Measuring and understanding outcomes of medical treatments promotes quality improvement.

QUALITY 2017

ROSWELL PARK®
COMPREHENSIVE CANCER CENTER

Unleashing the Healing Power of Hope™

BEST HOSPITALS
U.S.News & WORLD REPORT
NATIONAL CANCER
2017-18










A leader in cancer research, patient care, prevention and education, Roswell Park Comprehensive Cancer Center has made fundamental contributions to reducing the cancer burden since 1898. Roswell Park occupies 28 acres and 15 buildings on the 100-acre Buffalo Niagara Medical Campus in Downtown Buffalo, N.Y., and is Upstate New York's only National Cancer Institute-designated Comprehensive Cancer Center.

Dear Colleague,

On behalf of Roswell Park, I am pleased to share our latest outcomes report, **Quality 2017**. As the state's only Comprehensive Cancer Center designated by the National Cancer Institute located outside of New York City, we set a high bar for our quality of care, comparing ourselves to top cancer centers across the nation.

In this book, we present the latest data on our patient outcomes including 5-year relative survival by disease site and by stage, quality indicators such as rates of post-operative infection, readmission and length of stay, and factors that affect patient safety and quality of life. The numbers demonstrate our high volumes in specialized care such as minimally invasive robotic and video-assisted surgery, gamma knife and hypofractionated radiotherapy, and blood and marrow transplant.

We hope you will find this book to be a valuable resource and objective evidence of the quality of care we provide.

Thank you,

Candace S. Johnson, PhD
President & CEO
Wallace Family Chair in Translational Research
Professor of Oncology, Department of Pharmacology and Therapeutics
Roswell Park Comprehensive Cancer Center

Dear Colleague,

Welcome to **Quality 2017**, Roswell Park Comprehensive Cancer Center's third outcomes publication. This book presents our patient outcomes, including those related to complex surgical procedures and cancer-specific survival. We provide this information so that referring physicians can see for themselves the quality of cancer care we provide with our multidisciplinary, disease-specific care model.

Cancer care is evolving rapidly, and Roswell Park is at the forefront of innovation in oncology. The patients you entrust to us will be introduced to clinical trials that provide access to therapies not yet available to other providers, such as vaccines, immunotherapies and novel combinations. We emphasize patient-centered care in all that we do, including our comprehensive supportive care, nursing initiatives and enhanced patient education.

We hope you find **Quality 2017** an informative and useful resource to understand Roswell Park's strength across all of our cancer-specific disease sites.

Sincerely,

Boris Kuvshinoff II, MD, MBA
Chief Medical Officer
Professor of Oncology, Department of Surgical Oncology
Roswell Park Comprehensive Cancer Center
Phone: 716-845-7724

SURVIVAL OUTCOMES DATA

Patient survival outcomes presented in this publication have been compared to national statistics. Roswell Park Comprehensive Cancer Center knows that there are many challenges to interpreting survival data at face value, and comparisons do not necessarily reflect superiority of one cancer center over another. When possible, outcomes measures include reference to publicly available sources for comparison, such as the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute (NCI) (seer.cancer.gov). Inclusion of these references does not, and is not intended to, represent controlled, direct comparisons.

ROSWELL PARK DATA IN THIS REPORT HAVE BEEN BENCHMARKED AGAINST DATA COLLECTED BY THE FOLLOWING SOURCES

Surveillance, Epidemiology, and End Results

The SEER program of the NCI collects and provides information on cancer incidence, prevalence, mortality and survival from population-based cancer registries and represents 28% of the U.S. population. Data for this publication were available from 1975-2013.

The National Cancer Database (NCDB)

Established by the American Cancer Society (ACS) and the American College of Surgeons Commission on Cancer (CoC), the NCDB is an oncology data set that currently captures 70% of all newly diagnosed cancer cases in the United States annually, and stores information on more than 34 million cases of reported cancer cases. Data collected include patient characteristics, tumor staging and histology characteristics, type of first-course treatment administered, disease recurrence, and survival information.

Press Ganey

Press Ganey is the industry's recognized leader in healthcare performance improvement, working with more than 26,000 healthcare organizations nationwide, to improve clinical and business outcomes.

The National Comprehensive Cancer Network (NCCN)

The NCCN, a not-for-profit alliance of 27 of the world's leading cancer centers, promotes the importance of continuous quality improvement and recognizes the significance of creating clinical practice guidelines appropriate for use by patients, clinicians and other healthcare decision-makers. The primary goal of all NCCN initiatives is to improve the quality and value of oncology practice so patients can live better lives.

The National Surgical Quality Improvement Project (NSQIP)

NSQIP was developed by the American College of Surgeons to decrease patient complications and improve outcomes following surgery. The program is standardized nationally using a validated sampling methodology. Certified Surgical Clinical Reviewers abstract program-defined surgical cases that return risk-adjusted outcomes data. In this manner, the program provides data that can be trusted to adjust for variables in a patient's preoperative condition and the type of surgery performed. Surgical outcomes are benchmarked against hundreds of other hospitals nationally and the results are used to develop performance improvement strategies to enhance the quality of surgical care.

For 120 years, Roswell Park has remained steadfast to the revolutionary vision of its founder—Dr. Roswell Park—who set out to understand cancer, discover ways to treat it, and put an end to the suffering it causes. Roswell Park was among the first to be designated a Comprehensive Cancer Center by the National Cancer Institute (NCI) in 1974 and has held that distinction ever since.

HISTORICAL FIRSTS

1898 

Dr. Roswell Park opens the doors to America's first facility dedicated exclusively to the study of cancer.

1964 

Dr. Elias Cohen establishes one of the nation's first three voluntary platelet collection centers.

1972 

Dr. Thomas Dougherty pioneers Photodynamic Therapy, used worldwide to treat multiple types of cancer.

late 1970's 

Dr. T. Ming Chu and his associates characterized human prostate-specific antigen (PSA). Their discovery led to the development of the PSA Test.

1998 

Roswell Park acquires the Leksell Gamma Knife, allowing previously inoperable or inaccessible brain tumors and vascular malformations to be treated without opening the skull.

2004 

Roswell Park became the first facility in the Buffalo-Niagara region to offer state-of-the-art robotic surgical technology, enabling surgeons to use minimally invasive approaches for complex surgical procedures.

2016 

Roswell Park launched a clinical trial for CIMAvax-EGF, a groundbreaking immunotherapy for lung cancer developed in Cuba.

Roswell Park researchers also developed the world's first chemotherapy research program; pioneered 5-FU and Leucovorin therapy, the gold standard chemotherapy for colorectal cancer for many years; established one of the nation's first long-term survivor clinics for childhood cancer patients; and made significant contributions to the landmark Human Genome Project.

STATISTICS AT A GLANCE (2011-2016)

OUTPATIENT VISITS	
CY	Total
2011	201,465
2012	205,622
2013	202,716
2014	198,680
2015	211,553
2016	226,425
Total	1,246,461

INPATIENT ADMISSIONS	
CY	Total
2011	5,360
2012	5,391
2013	4,787
2014	4,521
2015	4,592
2016	5,031
Total	29,682

CHEMO AND INFUSION VISITS	
CY	Total
2011	38,393
2012	38,452
2013	38,839
2014	37,784
2015	38,575
2016	39,196
Total	231,239

RADIATION VISITS	
CY	Total
2011	33,085
2012	32,735
2013	30,375
2014	28,605
2015	31,443
2016	34,686
Total	190,929

OR CASES	
CY	Total
2011	4,947
2012	5,077
2013	4,942
2014	4,784
2015	5,010
2016	5,178
Total	29,938

ENDOSCOPY	
CY	Total
2011	2,063
2012	2,446
2013	2,833
2014	3,014
2015	3,636
2016	3,825
Total	17,817

VITAL STATISTICS FY 2017

3,386 EMPLOYEES

313 FACULTY MEMBERS

644 NURSES

5,077 HOSPITAL ADMISSIONS

231,744 OUTPATIENT VISITS

36,007 PATIENTS UNDER ACTIVE CARE

PATIENT ORIGIN:
46 U.S. STATES
3 FOREIGN COUNTRIES

133 BEDS

AVERAGE LENGTH OF STAY: 7.7 days

$89.2M IN GRANTS/ CONTRACTS (PER ANNUM)

599 FUNDED RESEARCH PROJECTS

92 LICENSE AGREEMENTS

64 U.S. PATENTS

Roswell Park's **Quality Improvement Program** ensures the provision of high-quality, cost-effective patient care. At Roswell Park, care and service systems are most effectively improved by continuously assessing and analyzing the structure, function and outcomes of these systems and using those data to indicate appropriate plans of correction.

NATIONAL DESIGNATIONS, ACCREDITATIONS

Forty-nine facilities nationwide are designated comprehensive cancer centers by the **National Cancer Institute (NCI)**, highlighting scientific excellence and the ability to integrate a diversity of research approaches to focus on reducing morbidity and mortality from cancer. Roswell Park was one of the original cancer centers designated by the NCI as a comprehensive cancer center.

Roswell Park is a charter member of the **National Comprehensive Cancer Network (NCCN)**, an alliance of leading cancer centers that brings together the best minds in science to engineer continuous quality improvements in cancer care, offer access to the most promising clinical trials, and provide best-practice guidelines and measurement tools. Roswell Park faculty members serve on NCCN panels that develop the guidelines that specify the best ways to detect and treat cancer.

BlueCross BlueShield's Blue Distinction designations for specialty care are conferred based on a healthcare facility's evidence-based quality measures, processes and aggregate outcomes for clinical care. Roswell Park is a Blue Distinction Center for Transplants (bone marrow and stem cell).

Foundation for the Accreditation of Cellular Therapy (FACT) promotes high-quality patient care and laboratory performance. Roswell Park is an accredited facility, having met the rigorous standards as defined by leading experts in the field.

Société Internationale d'Urologie conferred its first accreditation in robot-assisted surgical training to Roswell Park in 2011. This international accreditation allows Roswell Park to provide three-month fellowships focusing on laparoscopic and robot-assisted skills development and case observation to promising physicians early in their careers.

Association for the Accreditation of Human Research Protection Programs, Inc. (AAHRPP) accredits high-quality human research protection programs that promote excellent, ethically sound and safe research. Roswsell Park is fully accredited.

PARTNERS IN QUALITY

Roswell Park Comprehensive Cancer Center participates in, and has been recognized by, several programs that evaluate, track and share data to improve the quality and safety of cancer care. Such programs are detailed below.

Joint Commission's Gold Seal of Approval™ for meeting rigorous quality and safety standards. Hospitals that regularly monitor and track their performance of National Patient Safety Goals deliver safer, higher-quality healthcare. Roswell Park maintains high compliance (90%-100%) in all areas.

Since 1931, Roswell Park has been a participant in the **American College of Surgeons Commission on Cancer,** a national program that approves clinical programs at 1,500 hospitals nationwide.

The **Comprehensive Cancer Center Consortium for Quality Improvement (C4QI)** establishes common benchmarks by which cancer centers can compare themselves to each other. Roswell Park has been a C4QI member since 1997.

National Database of Nursing Quality Indicators, a proprietary database of the American Nurses Association, collects and evaluates unit-specific, nurse-sensitive data from hospitals, tracking information on patient falls, pressure ulcers, pain management, restraint use, staff mix, nursing care hours per patient day, and RN education and certification. Roswell Park has been a member since 2004.

