstract

Purpose: In the United States, colorectal cancer (CRC) is the third leading cause of cancer after breast and prostate cancer. Numerous improvement programs have been implemented to increase CRC screening rates, but few have focused on improving the care and management of patients with a diagnosis of this malignancy. As national medical organizations focus on quality of care, efforts are necessary to provide clinicians the opportunity for self-assessment and methods for practice improvement. With this goal in mind, a national continuing medical education–certified performance improvement initiative was conceived.

Methods: The initiative consisted of three stages: First, participants self-assessed their performance of predetermined topic measures through a review of patient charts. The topic areas included patient safety and supportive care, evidence-based surveillance, and evidenced-based treatment and were derived

from current guidelines and other successful quality-improvement initiatives. Second, an actionable plan for practice improvement was developed in at least one of the three topic areas. Third, after a period of self-improvement, participants reassessed their performance of the same topic measures to determine tangible changes in patient care.

Results: A total of 540 patient charts were reviewed by 27 clinicians. Notable results showed large gains in areas of supportive care, such as quantitative pain assessments and emotional well-being evaluations, which traditionally have been a minor focus of other quality-improvement initiatives. Participants also showed tangible improvements in the performance of leading measures of quality care.

Conclusion: These findings support the need for continued efforts toward performance improvement in both established and emerging areas of CRC patient care.

Introduction

Colorectal cancer (CRC) is the third most commonly diagnosed cancer and the second leading cause of cancer-related mortality in the United States.¹ The American Cancer Society estimated that 148,210 new cases would have been diagnosed and that 49,380 deaths would have occurred from this disease alone by the end of 2011. Many programs exist to promote awareness and early detection of CRC through increased screenings. In addition, research is ongoing to develop new screening tools and increase the understanding of the mechanisms underlying this disease. Yet substantially less attention has been devoted to improving the actual treatment and care of patients already diagnosed with CRC.

Efforts to improve the quality of care of patients with cancer have been steadily growing in the United States. Starting in 1999, the National Cancer Policy Board was established to assess the quality of cancer care.² Findings from their initial study concluded that cancer care was less than ideal, and the need for quality measures was established to improve outcomes in patients with cancer. In response, several oncology organizations have created initiatives to improve patient care. The American Society of Clinical Oncology (ASCO) established the National Initiative on Cancer Care Quality as a way to evaluate the care of patients with breast cancer and CRC in five major metropolitan areas.³ At the same time, ASCO also developed

the Quality Oncology Practice Initiative (QOPI) to aid oncology practices in quality self-assessment.⁴ Furthering both of these national efforts in the state of Florida, the Moffitt Quality Practice Initiative (MQPI) was created and later expanded to form the Florida Initiative for Quality Cancer Care (FIQCC).^{5,6} Published data from these initiatives illustrate variation in the quality of care for patients with cancer, including those with CRC.^{6,7}

In addition to cancer-specific organizations, the American Medical Association's (AMA) Physician Consortium for Performance Improvement and the American Board of Medical Specialties are leading efforts to improve the implementation of evidence-based performance measures in patient care.^{8,9} Specifically, the American Board of Medical Specialties recognizes that physicians should not only possess medical knowledge, but also must investigate and evaluate their patient care practices to improve their practice of medicine.⁹

To this end, Med-IQ (Baltimore, MD), an American Academy of Continuing Medical Education–accredited provider of medical education, collaborated with expert faculty to provide a CRC-specific national performance improvement (PI) initiative, designed by and promoted for community oncologists, that was free of charge for participants. Modeled after the ASCO QOPI, MQPI, and FIQCC, the specific aims of this initiative were to improve patient care in three topic areas: (1) patient safety and supportive care, (2) evidence-based surveil-

lance, and (3) evidenced-based treatment. Participation allowed individual clinicians across the United States to assess their performance of these quality indicators, devise a strategy for self-improvement, and reassess their performance after a period of strategy implementation to improve outcomes for patients with CRC.

