Model for the cost-efficient delivery of continuous quality cancer care: a hospital and private-practice collaboration

Yvonne M. Coyle, MD, Alan M. Miller, MD, PhD, and R. Steven Paulson, MD, MBA

Cancer care is expensive due to the high costs of treatment and preventable utilization of resources. Government, employer groups, and insurers are seeking cancer care delivery models that promote both cost-efficiency and quality care. Baylor University Medical Center at Dallas (BUMC), a large tertiary care hospital, in collaboration with Texas Oncology, a large private oncology practice, established two independent centers that function cooperatively within the Baylor Charles A. Sammons Cancer Center, the Oncology Evaluation and Treatment Center (OETC) and Infusion Center, to deliver urgent care and infusions after hours to oncology patients. Quality measures based on evidence-based care and cost-efficiency measures were implemented within these centers. Ability to meet predetermined goals for these measures will be a guide for implementing continuous quality and cost-efficiency interventions. During the first two quarters of operations, 2023 patients received care in the OETC (n = 423) and Infusion Center (n = 1600). The average time spent in the OETC was 48% less than the time spent in the BUMC emergency department (ED). Eighty-nine percent of the cancer center's patients who received urgent care at BUMC were referred to the OETC for this care, instead of the BUMC ED. The hospital admission rate in the OETC was 59% lower than it was in the BUMC ED, a high-volume level I trauma center. The addition of the OETC and Infusion Center to the cancer center holds promise for providing continuous quality cancer care that is cost-efficient.

The ideal cancer care delivery model is coordinated to provide comprehensive multidisciplinary services (1). However, this type of care can be costly, not only with respect to the high cost of treatment, but also related to the preventable use of resources. Therefore, government, employer groups, and insurers are seeking models for the delivery of quality cancer care that is cost-efficient. Oncologists in private practice are in a unique position to take the lead in defining treatment and operational standards for the delivery of cancer care that is value based, with regards to cost and quality, through collaborations with hospitals and insurers. This article describes two independent centers—the Oncology Evaluation and Treatment Center (OETC) and the Infusion Center—that serve as a model for the delivery of continuous cancer quality care to promote cost-efficiency. The centers were established within the existing Baylor Charles A. Sammons Cancer Center

through a joint collaboration of a hospital, Baylor University Medical Center at Dallas (BUMC), and Texas Oncology, a large statewide private oncology practice.

HISTORY OF THE BAYLOR CHARLES A. SAMMONS CANCER CENTER

The cancer center opened in 1976 and is an integral part of BUMC, a not-for-profit tertiary care hospital with 1025 beds whose medical staff is composed of physicians in private practice. The BUMC campus includes a large-volume emergency department (ED), designated as a Level I trauma center offering the most comprehensive level of service to patients. Promoting multidisciplinary interaction among physicians from Texas Oncology and other specialties housed at BUMC has been the main concept underlying the organization and development of a cancer center. The long-standing working relationship between BUMC and Texas Oncology dates back to 1972, when a small private practice called the Medical Oncology Group was developed to provide coverage and assistance with the growing number of oncology consults at BUMC (2). Currently, Texas Oncology leases space in the cancer center, further emphasizing the concept of collaboration between BUMC and Texas Oncology.

Since the opening of the Sammons Cancer Center in 1976, education and clinical and basic science cancer research has been an important part of the center's activities (3). Along with the opening of the cancer center, a medical oncology fellowship program, funded in part by Texas Oncology and by BUMC, was established at BUMC the same year. In conjunction with the training program, cancer research at the cancer center is coordinated between BUMC and Texas Oncology. Texas Oncology is a part of the US Oncology Network. McKesson Specialty Health supports the US Oncology Network to advance the science of oncology by providing the infrastructure to support innovative clinical trials and clinical care operations, as

From the Baylor Charles A. Sammons Cancer Center, Baylor University Medical Center at Dallas (Coyle, Miller); and Texas Oncology, Dallas, Texas (Coyle, Miller, Paulson).

Corresponding author: Yvonne M. Coyle, MD, Baylor Charles A. Sammons Cancer Center, Medical Director, Oncology Evaluation and Treatment Center, 3410 Worth Street, Dallas, TX 75246 (e-mail: yvonne.coyle@usoncology.com).

well as to provide the technological solutions to improve cancer clinical outcomes. The US Oncology Network is one of the nation's largest networks of community-based oncology physicians, serving more than 850,000 cancer patients annually.