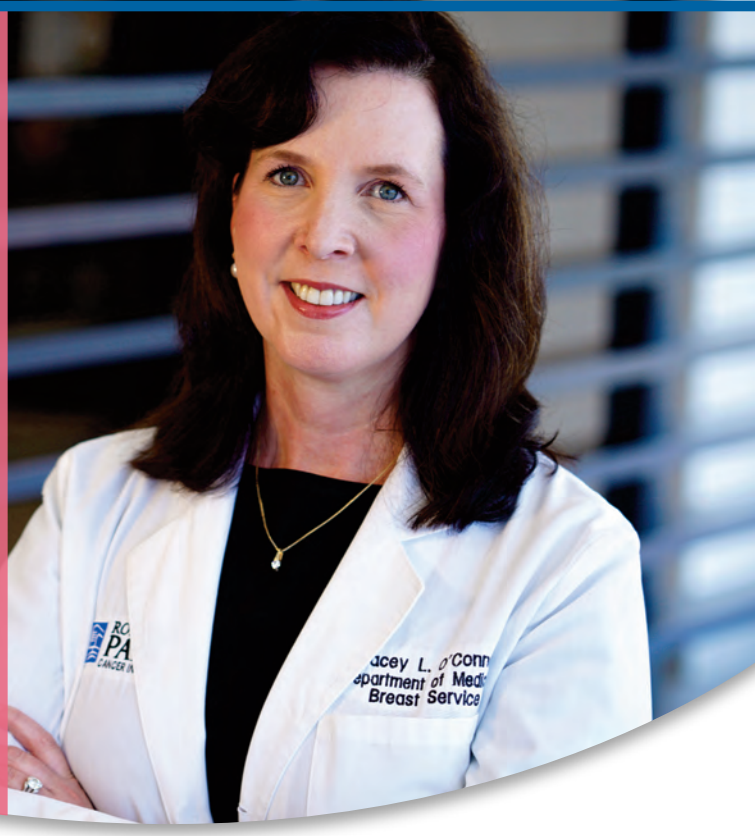
Pay for Performance is a payment model that rewards healthcare providers who have better outcomes and hospitals that meet certain performance measures for quality and efficiency. Roswell Park has been a national leader in Pay for Performance Quality Initiatives since 2003.

More than one-third of U.S. hospitals currently use **Press Ganey**, which maintains a national database for patient-satisfaction measurement and improvement services. Roswell Park has been using Press Ganey for patient satisfaction benchmarking since 2002.

Vizient is dedicated to the success of healthcare by delivering industry-leading supply-chain management services and facilitating the development of networks that bring members together to solve key clinical and operational challenges.

BREAST

The multidisciplinary Breast Oncology Center at Roswell Park provides comprehensive and integrated diagnostic and therapeutic options for all types and stages of benign and malignant breast disease.



Tracey O'Connor, MD

Our Volume

In 2016, the Breast Oncology Center evaluated over 900 new patients, resulting in over 800 surgical procedures, 4,000 chemotherapy visits and 15,000 office visits.

Our Approach

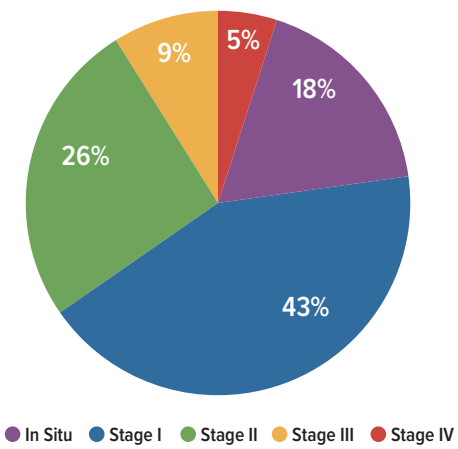
Subspecialty-trained, breast-specific experts on staff provide all services on site, spanning the entire continuum of care from screening, risk assessment and genetic testing to lymphedema treatment and long term survivorship care. We monitor our outcomes, including adherence to many quality measures, to ensure delivery of high quality, evidence-based cancer care. Highlights of our expertise include:

- Rate of breast-conserving surgery remains stable and/or exceeds national trends, while mastectomy rates rise nationally.
- Onco-plastic techniques make breast conservation sometimes possible even for larger cancers.
- Re-excision rate is lower than many published studies.
- Radioactive seed localization of nonpalpable breast lesions that require surgical excision.
- Participation in the Commission on Cancer's Rapid Quality Reporting System (RQRS) allowing real-time tracking of care to ensure concordance with national quality measures.
- Use of respiratory gating techniques and prone positioning to minimize cardiac radiation dose.
- Access to a large number of clinical research studies that provide breast cancer patients with options not generally available in the community.

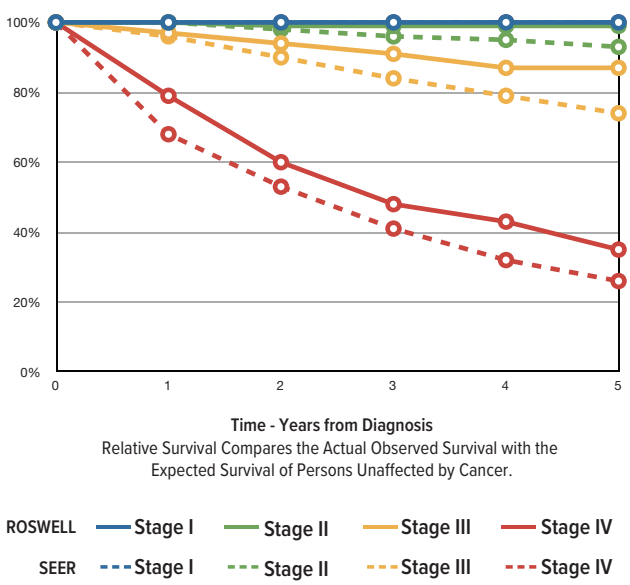
Our Patients

Cancer staging is an important first step in understanding the nature and severity of disease and provides guidance for determining the appropriate treatment plan for individual patients. The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group.

AJCC Stage Group, Breast Cancer
Note: Stage at diagnosis for CY 2014-2015



Survival Data
Five-Year Relative Breast Cancer, Stages I, II, III, IV,
Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival by Stage 2006-2013						
	Source	1	2	3	4	5
N=1631	Roswell Park Stage I	100%	100%	100%	100%	100%
N=965	Roswell Park Stage II	100%	99%	99%	99%	99%
N=373	Roswell Park Stage III	97%	94%	91%	87%	87%
N=225	Roswell Park Stage IV	79%	60%	48%	43%	35%

[1] American Joint Commission on Cancer (AJCC) Stage I-IV Breast Cancer
[2] SEER and Roswell Park data are matched for age, sex, and race but are not risk adjusted for comorbidities.
[3] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 7, 2017.

Commission on Cancer of American College of Surgeons

Roswell Park's accreditation by the Commission on Cancer (CoC) of American College of Surgeons requires benchmarking treatment against national quality standards. The quality measures and Roswell Park's performance on these measures for Breast Cancer are shown in the tables below. The CoC and other accrediting bodies do not expect, for many reasons (e.g., patient preference, medical contraindications), that compliance will reach 100%.

Roswell Park staff review every case where care is non-compliant with measures to ensure that the reason for non-compliance is recorded and appropriate.

Radiation is administered within 1 year (365 days) of diagnosis for women under the age of 70 receiving breast conservation surgery for breast cancer (Accountability)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	95%	93%	95%	95%	95%
Performance Rate Numerator / Denominator	142/149	99/107	113/119	162/170	516/545

Tamoxifen or third-generation aromatase inhibitor is recommended or administered within 1 year (365 days) of diagnosis for women with AJCC T1c or stage IB-III hormone receptor positive breast cancer (Accountability)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	98%	94%	96%	95%	96%
Performance Rate Numerator / Denominator	143/146	115/123	127/132	175/185	560/586

Radiation therapy is recommended or administered following any mastectomy within 1 year (365 days) of diagnosis of breast cancer for women with >= 4 positive regional lymph nodes (Accountability)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	89%	100%	82%	83%	90%
Performance Rate Numerator / Denominator	16/18	18/18	9/11	10/12	53/59

Image or palpation-guided needle biopsy to the primary site is performed to establish diagnosis of breast cancer (Quality Improvement)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	75%	71%	88%	81%	78%
Performance Rate Numerator / Denominator	78/104	76/107	80/91	95/118	329/420

Breast conservation surgery rate for women with AJCC clinical stage 0, I, or II breast cancer (Surveillance)

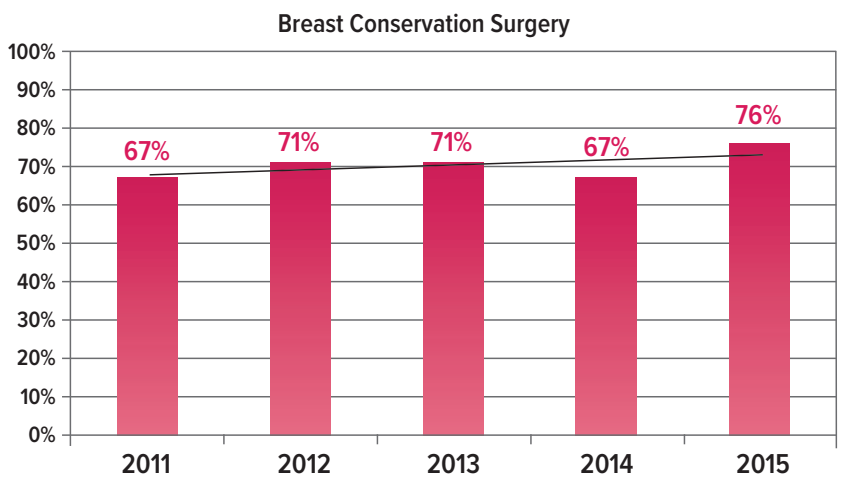
Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	70%	71%	67%	74%	71%
Performance Rate Numerator / Denominator	185/264	161/227	155/233	204/275	705/999

Combination chemotherapy is recommended or administered within 4 months (120 days) of diagnosis for women under 70 with AJCC T1cN0, or stage IB - III hormone receptor negative breast cancer (Accountability)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	84%	94%	89%	95%	90%
Performance Rate Numerator / Denominator	21/25	30/32	24/27	18/19	93/103

Breast Conserving Surgery Rate:

A key measure is the use of breast conserving surgery (non-mastectomy) for Stage I and Stage II cancers. National averages are generally around 60%.



Quality Reporting

Roswell Park participates in the Commission on Cancer's Rapid Quality Reporting System (RQRS), which collects data for treatment monitoring in real time. This program tracks adherence to nationally set standards in breast cancer care, such as timely receipt of adjuvant therapies, and alerts the providers if there is an impending lapse in concordant care. Daily alerts can prompt further investigation to ensure each individual patient receives, or at least considers, the appropriate treatment, and does not fall through the cracks.

High Risk for Breast Cancer

In our Risk Assessment and Prevention Program, over 200 women each year are counseled and managed according to their risk status. While some may benefit from measures such as risk-reducing breast surgery, others require enhanced surveillance techniques such as breast MRI. Our high-risk program works alongside the High-Risk Ovarian Cancer Program and Clinical Genetics Services and is supported in part by the Buffalo Sabres Alumni Wives. Consultation is available for anyone who shows a high risk for breast cancer.