Methods

The PI Process

Based on the AMA-approved, nationally standardized, continuing medical education (CME) process, program participants were able to earn up to 20 AMA PRA Category 1 Credits by completing the three-stage process.¹⁰ Participants began in stage A by completing a self-assessment of predetermined practice performance measures through retrospective chart reviews focused on three topic areas. On the basis of an evaluation of their performance compared with that of their peers and clinical practice guidelines, participants developed an individualized plan for improving their practice. In stage B, this individualized plan was implemented over a 3-month period in one or more of the topic areas. To support their improvement efforts, participants were directed to a CME-certified print document designed to discuss clinical evidence and guideline recommendations surrounding the performance measures assessed as part of the program. In addition, this guide offered participants useful tools for the implementation of improvement efforts (eg, a pain assessment tool, a planning calendar for surveillance; Data Supplement). Finally, in an effort to further personalize each participant's ability to design and implement their improvement plans, two audio conferences with the expert faculty were conducted. After the elapsed period for improvement, participants performed a second round of self-evaluation in stage C, comparing their performance of the topic measures with their performance at stage A, with the performance of their peers, and with national standards.

Selection of Topic Measures

PI measures were selected to model the ASCO QOPI, MQPI, and FIQCC initiatives.⁴⁻⁶ Measures that were consistent with evidence-, consensus-, and safety-based guidelines were chosen to assess practice quality in three major areas of patient care: patient safety and supportive care, evidence-based surveillance, and evidence-based treatment.¹¹⁻¹⁷ A total of 22 measures were compiled, reviewed, and pilot tested by four community oncologists to ensure easy abstraction from medical oncology records (Appendix Table A1, online only). Responses to measures were coded in simple terms of "yes," "no," or "N/A" (not applicable).

Participant Criteria and Recruitment

Clinicians who provided community-based oncology care were identified from Med-IQ's internal database and Medical Marketing Service's (Wood Dale, IL) database and invited to enroll in the PI initiative. Invitations were directed toward US-based physicians as well as nurse practitioners and physician assistants. Participation was voluntary, and CME credit was the only in-

centive offered. Clinicians were encouraged to participate to identify potential areas for improvement within their own practice and patient population and to implement changes that could positively affect patient outcomes.

Medical Record Selection

Participants were asked to submit data on 10 patients in stage A and 10 patients in stage C, for a total of 20 patients, who had stage II, III, or IV colon or rectal cancer. Patients had to have received their diagnosis within the 4 years before their last visit. During stage C, participants were advised to include at least five charts from patients who were seen for the first time after participants initiated their PI plans. Excluded from the study were patients who were monitored for screening considerations and those with anal cancer. Patient charts were not linked from stage A to stage C; therefore, patients whose charts were initially reviewed in stage A were not necessarily the same patients whose charts were reviewed in stage C. PI participants were not instructed to keep a key, nor was any coding supplied by them that would have linked patient data between stages A and C.

Patient Confidentiality, Participant Confidentiality, and Exemption From Consent

Only de-identified patient data were collected to ensure compliance with Health Insurance Portability and Accountability Act requirements. PI participant data were reported anonymously and in aggregate. Approval by institutional review board was not required for this PI initiative; the Department of Health and Human Services states that research involving the collection or study of existing data, documents, and records is exempt from review by an institutional review board "if the information is recorded by the investigator in such a manner that the subjects cannot be identified directly, or through identifiers linked to the subjects."^{18(p3)}

Statistical Analyses

Overall and measure-specific adherence rates were calculated for reviewed charts according to topics selected by participants as areas in need of improvement. χ^2 and Fisher's exact tests were used to compare individual measures of CRC care from stage A to stage C. Most analyses were conducted at the chart level. Because of limited sample sizes, a significance value of less than 10% ($P < .10$) was selected to detect important trends among the performance measures. We realize that this significance values lies outside of convention, and we report all significance values to allow readers to draw their own conclusions.

Results

Participant Demographics

Of the 27 participants who completed stage A and stage C, the majority selected patient safety and supportive care (85%), followed by evidence-based surveillance (70%) and/or evidence-based treatment (68%) as areas for PI. Participants were able to choose more than one area for improvement. Most participants (89%) had an MD degree. Other prevalent participant demo-