The new facility for outpatient services at the cancer center opened in 2011. BUMC opened the Baylor T. Boone Pickens Cancer Hospital in January 2012. Recognizing the need to further integrate oncology patient care at the cancer center to provide continuous quality care that promotes cost-efficiency, BUMC, in collaboration with Texas Oncology, opened the OETC and the Infusion Center in March 2012.

ONCOLOGY EVALUATION AND TREATMENT CENTER AND INFUSION CENTER MODEL

The OETC and the Infusion Center have a cooperative working relationship and are housed side by side in an outpatient facility located on the first floor of the cancer hospital. The OETC provides urgent care after office hours as well as scheduled procedures during office hours to adult oncology patients of all oncology physicians at BUMC, including Texas Oncology physicians. The procedures scheduled are diagnostic and therapeutic, such as thoracenteses, paracenteses, and lumbar punctures for the administration of intrathecal chemotherapy, as well as to maintain adherence to prescheduled clinical research testing, which may occur outside of normal office hours. All acute care can be provided at the OETC, with the exception of care required by patients who are transported by emergency medical services or care for patients with acute myocardial infarctions, cerebral vascular accidents, or trauma. Therefore, if necessary, OETC patients may be transferred to the BUMC ED, which is located in close proximity to the cancer hospital and is accessible by an indoor connector. The Infusion Center is open 24 hours a day 7 days a week to provide oncology patients access to blood product transfusions, as well as hydrating, chemotherapy, and biological therapy infusions. Thus, interruptions in cancer care can be prevented by administering infusions that are due on weekends and holidays in the Infusion Center, when private practice offices at the Sammons Cancer Center are closed.

The OETC and Infusion Center are staffed with a medical director under contract with BUMC, who is also a Texas Oncology physician, and a nurse manager employed by BUMC. BUMC owns and operates the OETC and the Infusion Center and owns the equipment therein, as well as employing the nursing staff within these two centers. Accordingly, BUMC bills facility and technical fees. Providers that evaluate and treat the patients in the OETC include Texas Oncology physicians and internal medicine physicians, all of whom have BUMC medical staff membership and admitting privileges, and these providers

Table 1. Oncology Evaluation and Treatment Center quality measures

Adult cancer supportive care	Quality measure	Outcome measure
Chemotherapy-related breakthrough nausea and vomiting	Treat with an additional antiemetic agent from a different drug class	Hospital admissions for intractable nausea and vomiting
Palliative care consult	Obtain palliative care consult if pain is resistant to conventional interventions or if there is a high risk for poor pain control related to one or more of the following: <ul style="list-style-type: none"> • Neuropathic pain • Incident or breakthrough pain • Associated psychological and family distress • Rapid escalation of opioid dosage • History of drug or alcohol abuse • Impaired cognitive function 	Hospital admissions for intractable pain
Febrile neutropenia	<ul style="list-style-type: none"> • High risk: within 1 hour treat with a broad-spectrum, antipseudomonal, bactericidal, antibiotic regimen as initial empiric therapy • Low risk: treat with ciprofloxacin + amoxicillin or ciprofloxacin + clindamycin for penicillin-allergic patients 	<ul style="list-style-type: none"> • Hospital admissions for febrile neutropenia • Hospital 30-day, all-cause, risk standardization mortality rate following febrile neutropenia hospitalization

bill for the related professional fees. Patients are referred to the OETC by their oncology physicians. Patients in the OETC may be transferred for services provided in the Infusion Center 24 hours a day, and patients in the Infusion Center can be evaluated and treated after normal office hours by an OETC provider, if necessary.

To promote efficient patient care, providers staffing the OETC are able to access the Texas Oncology electronic medical record, iKnowMed, developed by the US Oncology Network, in addition to the BUMC electronic medical record, Eclipsys. Evidence-based medicine is used as a guide to deliver quality cancer supportive care in the OETC.

The most prevalent patient clinical problems evaluated and treated in the OETC are used to periodically select quality measures derived from the National Comprehensive Cancer Network Guidelines for Cancer Supportive Care (4). Adherence to clinical outcome-based quality of care measures for the OETC is measured on a quarterly basis (*Table 1*) (5–7). As an indirect measure of quality of care in the OETC, Press Ganey patient satisfaction scores will be collected and analyzed quarterly (8). The cost-efficiency measures were selected based on commonly accepted business practices, as well as a review of the literature (9, 10). These measures focus on health care utilization, staff, facility, and ancillary service costs required to evaluate and treat patients in the OETC, as well as the time that patients spend in the OETC. Adherence to these measures will be reported quarterly. *Table 2* includes the current cost-efficiency measures for the OETC. The cost-efficiency measure, mean cost per visit,