RESEARCH & INNOVATION

Roswell Park conducts a large number of clinical trials with many other academic and/or community hospitals around the country, with a select few academic and/or community hospitals, or exclusively at Roswell Park. Current clinical research includes studies that may lead to limiting the need for aggressive lymph node surgery, improved radiation techniques, understanding factors associated with breast cancer risk and genetics, and improvements in drug, hormone, and chemotherapy treatments for breast cancer.

Questions addressed through these clinical trials include: Will genes being expressed in a cancer predict who will benefit from chemotherapy and who will not? Will targeted (non-chemotherapeutic) agents added to hormonal therapy allow hormonal therapy to be more effective? Will targeted (non-chemotherapeutic) agents added to chemotherapy allow chemotherapy to be more effective in triple negative breast cancer? Will targeted (non-chemotherapeutic) agents added to radiation therapy allow us to better control breast cancer that has spread to the brain?

Is a simple aspirin an effective way to prevent return of breast cancer after standard treatments have been employed? Will a vigorous weight loss program prevent the return of breast cancer? Are there diagnostic methods available that we can use to predict who is most likely to have heart damage from chemotherapy and therefore avoid the use of such drugs? Can we identify predictors in an older population that will determine who can safely tolerate chemotherapy and who cannot?

Roswell Park is one of the leading participants in the multi-site MATCH protocol. In this protocol, a woman's breast cancer undergoes thorough gene analysis to determine whether there is a gene alteration ("mutation") in the cancer that may be sensitive to targeted agents used in other malignancies, and whether there is an investigational drug available that may target the identified mutation. This protocol may be the vanguard by which cancer patients are eventually treated, and we are excited to allow our patients the opportunity to participate in this cutting-edge approach.

THE BREAST IMAGING CENTER

Our Breast Imaging Center is an American College of Radiology designated Center of Excellence. With our new expansion, we now have the capacity to provide screening mammography to the community, and we look to improve screening in historically underserved communities with the outreach programs Esperanza y Vida and Witness Project. In 2016, we entered into a 3-year contract with NY State, for a community navigator to help identify women eligible for screening mammography.

Based on screening studies demonstrating 3D mammography/tomosynthesis increases cancer detection and decreases recall rate, Roswell Park converted to this technology. We perform ultrasound, MRI, stereotactic and tomosynthesis guided core biopsies. We continually monitor multiple quality outcome metrics.

Roswell Park was one of the first hospitals in New York State to implement an I-125 radioactive seed localization program. Seed localization of nonpalpable breast lesions which require surgical excision has many advantages over traditional wire localizations including improved patient experience.

In partnership, with the Breast Cancer Risk Assessment and Prevention Program, Roswell Park has a strong high-risk screening breast MRI program. We performed almost 1000 diagnostic and screening breast MRIs in 2016. We have worked closely with our vendor to significantly decrease scan times while maintaining image quality. We are in the process of opening a collaborative group trial to investigate the potential use of an abbreviated breast MRI in women at average risk for breast cancer with dense breast tissue to shorten the time an MRI requires and increase the value to these women.

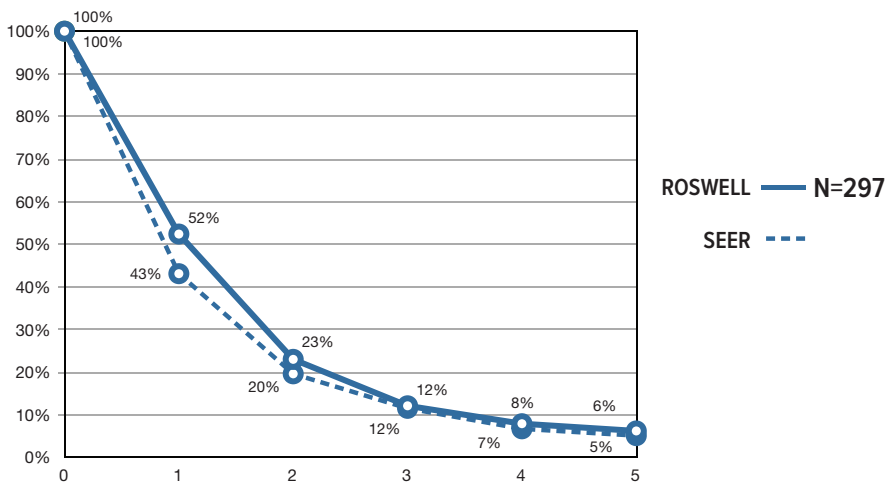
BRAIN & SPINE

Roswell Park Comprehensive Cancer Center takes a multidisciplinary approach, developing treatment plans for patients with brain disorders and tumors of the brain and spine.

Our Volume

Our team evaluates over 200 new patients, resulting in 3,000 office visits with our care providers each year.

Survival Data[1]
Five-Year Relative Glioblastoma
Cases Diagnosed (2006-2013)



Time - Years from Diagnosis
Relative Survival Compares the Actual Observed Survival with the Expected Survival of Persons Unaffected by Cancer.

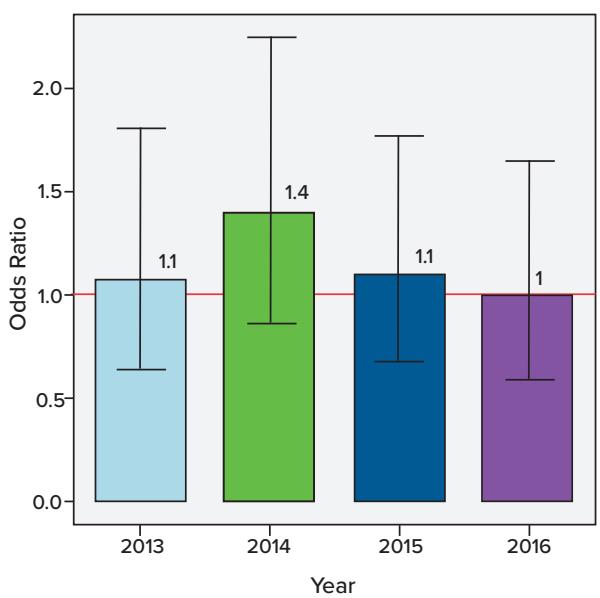
NATIONAL QUALITY METRICS FOR SURGICAL CARE AND PATIENT OUTCOMES

Roswell Park uses the **American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP)** to measure, monitor, and improve surgical care and patient outcomes. This program is designed to identify complications during and following surgery and provide a comparison of the hospital's rates to the national average. It also helps identify complications deemed preventable, including morbidity, surgical site infections, urinary tract infections, and readmissions to the operating room.

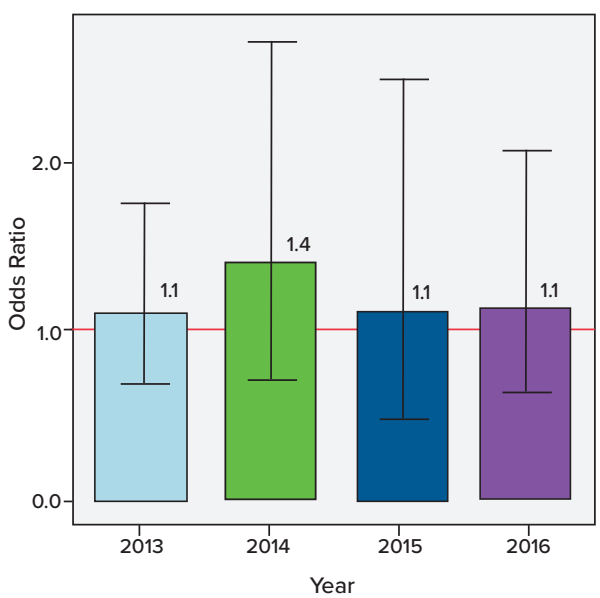
[1] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER* Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed March 3, 2017

The following graphs represent the likelihood (as indicated by the odd's ratio) of an event occurring at Roswell Park compared with the national average. The error bars represent the 95% confidence interval. If the confidence interval crosses an Odds Ratio[2] of 1, performance is on par with the national average. Roswell Park's performance for **neurosurgery** on these measures are presented below:

Morbidity
(2013-2016)



Pneumonia
(2013-2016)



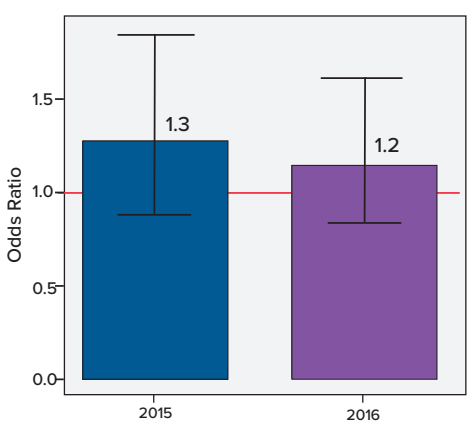
Morbidity

Time	Procedures	% Occurrence	% Expected
2013	79	8%	6%
2014	82	16%	9%
2015	106	8%	7%
2016	144	6%	6%

Pneumonia

Time	Procedures	% Occurrence	% Expected
2013	79	4%	1%
2014	81	7%	3%
2015	106	2%	1%
2016	144	3%	2%

ACS NSQIP: Neurosurgery Readmission



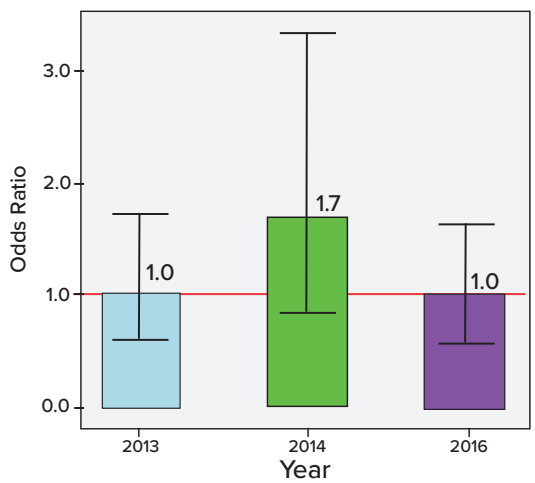
Readmission

Time	Procedures	% Occurrence	% Expected
2015	106	17%	10%
2016	144	13%	9%

[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

NSQIP also offers a Procedure Targeted option to allow participants to focus quality improvement efforts on high volume procedures. The Procedure Targeted is **neurosurgery for brain tumor**. The following charts outline Roswell Park's performance on key quality metrics for this procedure.

