

Reducing ED Visits and Hospital Admissions After Chemotherapy with Predictive Modeling of Risk Factors





Approximately 1.76 million people were diagnosed with cancer in the United States in 2019, and new technology and treatments have helped to increase our national five-year survival rates to 70 percent, up from 39 percent in 1960.¹ To better meet the needs of this growing patient population, providers have changed how they manage oncology patients. The most common patient concern today is the fear of financial toxicity from increasing drug costs and associated treatment costs; too many patients with cancer are concerned about going bankrupt or, even worse, taking their families into bankruptcy with them due to these high costs of care. Patients are also highly concerned about how their cancer diagnosis, treatment, and side effects will impact their quality of life and ability to work and care for their family. So, in addition to working to cure or manage cancer, today's oncology providers must also work to mitigate these patient stressors.

Rising Cost of Cancer Care

On average, in the 10 years from 2004 to 2014, the United States has seen a 62 percent increase for commercial healthcare plans and a 73 percent increase for Medicare-associated healthcare costs.² Oncology is unique compared to other diseases as patients often have at least two and up to five specialty areas (e.g., medical oncology, radiation oncology, surgery, cardiology) involved in their care. In 2015, the United States spent an estimated \$80.2 billion on all cancer care—with 52 percent spent on hospital

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outpatient and clinic services and 38 percent on inpatient admissions.² A reduction in inpatient admissions or emergency department (ED) visits would significantly improve the quality of life for patients with cancer while also reducing the cost of their care.

Increased Usage of ED and Inpatient Admissions to Manage Oncology Patients

Several studies have evaluated ED utilization of patients with cancer. A Fred Hutchinson Cancer Research Center study of 5,853 adults with solid tumors who had been treated with chemotherapy, radiation, or both, determined that 53 percent of

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these patients had an ED visit(s) related to symptom management that could have been managed in an outpatient setting.³ The study also found that the average cost of an ED visit was higher for oncology patients than those of non-oncology patients—\$1,047 compared to \$335.⁴ Extrapolating these data, if providers could impact only half of the 3,100 patients requiring ED care, 1,550 patients might have avoided an ED visit.⁴ Another study evaluated 87,025 patients with cancer who had 197,886 ED visits within one year of diagnosis and averaged 2.27 ED visits per patient, per year.⁴ Of these, 35 percent had more than one ED visit per year, and approximately 51 percent of oncology patients who presented for an ED visit had an inpatient admission.⁵ The potential cost-savings for managing these patients in the outpatient setting is clear.

Implementation of a New Medicare Outpatient Quality Measure

The Centers for Medicare & Medicaid Services (CMS) reviewed the 2007 commercial claims of 14 million patients with cancer and found that these patients averaged one inpatient admission and two ED visits per year.⁶ Forty percent of inpatient admissions and 50 percent of ED visits were related to their chemotherapy treatment.⁶ The study showed that patients have unmet needs and experience gaps in care that, if addressed, could reduce ED visits and inpatient admissions and improve quality of life.⁶ Based on these data, CMS developed the OP-35: Admissions and Emergency Department (ED) Visits for Patients Receiving Outpatient Chemotherapy measure to help quantify and reduce ED visits and inpatient admissions of patients with cancer, as well as improve their quality of life.⁵

CMS used claims data from October 2015 through September 2016 to provide a “dry run” of OP-35 in oncology programs and practices across the United States. The agency used 2018 claims data to establish benchmark metrics for ED visits and inpatient admissions as part of its Hospital Outpatient Quality Reporting Program. Initial benchmarks were 6.1 percent for ED visits and 12.9 percent for inpatient admissions.

OP-35 went into effect January 1, 2020, and the measure was designed to evaluate the rate of ED visits (EDV) and inpatient admissions (IPA) within 30 days of hospital-based outpatient chemotherapy treatment for patients 18 years and older with cancer, not including those with leukemia. The measure consists of two scores—one for EDVs and one for IPAs. The rates are determined by the hospital’s current and expected IPAs and EDVs, as well as national observed rates on both metrics. In addition,

rates are risk-adjusted for factors such as patient demographics, cancer type, comorbidities, treatment type, and possibly socio-demographic status. CMS provided oncology programs with data to compare their performance on these measures to national benchmarks.