Table 2. Oncology Evaluation and Treatment Center cost-efficiency measures

- Time spent in the OETC
- OETC hospital admission rate
- BUMC admission rate for oncology patients
- BUMC Emergency Department admission rate for oncology patients
- Average length of stay for oncology patients at BUMC
- Mean cost per visit in the OETC

OETC indicates Oncology Evaluation and Treatment Center; BUMC, Baylor University Medical Center at Dallas.

will be determined primarily based on nursing staff and provider hourly wages, drug and supply costs, and ancillary service costs, such as laboratory and radiology services. The cost per visit will be adjusted for severity of illness. Quality improvement and cost-efficiency interventions will be based on predetermined goals for adherence to the quality and cost measures listed in Tables 1 and 2.

Together, the OETC and Infusion Center provide patients with continuous supportive cancer care to 1) promote favorable clinical outcomes, 2) support the successful completion of clinical cancer research studies, and 3) reduce health care costs by decreasing preventable and expensive health care utilization. Within the OETC, health services research studies are being conducted to further advance our knowledge of the most cost-efficient ways to deliver quality cancer care (11). The *Figure* presents the model for the delivery of quality continuous cancer care to promote cost-efficiency that we developed by incorporating the OETC and Infusion Center within our existing cancer center infrastructure.

INITIAL UTILIZATION RESULTS

Between April and December 2012, the first two quarters of operations of the OETC and Infusion Centers, a total of 2023 oncology patients received care: 423 in the OETC and 1600 in the Infusion Center. During the first quarter, we identified visits to the BUMC ED if at least one cancer International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code was assigned for the care that was received during one of these visits (12). Health care delivery data for the first quarter of the OETC and Infusion Center operations are as follows. The average time spent in the OETC (3 hours and 48 minutes) was 48% lower than it was for the time spent for oncology patients in the BUMC ED (7 hours and 17 minutes). Ninety percent of the cancer center's patients who received urgent care at BUMC were referred to the OETC for this care, instead of the BUMC ED. The hospital admission rate in the OETC was 34%, compared with 83% for the BUMC ED.

DISCUSSION

Comprehensive and coordinated oncology care is necessary to promote favorable clinical outcomes for oncology patients, but it is costly. In a recent study, it was projected that the total cost of cancer care would be \$173 billion by 2020, which

Figure. Model for the cost-efficient delivery of continuous quality cancer care. The Baylor Charles A. Sammons Cancer Center at Baylor University Medical Center (BUMC) includes cancer center outpatient services, the Baylor T. Boone Pickens Cancer Hospital, and the Oncology Evaluation and Treatment Center (OETC) and Infusion Center.

represents a 39% increase from 2010 (13). As a result, cost-containment efforts by insurers have become commonplace. These cost-containment efforts have resulted in lower reimbursement for drugs, as well as for evaluation and management services, which is occurring in the face of rising costs for the new technologies required for the treatment of cancer.

Coinciding with the decline in cancer care reimbursement from insurers over the last decade, the delivery of cancer care in the community setting decreased from 85% to 65% in 2012, correlating with a number of community-based oncologists entering into employment or management arrangements with institutionally based programs in 2011 (14). Thus, it is important for oncologists in community-based settings to be engaged in developing models that promote the cost-efficient delivery of quality cancer care due to the current trends in health care economics. To provide direction for addressing this issue, the Institute of Medicine recently convened a workshop where its participants determined that the medical home concept should be considered when redesigning models of care in oncology (15).

Because cancer is increasingly being viewed as a chronic disease, the concept of the patient-centered medical home (PCMH), a model that has been used mainly in the primary care setting, is a viable option for use in the delivery of cost-efficient and quality cancer care. In the medical home model, care is provided by a dedicated team of providers, and they are reimbursed with an upfront fee and higher reimbursement for episodes of care (15). An episode of care is a managed care concept in which a single payment for health care services is provided for a specific illness during a set time period (16). The National Committee for Quality Assurance (NCQA) developed the standards for the primary care PCMH program (17). The NCQA's standards for the PCMH program require a physician-led care team to direct disease management and care coordination, to standardize care which is evidence-based, and to promote patient disease management education (17). Results

indicate that the use of the PCMH model has a positive effect on quality and cost, as well as satisfaction of the patient and the clinical team (17).