Morbidity[2]



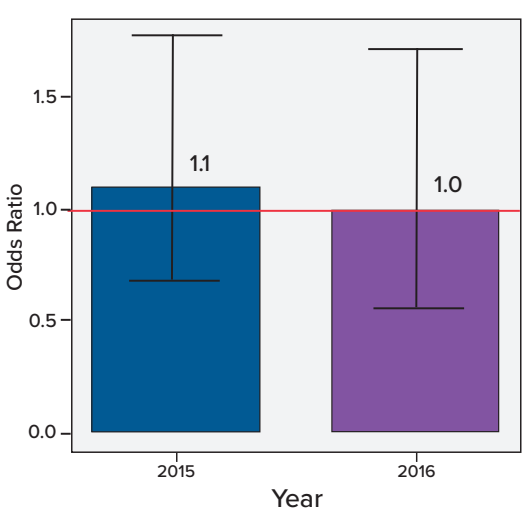
Morbidity

Time	Procedures	% Occurrence	% Expected
2013	66	8%	7%
2014	66	18%	7%
2016	108	6%	7%

Return to the Operating Room

Time	Procedures	% Occurrence	% Expected
2015	74	7%	4%
2016	108	4%	4%

Return to the Operating Room



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

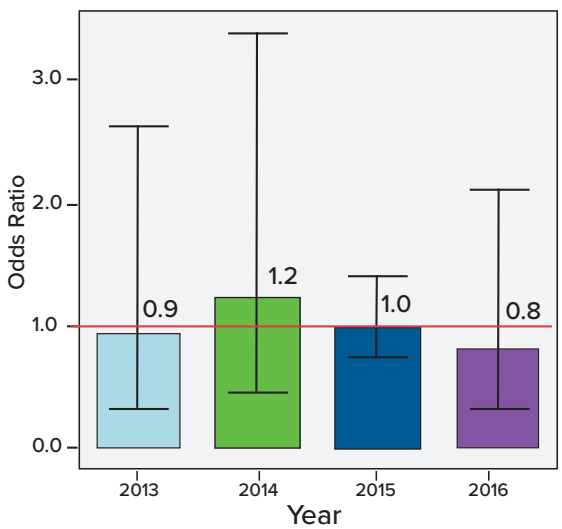
[2] Data not available for 2015 reporting period for this measure

ACS NSQIP: NEUROSURGERY FOR BRAIN TUMOR

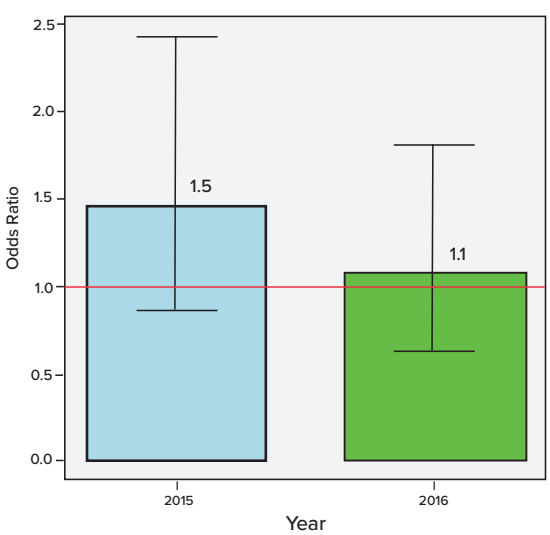
Surgical Site Infections

Time	Procedures	% Occurrence	% Expected
2013	64	2%	2%
2014	65	3%	2%
2015	74	3%	2%
2016	108	1%	2%

Surgical Site Infections



Length of Stay[2]



Length of Stay

Time	Procedures	% Occurrence	% Expected
2015	67	24%	16%
2016	96	17%	16%

[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

[2] The ACS NSQIP defines a Length of Stay (LOS) event as a LOS greater than the 75th percentile LOS for that group of operations.

RESEARCH & INNOVATION

Comparing Fluoroscopy to Neuronavigation in Spinal Tumor Surgery

Consecutive spinal operations performed by a single neurosurgeon at Roswell Park were retrospectively identified from 2012 until 2015 for patients undergoing oncologic instrumented spinal surgery. Two groups of operative techniques were evaluated: spinal instrumentation operations utilizing 2-dimensional (2D) fluoroscopy and spinal instrumentation operations using spinal neuronavigation and 3-dimensional imaging (3D). This research demonstrates the improved surgical outcomes with spinal neuronavigation.[8]

A Comparison of Operative Outcomes Before and After Implementing Spinal Neuronavigation		
	Before	After
Length of Surgery (minutes)	201	193
Estimated Blood Loss (liters)	0.79	0.39
Average Post-op Discharge Day	7.6	6.4
Screw Misplacement Rate	0.9%	0%

[8] Miller J and Fabiano AJ. Comparison of operative time with conventional fluoroscopy versus spinal neuronavigation in instrumented spinal tumor surgery. AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves Annual Spine Summit, Las Vegas, NV, 2017.

SPINAL ONCOLOGY PROGRAM

Mission

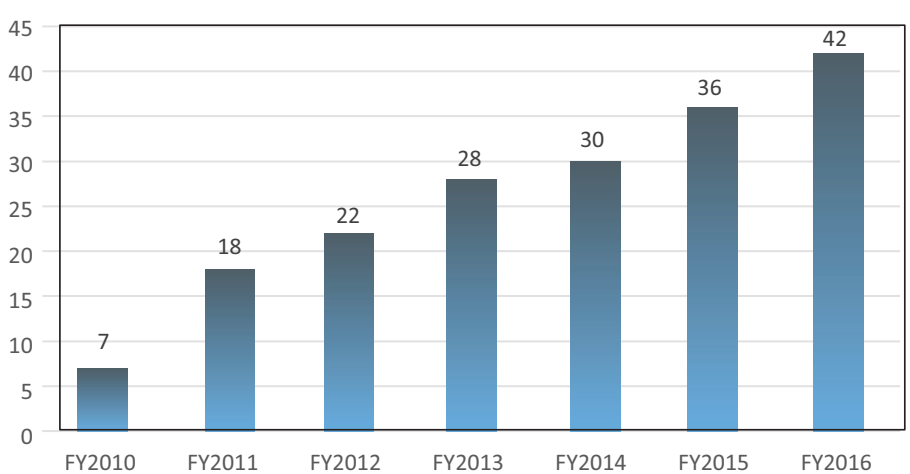
The mission of the Spinal Oncology program is to provide exceptional patient care for those with disorders of the spinal column, spinal cord, and peripheral nervous system.

Vision

To grow the volume of patients served while incorporating the latest advances in spinal tumor treatment

Our Volume

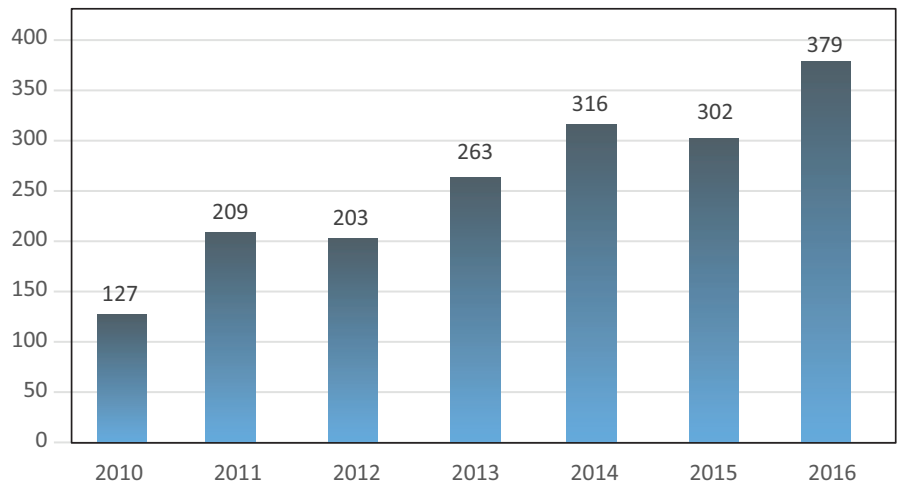
Operative Volume



Operative volume has increased 500% from 2010 to 2016

In FY 2016, 90% of spinal operations were for patients with spinal indications and 10% for patients with degenerative disease.

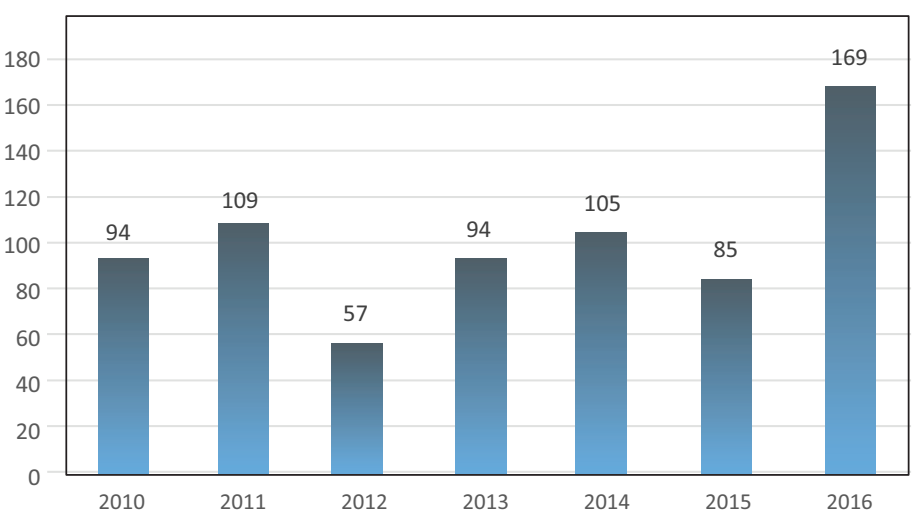
Neuroimaging Volume



Spinal CT volume has increased 198% from 2010 to 2016

Spinal CT Scans are a major imaging modality for preoperative surgical planning and postoperative evaluation of patients with spinal instrumentation.

Kyphoplasty Procedures



Kyphoplasty procedures have increased 198% from 2010 to 2016

Dheerendra Prasad, MD, MCh, FACRO

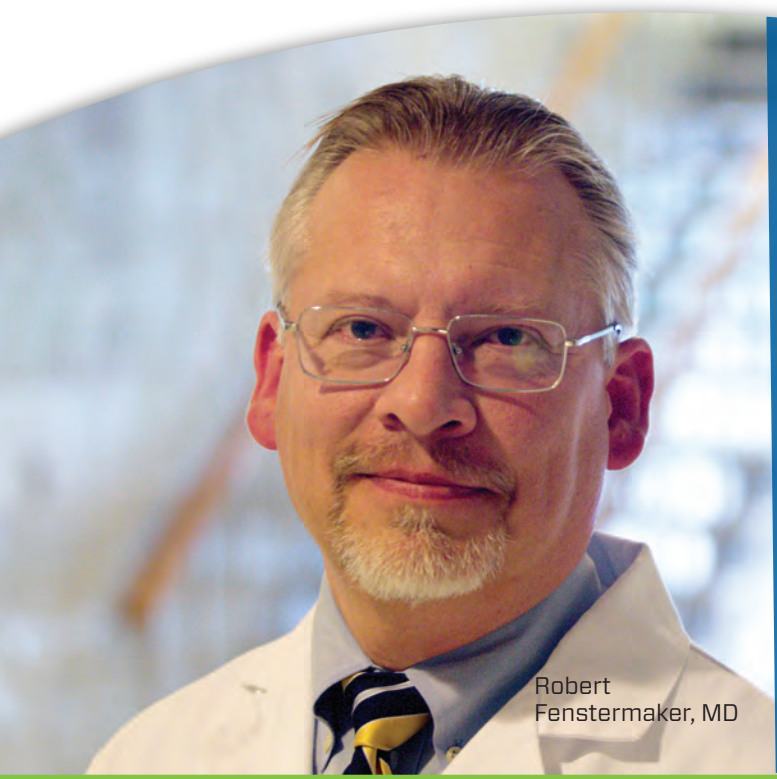
Gamma Knife Radiosurgery

Roswell Park now treats patients with the state-of-the-art Gamma Knife radiosurgery device, the Leksell Gamma Knife® Icon™ — the most advanced technology of its kind on the market. Roswell Park is the first cancer center in the United States to receive a license to operate it and remains the only facility in Western New York with Gamma Knife capabilities.