Table 1. Patient Clinical Characteristics

Characteristic	Patient Safety and Supportive Care: Benchmark 1				Evidence-Based Surveillance: Benchmark 2				Evidence-Based Treatment: Benchmark 3			
	Stage A (n = 230)		Stage C (n = 230)		Stage A (n = 190)		Stage C (n = 190)		Stage A (n = 170)		Stage C (n = 170)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cancer type and stage												
Colon												
Stage II	55	24	53	23	47	25	44	23	41	24	41	24
Stage III	60	26	60	26	44	23	46	25	37	22	37	22
Stage IV	41	18	58	25	34	18	45	24	37	22	43	25
Rectal												
Stage II	18	8	21	9	19	10	21	11	15	9	15	9
Stage III	32	14	23	10	27	14	19	10	24	14	15	9
Stage IV	23	10	14	6	19	10	15	8	15	9	19	11
Time since diagnosis, years												
< 1	94	41	108	47	78	41	91	48	76	45	88	52
1-3	90	39	92	40	76	40	78	41	66	39	63	37
3-4	46	20	28	12	38	20	21	11	28	17	19	11

graphics were as follows: 44% practiced primarily in community-based oncology centers, 48% had been in practice for 11 to 20 years, and 48% saw, on average, two to five patients with CRC each week (Appendix Table A2, online only).

Patient Demographics

The majority of patient records reviewed for all topic areas were from patients with a diagnosis of colon cancer; the distributions across stages of disease were relatively equal (Table 1). Between 41% and 52% of patients reviewed for each topic at each stage had received a diagnosis of CRC within the past year.

Topic 1: Patient Safety and Supportive Care

A full list of quality measures can be found in Appendix Table 1. Twenty-three of the 27 participants selected to focus their improvement plans on patient safety and supportive care. Baseline levels of supportive care measures were low, and participants notably and significantly improved their performance of these measures by stage C (quantified pain assessments, stage A: 42%, stage C: 72%, $P < .001$, $n = 230$; charting of patient's emotional well-being, stage A: 50%, stage C: 84%, $P < .001$, $n = 230$; Figure 1A). Conversely, baseline reviews of 230 charts indicated high levels of performance of complete colon evaluations within 12 months of cancer diagnosis (89%), inclusion of the surgical pathology report (96%), and documentation of TNM staging (97%) within the patient's chart. After the intervention, the charts demonstrated universal inclusion of the surgical pathology report and documentation of TNM staging information ($P = .004$ and $P = .015$, respectively). Overall, chart reviews indicated that participants more than doubled their performance of the quality indicators within this topic after CME intervention (stage A: 24%, stage C: 51%; $P < .001$; $n = 230$).

Topic 2: Evidence-Based Surveillance

Of the 190 baseline chart reviews that were submitted by the 19 participants who selected evidence-based surveillance as an area of improvement, $> 80\%$ adherence was reported for all but two of the eight measures: documented number of evaluated lymph nodes and number of evaluated lymph nodes ≥ 12 . No difference in the documented number of evaluated lymph nodes was seen between the two chart reviews (75% in both stages A and C). However, a trend toward improved performance was observed in stage C for patients who had ≥ 12 lymph nodes evaluated after colon cancer surgery (from 68% to 75%; $P = .215$). Despite high baseline levels, a statistically significant improvement was observed in five of the measures: number of evaluated lymph nodes included in staging considerations, annual chest and abdominal computed tomography ordered and/or performed after primary treatment, colonoscopy ordered and/or performed 3 years after primary treatment, carcinoembryonic antigen (CEA) blood test performed at least once before surgery or chemotherapy, and CEA blood test performed more than once after surgery or chemotherapy (Figure 1B). Overall, a greater percentage of charts reviewed met all guideline-based surveillance measures by the second chart review (stage A: 23%, stage C: 31%; $P = .083$).

Topic 3: Evidence-Based Treatment

A review of 170 charts at baseline revealed that five of nine quality measures were performed for patients $> 90\%$ of the time: adjuvant chemotherapy recommended for stage III colon or rectal cancer, discussion of adjuvant chemotherapy for stage II colon or rectal cancer, chemotherapy initiated within 8 weeks after surgical resection for stage II/III colon or rectal cancer, receipt of guideline-recommended adjuvant chemotherapy regimen for stage II/III colon cancer, and recommendation of

Figure 1. Quality measures with significant improvements. (A) Patient safety and supportive care measures: inclusion of surgical pathology report in the patient chart, documented TNM staging information, documented quantified pain assessment, and documented status of emotional well-being. (B) Evidence-based surveillance measures: performance of carcinoembryonic antigen (CEA) blood test at least once before surgery or chemotherapy, performance of CEA blood test at least once 6 months after surgery or chemotherapy, inclusion of number of evaluated lymph nodes in staging considerations, performance and/or order of annual chest and abdomen computed tomography (CT) scans after primary treatment, and performance and/or order of colonoscopy 3 years after primary treatment. (C) Evidence-based treatment measures: documented *KRAS* status for patients with metastatic colorectal cancer (CRC) and documentation of wild-type status in patients with metastatic CRC receiving cetuximab (CTX) and/or panitumumab (INN).