Although OP-35 recognizes two outcomes—ED visits and inpatient admissions—a single patient can be assigned only a single outcome. Thus, patients experiencing both an EDV and an IPA will count as having only an IPA. The numerator is 1 or more EDV or IPA for 1 of 10 diagnoses (anemia, nausea, dehydration, neutropenia, diarrhea, pain, emesis, pneumonia, fever, or sepsis) within 30 days of receiving hospital-based outpatient chemotherapy for cancer treatment. The denominator is Medicare fee-for-service patients 18 years and older with a diagnosis of cancer (except leukemia) who have received at least one outpatient chemotherapy treatment during the 30-day performance period.

For the first year (2020), participating institutions that shared data for disclosure avoided a 2 percent penalty imposed on their CMS oncology claims. The 10 diagnoses associated with an EDV or IPA are all common side effects of most chemotherapy agents, and most patients with cancer experience them at some point in their journey. CMS’s rationale for OP-35 was multifold and included:

- Assessing the care provided to patients with cancer by publishing an institution’s metrics on the CMS website
- Increasing the quality of care provided to and the quality of life of patients with cancer
- Encouraging quality improvement efforts to reduce the number of potentially avoidable EDVs and IPAs for patients with cancer
- Promoting the use of evidence-based interventions to prevent and treat common side effects and complications of chemotherapy.

What Should Cancer Programs and Practices Be Thinking About?

Measure OP-35 requires change. To effect positive change and meet this quality measure, cancer programs and practices need to ask and find answers to the right questions, including:⁸

- Do patients have easy access to care? Think in terms of your office location(s) and hours of operation.
- What are we doing to improve the patient’s quality of care and quality of life?
- Are we proactively addressing symptom management?
- Do patients know what to expect and how to address symptoms?
- How are we monitoring outcomes for our patients receiving cancer treatment?
- What interventions do we have in place to identify patients who are having difficulty with treatment?
- What interventions do we offer? How are patients educated on these interventions?
- What happens to our patients after hours?
- How can we meet the needs of our patients in the moment—yet at a convenient time for them?

How We Addressed Measure OP-35

We were an early adopter of the Epic electronic health record (EHR). Over the past 12 years, Mercy Cancer Care has accumulated more than 700 million separate inpatient and outpatient Epic encounters. Our response to OP-35 was to develop an internal report that predicted the metrics for one of our larger oncology practices. While the clinic was doing well with the ED benchmark, its metric for IPAs was too high. This initial work led Mercy Cancer Care to develop an internal review board protocol to review all the health system's data. Initial study objectives were twofold: 1) to use the EHR to identify the risk factors associated with EDVs and IPAs within 30-days of chemotherapy; and 2) to use these data to build a predictive model to prevent such future encounters by focusing on key factors and at-risk patients.

We defined chemotherapy based on CMS metrics. For example, the OP-35 measure excluded oral chemotherapy as CMS identified challenges with oral chemotherapy administration without using pharmacy claims data. CMS data also found that oral agents had fewer adverse reactions and side effects, which resulted in lower numbers of EDVs and IPAs.

Mercy Cancer Care's review included approximately 100,000 chemotherapy encounters within 30 days of the infusion encounter. The study identified that 16.8 percent of the encounters resulted in an IPA and 11.8 percent experienced an EDV. Both metrics exceeded CMS's initial published benchmarks. With the understanding that many of the targeted diagnoses in OP-35 can be managed in the outpatient setting, our next step was to identify our at-risk patients.

Now, How to Make the Data Usable?

Mercy Cancer Care decided to use predictive algorithm methodology and machine learning to identify patients at risk for potential EDVs or IPAs. We split our retrospective patient data into a training cohort (70 percent) and testing cohort (30 percent) and applied the algorithm. The final algorithm model was applied to our live patient data set, assigning a probability of an ED visit or being admitted as an inpatient to all active chemotherapy patients. Based on modeling, "at-risk" patients were divided into high, intermediate, and low risk categories. Every 24 hours, Mercy Cancer Care assessed the pertinent EHR variables within the model, including natural language processing where appropriate.