No other regional facility has radiation oncologists with the training, qualifications and expertise to perform Gamma Knife radiosurgery. Roswell Park treats 400 patients with this procedure annually.

With Gamma Knife radiosurgery, only 0.5% of the brain is irradiated, compared to whole brain radiation therapy, preserving significantly more healthy brain tissue and brain function down the road, improving both medical outcomes and quality of life for patients.

Please see our Gamma Knife outcomes data on page 128.



Robert Fenstermaker, MD

Glioblastoma Vaccine

An innovative vaccine therapy developed at Roswell Park is currently under study in a multi-site clinical trial involving 50 patients with newly diagnosed glioblastoma. The phase II study, accruing patients at both Roswell Park and the Cleveland Clinic, will assess the effectiveness of the SurVaxM vaccine in combination with standard chemotherapy as treatment for this often-fatal cancer.

SurVaxM vaccine, developed by Roswell Park faculty members Robert Fenstermaker, MD, and Michael Ciesielski, PhD, targets survivin, a cell-survival protein present in the vast majority of cancers, including glioblastoma.

Steven Nurkin, MD, MS, FACS

GASTROINTESTINAL

Roswell Park provides comprehensive evaluation and treatment for gastrointestinal cancers including colorectal, small intestine, gastric, esophageal, liver, bile duct, pancreas and neuroendocrine tumors.

Our Volume

We evaluate more than 2,000 new patients with more than 18,000 office visits annually. Our physicians perform more than 3,500 endoscopy procedures and manage 6,000 chemotherapy and infusion encounters.

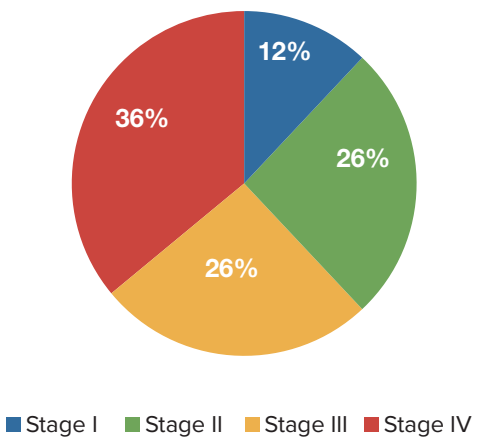
COLON AND RECTAL CANCER

Our Patients

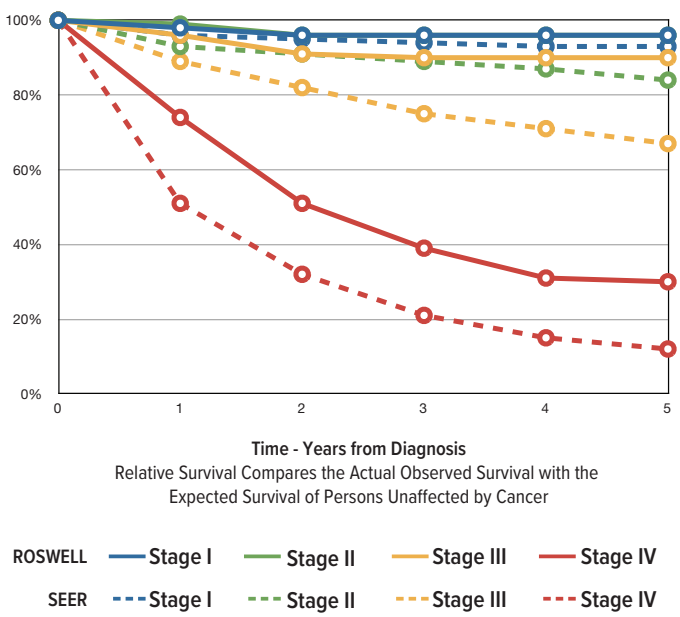
Cancer staging is an important first step to understanding the nature and severity of disease and provides guidance for determining the appropriate treatment plan for individual patients. The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group for Roswell Park patients.

COLON CANCER

AJCC Stage Group, Colon Cancer



Survival Data
Five-Year Colon Cancer Survival, Stages I, II, III, IV
Cases Diagnosed (2006-2013)

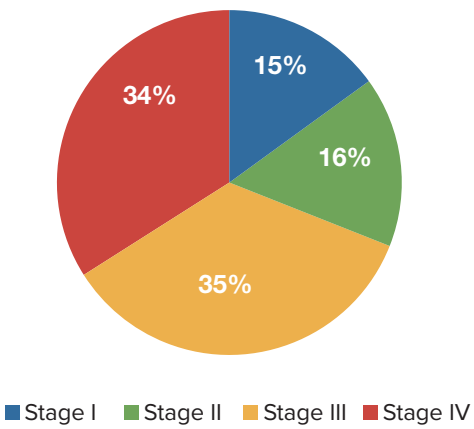


Roswell Park 5-Year Relative Survival for Colon Cancer						
	Source	1	2	3	4	5
N=69	Roswell Park Stage I	98%	96%	96%	96%	96%
N=101	Roswell Park Stage II	99%	96%	96%	96%	96%
N=151	Roswell Park Stage III	96%	91%	90%	90%	90%
N=230	Roswell Park Stage IV	74%	51%	39%	31%	30%

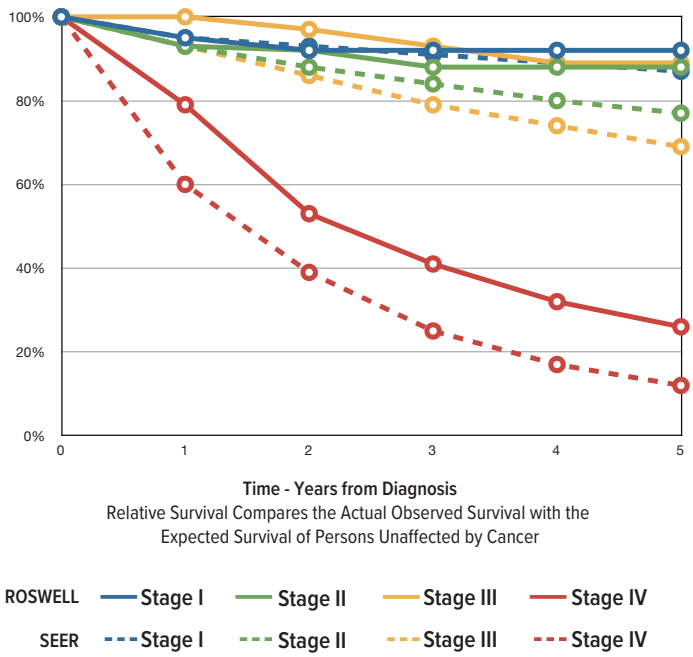
[1] American Joint Commission on Cancer (AJCC) Stage I-IV Colon Cancer
[2] SEER and Roswell Park data are matched based on age, sex, and race but are not risk adjusted for comorbidities.
[3] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017

RECTAL CANCER

AJCC Stage Group, Rectal Cancer



Survival Data
Five-Year Rectal Cancer Survival, Stages I, II, III, IV
Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival for Rectal Cancer						
	Source	1	2	3	4	5
N=88	Roswell Park Stage I	95%	92%	92%	92%	92%
N=94	Roswell Park Stage II	93%	92%	88%	88%	88%
N=127	Roswell Park Stage III	100%	97%	93%	89%	89%
N=120	Roswell Park Stage IV	79%	53%	41%	32%	26%

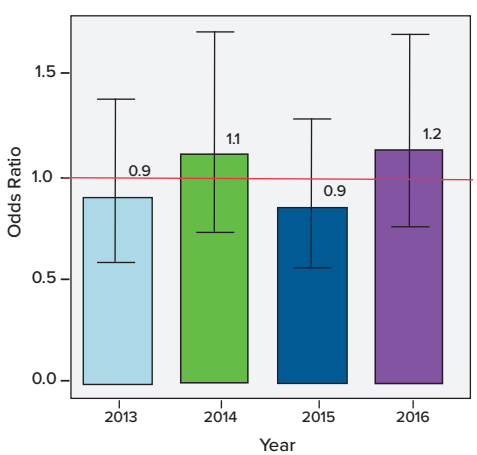
[1] American Joint Commission on Cancer (AJCC) Stage I-IV Rectal Cancer
[2] SEER and Roswell Park data are matched based on age, sex, and race but are not risk adjusted for comorbidities.
[3] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017

NATIONAL QUALITY METRICS FOR SURGICAL CARE AND PATIENT OUTCOMES

Roswell Park uses the **American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP)** to measure, monitor, and improve surgical care and patient outcomes. This program is designed to identify complications during and following surgery and provide a comparison of the hospital's rates to the national average. It also helps identify complications deemed preventable including morbidity, surgical site infections, urinary tract infections, and readmissions to the operating room.

The following graphs represent the likelihood (as indicated by the odd's ratio) of an event occurring at Roswell Park compared with the national average for **colectomy**. The error bars represent the 95% confidence interval. If the confidence interval crosses an Odds Ratio of 1, performance is on par with the national average. Rowell Park's performance on these measures from 2013-2016 are presented below:

Death or Serious Morbidity



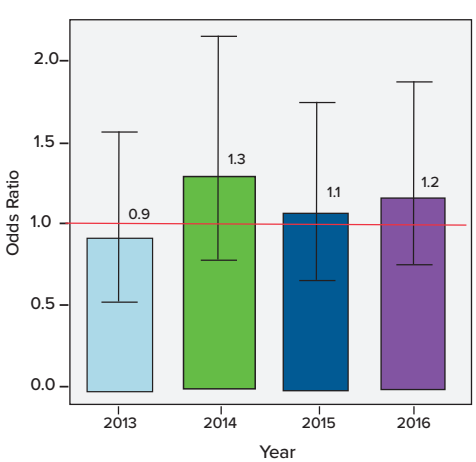
Death or Serious Morbidity

Time	Procedures	% Occurrence	% Expected
2013	69	10%	13%
2014	68	16%	12%
2015	79	6%	10%
2016	94	14%	10%

Surgical Site Infections

Time	Procedures	% Occurrence	% Expected
2013	69	9%	10%
2014	68	15%	9%
2015	77	9%	8%
2016	94	12%	9%

Surgical Site Infections



Commission on Cancer of American College of Surgeons

Roswell Park's accreditation by the Commission on Cancer (CoC) of American College of Surgeons requires benchmarking treatment against national quality standards. The quality measures and Roswell Park's performance on these measures for Colon Cancer are shown in the table below. The CoC and other accrediting bodies do not expect, for many reasons (e.g., patient preference, medical contraindications), that compliance will reach 100%.

Roswell Park staff review every case where care is non-compliant with measures to ensure that the reason for non-compliance is recorded and appropriate.