chemotherapy to patients with metastatic CRC who had lymph node involvement or whose cancer had penetrated the rectal wall.^{12,13} A significant improvement in the documentation of

KRAS status was observed in charts from patients with metastatic CRC (Figure 1C). Also, the documentation of wild-type *KRAS* status in patients receiving the epidermal growth factor receptor (EGFR) –targeted therapies cetuximab and/or panitumumab increased significantly in the postparticipation period. Finally, a trend toward increased referral for surgery in patients with metastatic CRC limited to the liver was seen (stage A: 77%, $n = 26$; stage C: 91%, $n = 34$; $P = .157$). Because the performance measures in this area of improvement were specific to tumor type and disease stage, it is not practical to calculate the percentage of charts that met all measures within this topic area.

Discussion

Participants in this PI initiative were able to implement and enhance their processes of care within select topic areas of improvement for their patients with CRC. Most notably, the largest gains in improvement were within the patient safety and supportive care topic. The performance of the participants improved significantly in the following two areas: documented quantified pain assessment and documented status of patient's emotional well-being. Only approximately one half of the charts reviewed indicated that pain and emotional well-being had been assessed by the participants before participation in the program. However, quantified assessments of pain increased by 30%, and psychological assessments of CRC patients increased by 34% after completion of the program.

Traditionally, supportive care issues have been considered beyond the scope of expertise for many medical oncologists. Unfortunately, as many as 40% of patients with cancer will experience emotional distress, yet as few as 10% of patients with cancer in need of psychological care are identified and referred for appropriate therapeutic intervention.^{19,20} In addition, 50% to 90% of patients will experience some form of pain.¹⁹ Pain is one of the most important independent predictors of survival in patients with cancer.²¹ Although physicians may address the issue of pain with their patients, they may not be appropriately quantifying and tracking pain intensities.²² In addition, visits with oncologists are short, particularly in an ambulatory setting, and psychological issues are often stigmatized such that patients do not share their concerns with their clinicians. If patients fail to receive appropriate treatment and support, pain and emotional distress can lead to poor adherence, poor quality of life, and dissatisfaction with care, which can ultimately result in negative outcomes.²³

Participation in this program had a clear impact on the practices of those physicians who sought to improve the quality of their supportive care practices. What remains to be seen, however, are the responsive actions by oncologists who determine that a patient is in need of emotional and psychological support. Recent findings from the FIQCC study group found that, on average, only 58% (range, 13%–100%) of cases had evidence of action taken in patients with a documented emotional problem.²⁴ This finding suggests that few practices had procedures in place to address the emotional needs of their patients. Whereas assessment and identification are key first steps to pro-

Table 2. Comparison of CRC QI Initiative Outcomes

Core Measure	MQPI/FIQCC		Blayney et al (2008)		Med-IQ (2009)	
	Baseline (%)	Postintervention (%)	Baseline (%)	Postintervention (%)	Baseline (%)	Postintervention (%)
Pathology report included in medical record	94	99	99	99	96	100
CEA measured before surgery or chemotherapy	57	80	N/A	N/A	94	98
CEA measured 6 months after surgery or chemotherapy	83	80	77*	88*	96	97
Colon evaluation within 12 months of diagnosis	46	89	N/A	N/A	89	92
≥ 12 lymph nodes examined after colon cancer surgery	N/A	N/A	59†	73	68	75

Abbreviations: CEA, carcinoembryonic antigen; CRC, colorectal cancer; FIQCC, Florida Initiative for Quality Cancer Care; MQPI, Moffitt Quality Practice Initiative; N/A, not applicable; QI, quality initiative.

* 4 months after surgery or chemotherapy.

† First recorded measure.

moting emotional well-being, further education focusing on strategies to help patients address the problems identified may be indicated.