In 2010, Consultants in Medical Oncology and Hematology (CMOH), a community-based single-specialty practice in Philadelphia, became the first oncology practice recognized by the NCQA as a level three PCMH program (18). Achievement at this level requires the highest level of expertise related to patient communication, data tracking, care management, self-management support, electronic prescribing, test tracking, referral tracking, advanced electronic patient communications, and performance metrics reporting and improvement (18). As the result of CMOH implementing the PCMH model, ED visits decreased by 68%, chemotherapy-related hospital admissions decreased by 51%, and length of hospital stay decreased by 21% (14, 18). In addition, CMOH outpatient visits and chemotherapy outpatient visits per patient per year decreased by 22% and 12%, respectively (14, 18).

The US Oncology network launched its program, Innovent Oncology, in 2010 to improve the clinical management of oncology patients receiving chemotherapy (19). The program is supported by the US Oncology network and is offered at all of the Texas Oncology sites. This program creates a link between physicians and insurers by using evidence-based practice guidelines for the selection of chemotherapy, along with patient support services and advance care planning to promote favorable cost metrics and health care utilization patterns. The clinical and cost outcomes included in Innovent Oncology are chemotherapy-related hospitalizations and ED visits, length of hospital stay, chemotherapy costs, end-of-life care including hospice enrollment, death in a hospital, and chemotherapy administration within 2 to 4 weeks of death. Insurers make a single payment for each patient enrolled in Innovent Oncology, and they provide Innovent Oncology staff with access to program enrollee health care utilization and financial data to calculate the program's clinical and cost outcomes. Initial results related to implementation of the program are encouraging. Physician adherence to the evidence-based practice guidelines for the selection of chemotherapy was 72%, which increased to over 80% for the most recent quarter (J. R. Hoverman, personal communication, September 12, 2012). In addition, there was a substantial decrease in the hospitalization costs for the first 100 patients enrolled in this program (19).

However, as important as CMOH and the Innovent Oncology program are in promoting the cost-efficient delivery of quality cancer care within the private oncology practice setting, we propose it is just as important to make interventions in the emergency and urgent care settings to prevent avoidable health care utilization. The need to develop interventions for reducing avoidable inpatient and outpatient visits at all points of care that are affordable, efficient, and of high quality is of further importance since it is projected that there will be a shortage of oncologists in the US by 2020 (13). This shortage in oncologists is due, in part, to the increase in the aging US population among whom the cancer incidence is higher (13). Through the combined efforts of an oncology group practice and hospital, the

OETC and Infusion Center was incorporated within the cancer center, creating a model for the efficient delivery of continuous quality care to help prevent the avoidable use of costly health care resources.

Analysis of data from the first quarter of operations for the OETC and Infusion Center provides evidence that we are likely to achieve our goal of reducing preventable health care utilization in a cost-efficient manner. A total of 2023 oncology patients received care in the OETC and Infusion Center, and 90% of the cancer center's patients who received urgent care at BUMC were referred to the OETC for this care, instead of the BUMC ED. The average time spent in the OETC was 48% lower than the time spent for oncology patients in the BUMC ED, as would be expected since the BUMC ED is a high-volume Level I trauma center. Moreover, the hospital admission rate in the OETC was 34%, which was more than 59% lower than it was for the BUMC ED. Similarly, the hospital admission rate in the OETC was almost 50% lower than what was recently reported for oncology patients in the ED using a statewide database in North Carolina (63.2%) (20). Furthermore, our new initiatives for conducting health service research within the OETC and Infusion Center hold promise for providing our cancer center and others with results that will assist in developing new methods for effectively organizing, managing, financing, and delivering quality cancer care.

An additional benefit related to establishing new models for cancer care delivery that promote favorable cost-efficiency and clinical outcomes is that more equitable medical insurance reimbursement contracts for both the payer and payee may be negotiated for this type of center. This type of center also has an infrastructure conducive to receiving bundled payments for a defined episode of care (21). The bundled payment functions as a tool of alignment between insurers and providers, which can eliminate some of the unintended financial incentives that can lead to fractured and inefficient care. Using the episode of care model tied to bundled payments is a rapidly evolving movement by insurers to produce the best cost and clinical outcomes by decreasing unwanted variations in the delivery of health care (22).

Given the growing public awareness of the need to redesign the cancer delivery system, including government, physicians and hospitals, and employer groups and insurers, a new health care environment is developing that demands accountability for the cost and quality of care. Consequently, it is critical for oncologists to continue to take the lead in defining standards of care for specific disease states and to collaborate with hospitals and insurers when possible to develop systems for the delivery of high-quality and cost-efficient cancer care.

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