At least 12 regional lymph nodes are removed and pathologically examined for resected colon cancer (Quality Improvement)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	92%	100%	97%	98%	97%
Performance Rate Numerator / Denominator	34/37	37/37	28/29	46/47	145/150

Adjuvant chemotherapy is recommended, or administered within 4 months (120 days) of diagnosis for patients under the age of 80 with AJCC stage III (lymph node positive) colon cancer (Accountability)

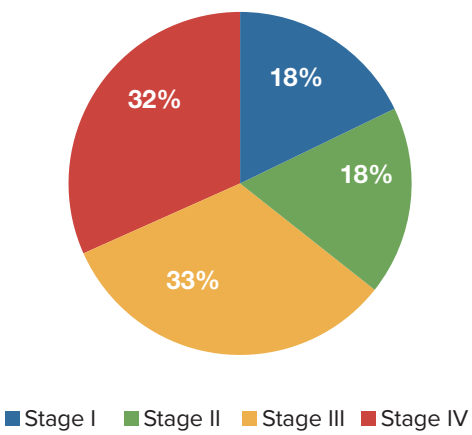
Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	92%	88%	100%	86%	90%
Performance Rate Numerator / Denominator	11/12	15/17	9/9	12/14	47/52

ESOPHAGEAL CANCER

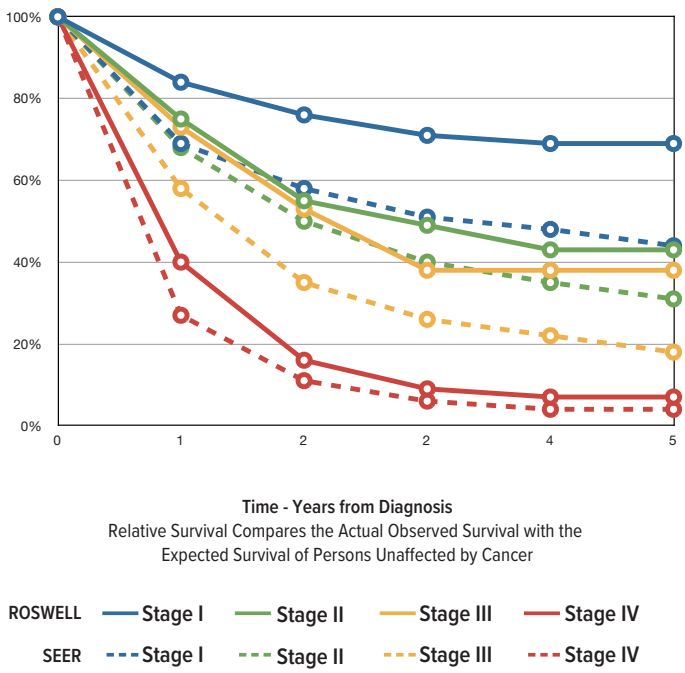
Our Patients

The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis and the associated 5-year relative survival rates by AJCC stage group.

AJCC Stage Group, Esophageal Cancer
Cases Diagnosed (2014-2015)



Survival Data
Five-Year Esophageal Cancer Survival, Stages I, II, III, IV
Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival for Esophageal Cancer						
	Source	1	2	3	4	5
N=115	Roswell Park Stage I	84%	76%	71%	69%	69%
N=106	Roswell Park Stage II	75%	55%	49%	43%	43%
N=126	Roswell Park Stage III	73%	53%	38%	38%	38%
N=263	Roswell Park Stage IV	40%	16%	9%	7%	7%

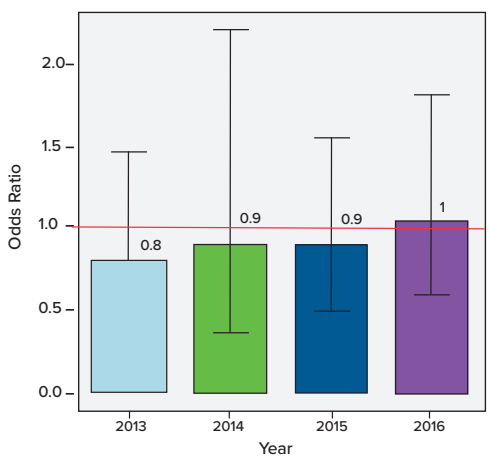
[1] American Joint Commission on Cancer (AJCC) Stage I-IV Esophageal Cancer
[2] SEER and Roswell Park data are matched based on age, sex, and race but are not risk adjusted for comorbidities.
[3] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017

NATIONAL QUALITY METRICS FOR SURGICAL CARE AND PATIENT OUTCOMES

American College of Surgeons National Surgical Quality improvement Program (ACS NSQIP)

NSQIP offers a Procedure Targeted option to allow participants to focus quality improvement efforts on high volume procedures. For esophageal cancers one Procedure Targeted is **esophagectomy**. The following charts outline Roswell Park's performance on key quality metrics for this procedure.

Morbidity



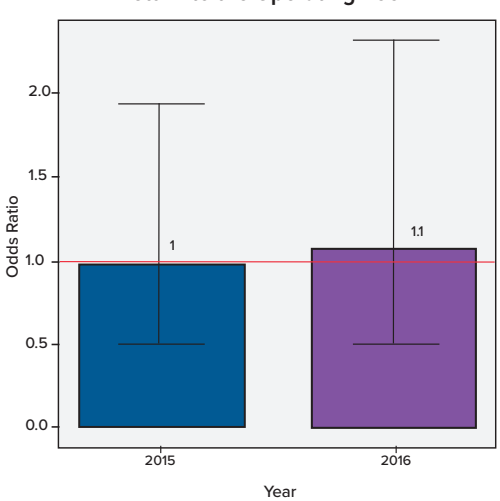
Morbidity

Time	Procedures	% Occurrence	% Expected
2013	25	24%	35%
2014	21	24%	27%
2015	32	34%	40%
2016	29	31%	30%

Return to the Operating Room

Time	Procedures	% Occurrence	% Expected
2015	32	16%	16%
2016	29	14%	12%

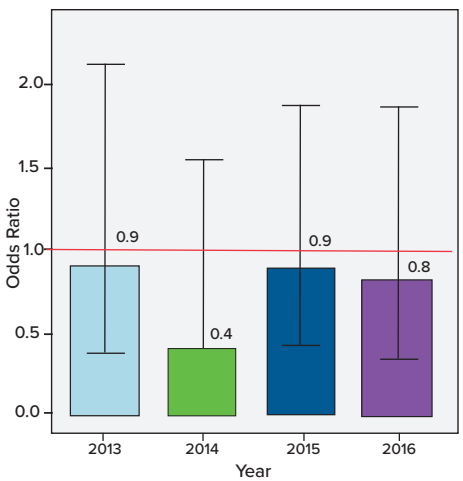
Return to the Operating Room



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

ACS NSQIP: ESOPHAGECTOMY

Surgical Site Infections



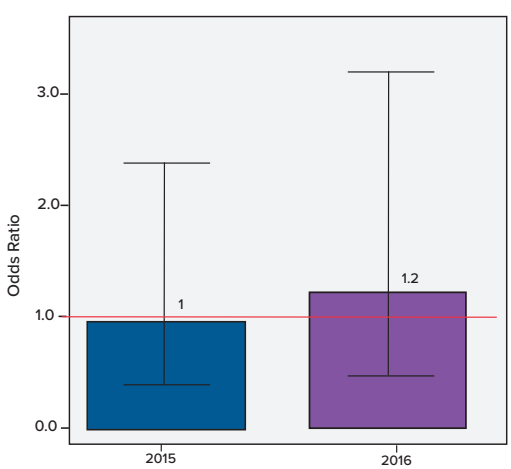
Surgical Site Infections

Time	Procedures	% Occurrence	% Expected
2013	25	12%	14%
2014	21	0%	12%
2015	32	13%	15%
2016	29	7%	11%

Length of Stay

Time	Procedures	% Occurrence	% Expected
2015	20	20%	20%
2016	20	25%	24%

Length of Stay



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

[2] The ACS NSQIP defines a Length of Stay (LOS) event as a LOS greater than the 75th percentile LOS for that group of operations.

MINIMALLY INVASIVE ESOPHAGECTOMY*

In-hospital outcomes (N=315)	N
Total lymph nodes harvested, median (range)	16 (2-39)
Margin status	
Positive	23 (7.6%)
Total hospital stay, median	8
Reoperation	24 (7.6%)
Total in hospital complications	156 (49.5%)
Post-discharge complications	
30-day mortality	4 (1.3%)
90-day mortality	16 (5.1%)
Readmission within 30 days	23 (7.3%)
Symptomatic anastomotic stricture requiring dilation	13 (4.1%)

*data include patients from the University of Florida

ONCOLOGIC OUTCOME OF ENTIRE COHORT

Patient outcome	N
Follow-up (mo), median (range)	6 (1-76)
Outcome	
Died of disease	21%
Alive with disease	4%
No evidence of disease	75%

*data include patients from the University of Florida

Steven Hochwald, MD, MBA

RESEARCH & INNOVATION

Innovation in Esophagectomy

Esophagectomies have traditionally been performed with an open approach and are associated with a high rate of morbidity and mortality. Minimally invasive procedures are typically associated with reduced length of stay, reduced morbidity, and improved quality of life than open operations. Our surgical team at Roswell Park recently published their outcomes for patients who underwent a minimally invasive esophagectomy demonstrating this as a safe and effective approach.

[1] Ben-David K, Tuttle R, Kukar M, Rossidis G, Hochwald SN. Minimally Invasive Esophagectomy Utilizing a Stapled Side-to-Side Anastomosis is Safe in the Western Patient Population. Annals of Surgical Oncology. 2016 Apr 25:1-7.

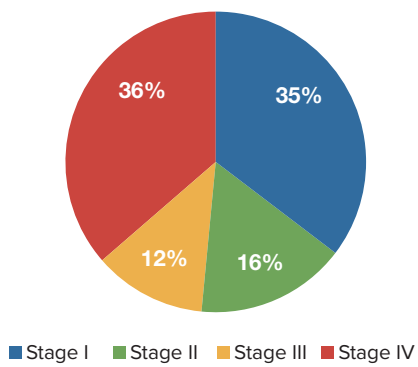
STOMACH CANCER

Our Patients

The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group.

AJCC Stage Group, Stomach Cancer

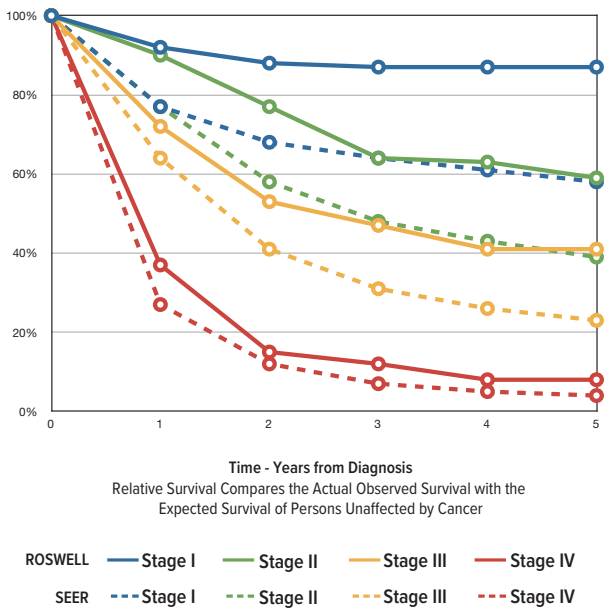
Note: Stage at diagnosis for CY 2014-2015



Survival Data

Five-Year Stomach Cancer Survival, Stages I, II, III, IV

Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival for Stomach Cancer						
	Source	1	2	3	4	5
N=163	Roswell Park Stage I	92%	88%	87%	87%	87%
N=71	Roswell Park Stage II	90%	77%	64%	63%	59%
N=77	Roswell Park Stage III	72%	53%	47%	41%	41%
N=170	Roswell Park Stage IV	37%	15%	12%	8%	8%

COMMISSION ON CANCER OF AMERICAN COLLEGE OF SURGEONS

At least 15 regional lymph nodes are removed and pathologically examined for resected gastric cancer (Quality Improvement)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	89%	78%	90%	60%	79%
Performance Rate Numerator / Denominator	8/9	7/9	9/10	6/10	30/38

[1] American Joint Commission on Cancer (AJCC) Stage I-IV Stomach Cancer

[2] SEER and Roswell Park data are matched based on age, sex, and race but are not risk adjusted for comorbidities.