Regarding evidence-based treatment, participants significantly improved their assessment of *KRAS* status in patients with metastatic CRC and tailored chemotherapeutic regimens accordingly. Of the several molecular markers that have been evaluated as prognostic and predictive indicators, only *KRAS* mutational analysis is currently recommended for routine screening in patients with CRC.²⁵ Tumors that contain mutated versions of the *KRAS* gene are resistant to EGFR-targeted therapies. As a result of this program, we believe that better selection criteria were applied to this subset of patients; therefore, they are more likely to have an optimal treatment response. In turn, those patients who were not candidates for EGFR-targeted therapies were able to avoid unnecessary toxicities.

This initiative also showed changes in clinician performance in areas that have been the focus of many educational efforts (Table 2), namely in the evaluation of 12 or more lymph nodes, complete evaluation of the colon after diagnosis, and assessment of CEA levels before and after treatment.^{5,6,22} Although our program is similar to these other quality-improvement initiatives, knowledge and adaption of new practices is an ongoing and evolving process. Periodic episodes of self-assessment and feedback can help clinicians in their continued efforts to improve patient care. If the practice continues and evolves over time, then PI may also help clinicians strive even further to meet standards of high-quality care.

The limitations associated with this initiative are typical of those associated with other PI activities.^{10,26,27} Bias may have occurred with patient chart selection and self-reporting. This study did not distinguish between improvements in actual care processes and improvements in charting. However, given the number of significant changes observed over several performance measures, we believe that actual changes in practice did occur, despite improvements in charting efforts. Patient record numbers are frequently a limitation in oncology initiatives such

as this, in which clinicians are asked to submit a number of charts that represent patients with different tumor types at different stages of disease. For this reason, sample sizes for the measures not applicable to all patients with CRC were limited. Finally, the generalities of the performance measures used cannot account for the complexities and individualization required for optimal treatment.

This initiative showed that quality improvement is an ongoing and gradual process that can be effective in bolstering national efforts to change the behavior of community clinicians through self-assessment of quality topics. In the United States, 84% of all those with cancer are treated in the community setting.²⁸ Community practices have less access to large-scale quality-improvement programs, which require practices to provide additional operating expenses as part of their programs.²⁹ In contrast, this program was made widely available through an unrestricted educational grant that funded the research and development of the benchmark measures data collection form, online data system, CME-certified print publication, and tools. The core educational component of this initiative was validated and evaluated for objectivity, balance, scientific rigor, and the potential for commercial bias by an independent, third-party review board. The program was free of charge to any individual practicing oncology clinician in the United States and provided an affordable opportunity for PI to those who treat the majority of patients with CRC. Participants were also able to use data from this initiative to complete the Self-Directed Performance Improvement Module and earn practice performance points for American Board of Internal Medicine Maintenance of Certification.

This study represents merely one snapshot of practice assessment for these clinicians, as clinicians must routinely update their medical knowledge and skills. Ideally, these participants will continue to seek out similar opportunities for self-assessment and performance improvement, with the goal of improving the quality of care provided to their patients.

Accepted for publication on February 1, 2012.

Acknowledgment

This initiative was supported by an unrestricted educational grant from sanofi-aventis. The funding source had no role in the execution, analysis, or development of the resulting manuscript associated with this initiative. We thank Whitney Stevens Dollar for project management, LaWanda Abernathy for audience development, Lisa Rinehart and Brenda Milot for editorial assistance, Kenny Khoo for data management, Bianca Perri for data analysis, and Reshma Carter and Amy Sison for outcomes management.

Authors' Disclosures of Potential Conflicts of Interest

Although all authors completed the disclosure declaration, the following author(s) and/or an author's immediate family member(s) indicated a financial or other interest that is relevant to the subject matter under consideration in this article. Certain relationships marked with a "U" are those for which no compensation was received; those relationships marked with a "C" were compensated. For a detailed description of the disclosure categories, or for more information about ASCO's conflict of interest policy, please refer to the Author Disclosure Declaration and the Disclosures of Potential Conflicts of Interest section in Information for Contributors.