Implementing a Reporting Process

Mercy Cancer Care has a web-based oncology dashboard of multiple oncology-related quality metrics, including:

- Preferred regimen compliance
- Performance score documentation
- Discrete staging documentation
- Chemotherapy within 14 days of end of life (EOL)
- Survivorship care plan completion rate.

The dashboard also includes Commission on Cancer (CoC) Standards, such as automated tracking for clinical research accruals, genetic testing and risk assessments, and distress screening.

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The oncology dashboard was the obvious tool to collect and monitor OP-35 risk scores for every patient who had received chemotherapy. The dashboard displayed patients at high risk for EDV or IPA; data were summarized and are searchable by region, community, clinic, and provider. OP-35 dashboard reports are updated daily to generate the most recent score for each patient. Automated reports are delivered daily to essential personal within each clinic, including medical oncology, radiation oncology, and surgery, to minimize the clicks required at the clinic level while still allowing providers to use these data in intake assessments. When medical assistants room patients, they use a questionnaire to assess patients and alert providers to potential areas that need further assessment.

The automated OP-35 report is also sent to navigators, triage nurses, infusion nurses, and clinic managers. It is especially critical that these reports go to infusion nurses who educate patients on side effects, review home medications, and teach patients and caregivers best practices for handling side effects. Mercy Cancer Care developed an Epic Smart phrase to assist its infusion nurses with documentation related to OP-35 status and planned intervention(s) of high-risk patients.

Our Nurse on Call Program

Mercy Cancer Care established the world's first Virtual Care Center in October 2015. Our Virtual Care Center offers approximately 12 programs, one of which is our Nurse on Call (NOC) program. Available 24/7, NOC uses Schmitt-Thompson evidence- and symptom-based protocols.⁷ NOC protocols are reviewed and updated every year and are standardized across the ministry. The NOC team has access to Epic for scheduling appointments quickly, and nurses document every encounter and communicate with the clinic or provider on call. Providers have access to all the notes entered from the NOC, which means potentially more cost-effective care management as patients are proactively captured before they require EDV or IPA interventions. NOC data have shown an 80 percent reduction in unnecessary ED visits for oncology patients in two Mercy communities.

Next Steps and Future State

While our current proactive OP-35 management dashboard is a huge success, it requires our clinical team to assess patients. Under Mercy Cancer Care's planned future state, currently in development, this assessment process will be automated. Patients at higher risk will be identified through smart texting for electronic navigation (eNavigation). Initiation of the oncology texting project

was delayed due to COVID-19. By automating the assessment process and directly interfacing with patients, Mercy Cancer Care may be able to reduce care variations. Accordingly, we developed algorithms for common diagnoses amendable to eNavigation such as pain, fever, diarrhea, nausea and vomiting, and fatigue. eNavigation will be used in conjunction with Mercy Cancer Care's Nurse on Call program to escalate issues to a nurse who is available 24 hours a day. Based on the smart text response, the NOC can contact the patient directly. If the response indicates an escalation threshold was not met, the NOC sends a message acknowledging that patients are doing well.

Best Practices for Reducing Unplanned Acute Care for Patients with Cancer

Mercy Cancer Care's OP-35 quality improvement initiative allows us to identify our high-risk patients and their needs in a proactive manner. We improved our care coordination by running daily real-time reports of these at-risk patients, standardizing their symptom management, and establishing a process to escalate care, when appropriate, to the NOC. For cancer programs and practices looking to develop a similar quality improvement initiative, Mercy Cancer Care suggests following these best practices:⁹

1. Develop a process to identify patients at high risk for unplanned care.
2. Look at ways to improve access and care coordination.
3. Standardize clinical pathways for symptom management.
4. Develop urgent care tactics.
5. Use palliative care earlier.

CMS's intent for establishing OP-35 was to reduce IPAs and EDVs for oncology patients. One way the agency thought to do this was by publishing how well each institution is doing to meet this metric. As a result, many institutions changed their care or made efforts to improve care coordination and patient outcomes because they knew their performance was being tracked and monitored. Mercy Cancer Care is no different, but we used this

impetus to change our care model to proactively treat patients with cancer, improve their outcomes, and most importantly improve their quality of life. 

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