[3] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017

LAPAROSCOPIC RESECTIONS FOR ADVANCED GASTRIC CANCER*

Type of Therapy (N=28)	
Neoadjuvant only	14%
Type of Surgery	
Proximal	2 (7%)
Distal	14 (50%)
Total	12 (43%)
Conversion to open	14%
Operative time (min), median	329 (232-481)
EBL (mL), median	125 (30-300)
Operative Parametrics	
Margin status	
Positive	0
Total lymph nodes harvested, median (range)	22 (6-53)
Number of positive lymph nodes, median (range)	9 (0-39)

PATIENT OUTCOMES

Total hospital stay, median	7
Reoperation	0
Readmission within 30 days	1 (3.6 %)
Total complications	9 (32.1 %)
Outcome	
Died of disease	21.4%
Alive with disease	3.6%
No evidence of disease	75%

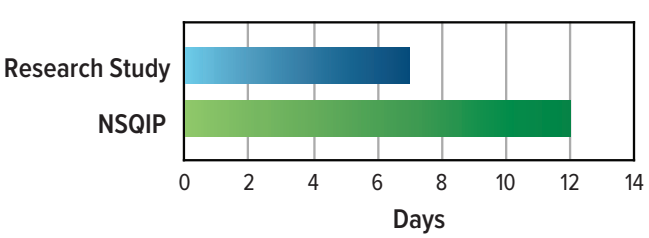
*data include patients from the University of Florida

RESEARCH & INNOVATION

Innovation in Gastrectomy

Laparoscopic resection has been effective for treating early gastric cancer, but debate remains whether this procedure is feasible for advanced gastric cancer. Laparoscopic procedures are typically associated with reduced length of stay, fewer morbidities, and improved quality of life than open operations. Our surgical team at Roswell Park recently published their outcomes for 28 patients with advanced gastric cancer who underwent minimally invasive gastrectomy.

Length of Hospital Stay following Laproscopic Resection for Advanced Gastric Cancer



[1] Tuttle R, Hochwald SN, Kukar M, Ben-David K. Total laparoscopic resection for advanced gastric cancer is safe and feasible in the Western population. Surgical Endoscopy. 2015 Nov 5:1-7.

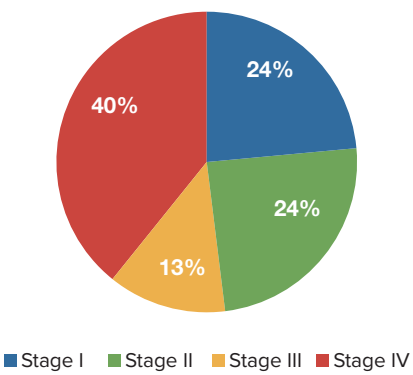
PANCREATIC CANCER

Our Patients

The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group.

AJCC Stage Group, Pancreatic Cancer

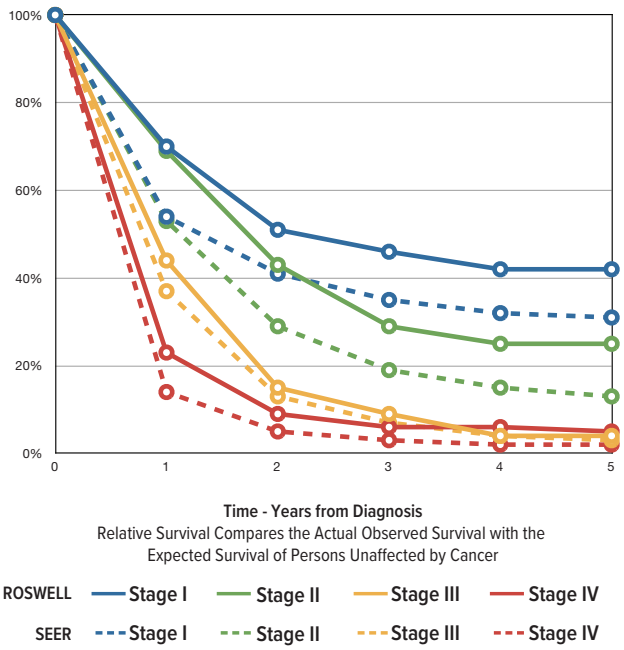
Note: Stage at diagnosis for CY 2014-2015



Survival Data

Five-Year Pancreatic Cancer Survival, Stages I, II, III, IV

Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival for Pancreatic Cancer						
	Source	1	2	3	4	5
N=77	Roswell Park Stage I	70%	51%	46%	42%	42%
N=210	Roswell Park Stage II	69%	43%	29%	25%	25%
N=118	Roswell Park Stage III	44%	15%	9%	4%	4%
N=411	Roswell Park Stage IV	23%	9%	6%	6%	5%

[1] American Joint Commission on Cancer (AJCC) Stage I-IV Pancreatic Cancer

[2] SEER and Roswell Park data are matched based on age, sex, and race but are not risk adjusted for comorbidities.

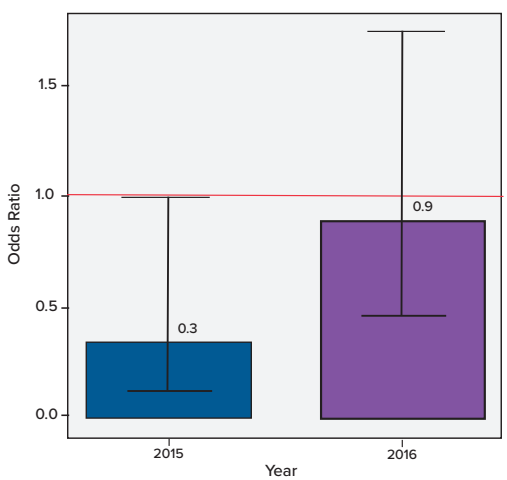
[3] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017

NATIONAL QUALITY METRICS FOR SURGICAL CARE AND PATIENT OUTCOMES

American College of Surgeons National Surgical Quality improvement Program (ACS NSQIP)

NSQIP offers a Procedure Targeted option to allow participants to focus quality improvement efforts on high volume procedures. For pancreatic cancer one Procedure Targeted is **pancreatectomy**. The following charts outline Roswell Park's performance on key quality metrics for this procedure.

Fistula



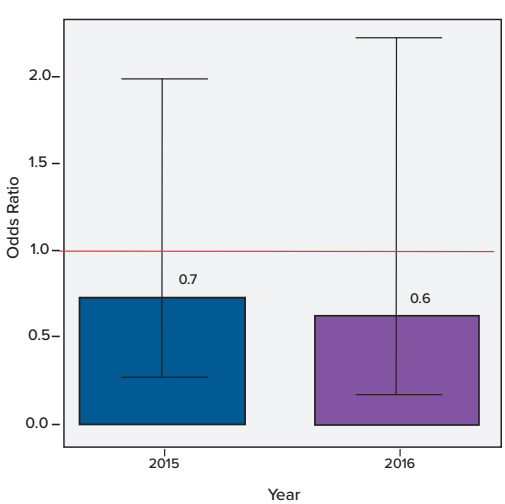
Fistula

Time	Procedures	% Occurrence	% Expected
2015	30	3%	20%
2016	29	17%	21%

Sepsis

Time	Procedures	% Occurrence	% Expected
2015	30	0%	4%
2016	29	0%	4%

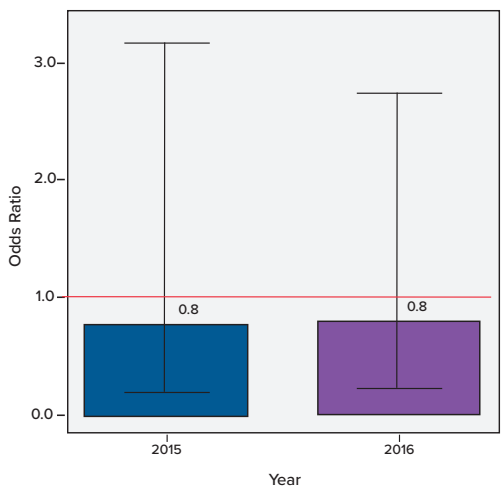
Sepsis



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

ACS NSQIP: PANCREATECTOMY

Pneumonia



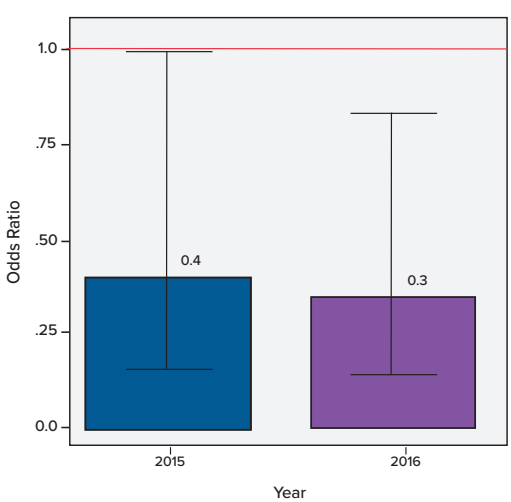
Pneumonia

Time	Procedures	% Occurrence	% Expected
2015	30	0%	2%
2016	29	0%	2%

Length of Stay

Time	Procedures	% Occurrence	% Expected
2015	50	4%	15%
2016	58	3%	16%

Length of Stay



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

[2] The ACS NSQIP defines a Length of Stay (LOS) event as a LOS greater than the 75th percentile LOS for that group of operations.

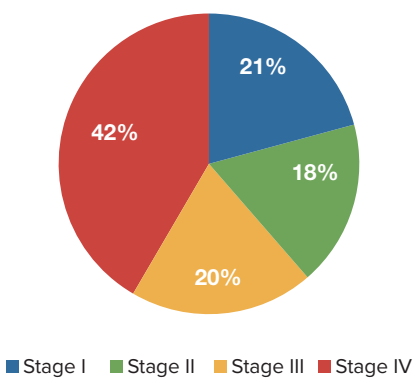
LIVER CANCER

Our Patients

The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group.