Employment or Leadership Position: Sara C. Miller, Med-IQ (C)

References

1. American Cancer Society: Colon cancer facts & figures 2011-2013. www.cancer.org/Research/CancerFactsFigures/ColorectalCancerFactsFigures/colorectal-cancer-facts-figures-2011-2013-page
2. Hewitt M, Simone JV (eds): Ensuing quality cancer care. http://books.nap.edu/openbook.php?record_id=6467
3. Bailes JS: ASCO's groundbreaking study on cancer care quality: NCCQ. *J Oncol Pract* 2:48, 2006
4. Neuss MN, Desch CE, McNiff KK, et al: A process for measuring the quality of cancer care: The Quality Oncology Practice Initiative. *J Clin Oncol* 23:6233-6239, 2005
5. Jacobsen PB, Shibata D, Siegel EM, et al: Measuring quality of care in the treatment of colorectal cancer: The Moffitt quality practice initiative. *J Oncol Pract* 3:60-65, 2007
6. Malafa MP, Corman MM, Shibata D, et al: The Florida Initiative for Quality Cancer Care: A regional project to measure and improve cancer care. *Cancer Control* 16:318-327, 2009
7. Malin JL, Schneider EC, Epstein AM, et al: Results of the National Initiative for Cancer Care Quality: How can we improve the quality of cancer care in the United States? *J Clin Oncol* 24:626-634, 2006
8. American Medical Association: Physician consortium for performance improvement. www.ama-assn.org/ama/pub/physician-resources/physician-consortium-performance-improvement.page
9. American Board of Medical Specialties: ABMS maintenance of certification. www.abms.org/Maintenance_of_Certification/ABMS_MOC.aspx
10. Cannon CP, Hoekstra JW, Larson DM, et al: Individual quality improvement in acute coronary syndromes: A performance improvement initiative. *Crit Pathw Cardiol* 8:43-48, 2009
11. Benson AB 3rd, Schrag D, Somerfield MR, et al: American Society of Clinical Oncology recommendations on adjuvant chemotherapy for stage II colon cancer. *J Clin Oncol* 22:3408-3419, 2004
12. National Comprehensive Cancer Network: NCCN clinical practice guidelines in oncology: Colon cancer. v. 3, 2009
13. National Comprehensive Cancer Network: NCCN clinical practice guidelines in oncology: Rectal cancer. v. 3, 2009
14. National Comprehensive Cancer Network: NCCN clinical practice guidelines in oncology: Adult cancer pain. v. 1, 2009
15. National Comprehensive Cancer Network: NCCN clinical practice guidelines in oncology: Distress management. v. 2

Consultant or Advisory Role: John L. Marshall, Amgen (C), Genentech (C), Thomas H. Cartwright, Amgen (C), Lilly (C), Genentech (C) **Stock Ownership:** None **Honoraria:** Thomas Cartwright, Amgen, Lilly, Genentech **Research Funding:** John L. Marshall, Amgen, Genentech **Expert Testimony:** None **Other Remuneration:** None

Author Contributions

Conception and design: John L. Marshall, Thomas H. Cartwright, Carolyn A. Berry, Sara C. Miller

Data analysis and interpretation: All authors

Manuscript writing: Stephanie A. Stowell, Sara C. Miller

Final approval of manuscript: All authors

Corresponding author: Stephanie A. Stowell, MPhil, Med-IQ, 5523 Research Park Dr, Suite 210, Baltimore, MD 21223; e-mail: ssowell@med-iq.com.

DOI: 10.1200/JOP.2011.000461; published online ahead of print at jop.ascpubs.org on May 15, 2012.

16. Rex DK, Kahi CJ, Levin B, et al: Guidelines for colonoscopy surveillance after cancer resection: A consensus update by the American Cancer Society and US Multi-Society Task Force on Colorectal Cancer. *CA Cancer J Clin* 56:160-167, 2006
17. Sturgeon CM, Duffy MJ, Stenman UH, et al: National Academy of Clinical Biochemistry laboratory medicine practice guidelines for use of tumor markers in testicular, prostate, colorectal, breast, and ovarian cancers. *Clin Chem* 54:e11-e79, 2008
18. Code of Federal Regulations, Title 45: Public Welfare, Department of Health and Human Services, Part 46: Protection of Human Subjects, Revised January 15, 2009. <http://www.hhs.gov/ohrp/policy/ohrpregulations.pdf>
19. Keefe FJ, Abernethy AP: Psychological approaches to understanding and treating disease-related pain. *Ann Rev Psychol* 56:601-630, 2005
20. Kadan-Lottick NS, Vanderwerker LC, Block SD, et al: Psychiatric disorders and mental health service use in patients with advanced cancer: A report from the Coping With Cancer study. *Cancer* 104:2872-2881, 2005
21. Montazeri A: Quality of life data as prognostic indicators of survival in cancer patients: An overview of the literature from 1982 to 2008. *Health Qual Life Outcomes* 7:102, 2009
22. Blayney DW, McNiff K, Hanauer D, et al: Implementation of the Quality Oncology Practice Initiative at a university comprehensive cancer center. *J Clin Oncol* 27:3802-3807, 2009
23. Jacobsen PB, Donovan KA, Trask PC, et al: Screening for psychological distress in ambulatory cancer patients. *Cancer* 103:1494-1502, 2005
24. Jacobsen PB, Shibata D, Siegel EM, et al: Evaluating the quality of psychosocial care in outpatient medical oncology settings using performance indicators. *Psychooncology* 20:1221-1227, 2011
25. Walther A, Johnstone E, Swanton C, et al: Genetic prognostic and predictive markers in colorectal cancer. *Nat Rev Cancer* 9:489-499, 2009
26. Stowell SA, Karcher RB, Bartel RC, et al: Results of a performance improvement initiative in diabetes care. *CE Measure* 4:34-39, 2010
27. Cannon CP, Hoekstra JW, Larson DM, et al: A report of quality improvement in the care of patients with acute coronary syndromes. *Crit Pathw Cardiol* 10:29-34, 2011
28. Community Oncology Alliance: Fact sheet about COA. www.communityoncology.org/COAPressKit.aspx
29. Jacobson JO, Neuss MN, McNiff KK, et al: Improvement in oncology practice performance through voluntary participation in the Quality Oncology Practice Initiative. *J Clin Oncol* 26:1893-1898, 2008

Appendix

Table A1. Evidence-Based Quality Measures

Measures
Benchmark 1: Patient safety and supportive care
Surgical pathology report included in patient chart
Documented TNM staging information
Colonoscopy or barium enema performed within 12 months of diagnosis
Documented quantified pain assessment
Documented status of emotional well-being
Benchmark 2: Evidence-based surveillance
CEA blood test performed at least once before surgery or chemotherapy
CEA blood test performed at least once 6 months after surgery or chemotherapy
CEA blood test performed more than once after surgery or chemotherapy
Documented number of evaluated lymph nodes
Number of evaluated lymph nodes ≥ 12
Number of evaluated lymph nodes included in staging considerations
Annual chest and abdominal CT ordered and/or performed after primary treatment
Colonoscopy ordered and/or performed 3 years after primary treatment
Benchmark 3: Evidence-based treatment
Adjuvant chemotherapy recommended for stage III colon or rectal cancer
Discussion of adjuvant chemotherapy for stage II colon or rectal cancer
Chemotherapy initiated within 8 wk after surgical resection for stage II/III colon or rectal cancer
Radiation therapy referral within 6 mo of stage II/III rectal cancer diagnosis
Adjuvant chemotherapy regimen received for stage II/III colon cancer*
Chemotherapy recommended to metastatic colorectal cancer patients†
Surgical referral for metastatic colorectal cancer patients with liver-only metastases
Documented <i>KRAS</i> status for metastatic colorectal cancer patients
CTX/INN treatment of metastatic colorectal cancer patients with wild-type <i>KRAS</i>

Abbreviations: CEA, carcinoembryonic antigen; CT, computed tomography; CTX/INN, cetuximab/panitumumab.

* Adjuvant chemotherapy included any one of the following regimens: fluorouracil (FU) and leucovorin; capecitabine; FLOX regimen, including FU, leucovorin, and oxaliplatin; FLOXFOX regimen, including FU, leucovorin, and oxaliplatin; XELOX regimen, including oxaliplatin and capecitabine.

† Patients with lymph node involvement or penetration of the rectal wall only.

Table A2. Participant Demographic Characteristics

Characteristic	Completers (%; n = 27)
Degree type	
MD	89
DO	0
PA	7
NP	4
Primary practice type	
Solo practice	15
Community-based oncology center	44
Community-based hospital	22
Academic medical center	19
Time in practice, years	
< 1	0
1-5	11
6-10	26
11-20	48
> 20	15
Mean No. of patients with colorectal cancer encountered each week	
≤ 1	11
2-5	48
6-10	19
> 10	22

Abbreviations: NP, nurse practitioner; PA, physician assistant.