AJCC Stage Group, Liver Cancer

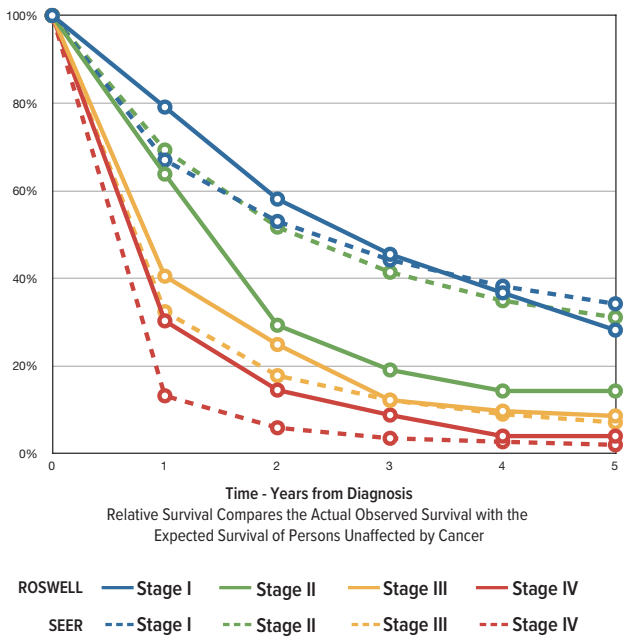
Note: Stage at diagnosis for CY 2014-2015



Survival Data

Five-Year Liver Cancer Survival, Stages I, II, III, IV

Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival for Liver Cancer						
	Source	1	2	3	4	5
N=65	Roswell Park Stage I	79%	58%	46%	37%	28%
N=37	Roswell Park Stage II	64%	29%	19%	14%	14%
N=84	Roswell Park Stage III	41%	25%	12%	10%	9%
N=68	Roswell Park Stage IV	30%	15%	9%	4%	4%

[1] American Joint Commission on Cancer (AJCC) Stage I-IV Liver Cancer

[2] SEER and Roswell Park data are matched based on age, sex, and race but are not risk adjusted for comorbidities.

[3] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017

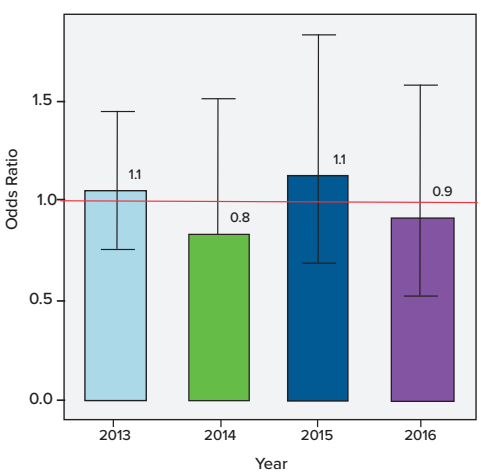
NATIONAL QUALITY METRICS FOR SURGICAL CARE AND PATIENT OUTCOMES

American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP)

NSQIP offers a Procedure Targeted option to allow participants to focus quality improvement efforts on high volume procedures. For liver cancers, one Procedure Targeted is **hepatectomy** for primary liver and metastatic disease. The following charts outline Roswell Park's performance on key quality metrics for this procedure.

ACS NSQIP: HEPATECTOMY

Morbidity



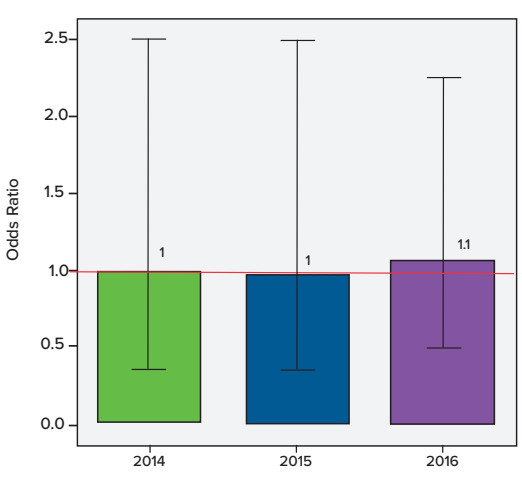
Morbidity

Time	Procedures	% Occurrence	% Expected
2013	16	31%	17%
2014	20	5%	15%
2015	37	22%	16%
2016	42	12%	15%

Mortality

Time	Procedures	% Occurrence	% Expected
2014	20	0%	1%
2015	37	0%	0%
2016	42	2%	1%

Mortality



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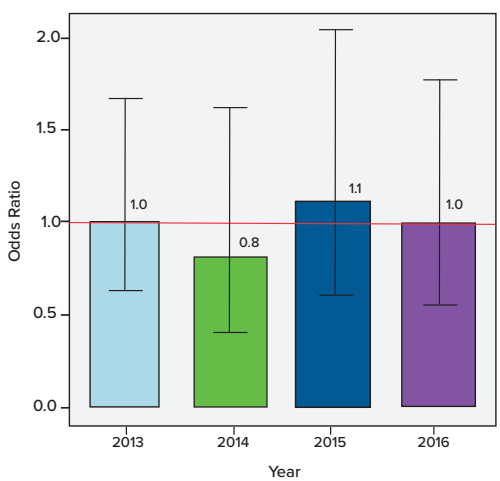
ACS NSQIP: HEPATECTOMY

Pneumonia

Time	Procedures	% Occurrence	% Expected
2015	37	5%	3%
2016	42	2%	3%

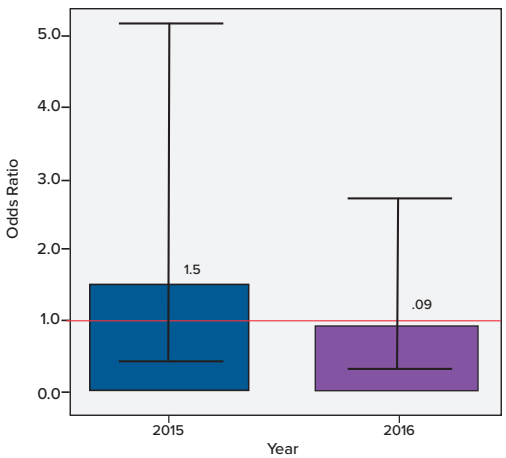
Surgical Site Infections



Length of Stay

Time	Procedures	% Occurrence	% Expected
2015	28	14%	14%
2016	35	6%	13%

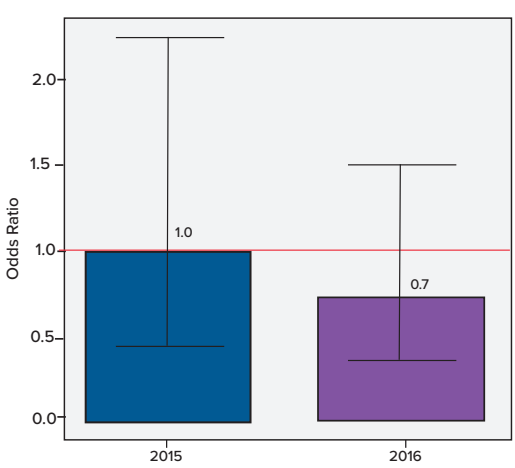
Pneumonia



Surgical Site Infections

Time	Procedures	% Occurrence	% Expected
2013	16	13%	11%
2014	20	0%	9%
2015	37	14%	11%
2016	42	7%	7%

Length of Stay



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

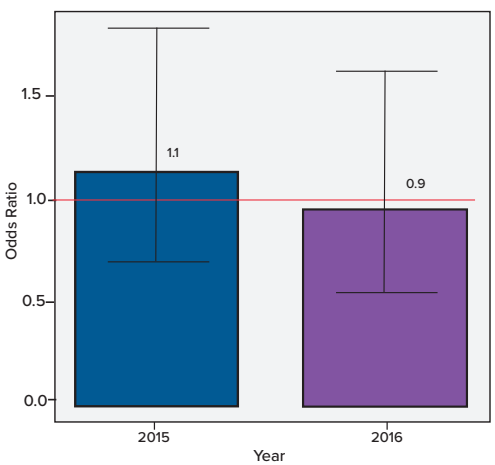
[2] The ACS NSQIP defines a Length of Stay (LOS) event as a LOS greater than the 75th percentile LOS for that group of operations.

ACS NSQIP: HEPATECTOMY

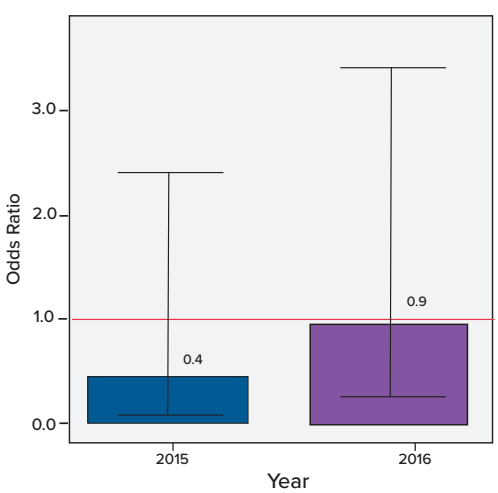
Readmission

Time	Procedures	% Occurrence	% Expected
2015	37	16%	10%
2016	42	7%	9%

Readmission



Liver Failure



Liver Failure

Time	Procedures	% Occurrence	% Expected
2015	37	0%	4%
2016	42	2%	3%

[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

CYTOREDUCTIVE SURGERY/HIPEC[1]

Morbidity	
Superficial surgical site infection	15.2%
Deep surgical site infection	10.7%
Pulmonary complications	3.6%
Cardiac complications	2.7%
Renal complications	0.9%
Urinary tract infections	4.5%
Venous thromboembolism	4.5%
Gastrointestinal complications	14.3%
Hematologic complications	0.9%
Neutropenia	6.3%
Mortality	
30-day mortality	0
60-day mortality	2.7%
Operative mortality	0

RESEARCH & INNOVATION

Cytoreductive Surgery / HIPEC

Cytoreductive surgery combined with heated chemotherapy (CS/HIPEC) is a novel treatment for late stage gastrointestinal cancers. Researchers at Roswell Park retrospectively reviewed 112 consecutive CS/HIPEC patients receiving treatment at our center demonstrating positive results. This procedure can be performed safely with minimal mortality and acceptable morbidity.

The most common histologies:

Colorectal cancer (33.9%)

Appendiceal adenocarcinoma (21.4%)

DPAM (24.1%)

Peritoneal mesothelioma (9.8%)

Histology	Median Survival	5-year overall survival
Colorectal cancer	45.2 months	38.2%
Appendiceal adenocarcinoma	39.9 months	38.7%
DPAM	Not reached	91.3%
Peritoneal mesothelioma	68.5 months	80.8%

Roswell Park developed and is piloting a CS/HIPEC patient pathway (for post-op inpatient stay) and we are currently developing a pre-op and post-op (home) pathway for recovery aimed at improving quality of life and ability to return to activities.

[1] Haslinger M, Francescutti V, Attwood K, McCart JA, Fakih M, Kane JM, Skitzki JJ. A contemporary analysis of morbidity and outcomes in cytoreduction/hyperthermic intraperitoneal chemoperfusion. Cancer Medicine. 2013 Jun 1;2(3):334-42.

[2] Singla S, Francescutti V, Kane JM, Skitzki JJ. Identifying variables that predict poor tumor biology and suboptimal outcomes in patients treated with cytoreduction and HIPEC. In ASCO Annual Meeting Proceedings 2015 Jan 20 (Vol. 33, No. 3_suppl, p. 709).

Clinical Research

Our Gastrointestinal Program has a robust portfolio of innovative clinical trials. Four clinical research coordinators are dedicated to patient accrual and ensuring compliance to these studies. The NCI rewards grant funded/investigator initiated studies based on the highest quality of peer-reviewed research and Roswell Park's GI program currently has eight such protocols.

CLINICAL TRIALS: Number of Studies by Phase

	STUDY PHASE					
Year	1	1/2	2	2/3	3	Total
2015	0	3	9	1	4	17
2016	1	3	11	1	4	20

CLINICAL TRIALS: Studies by site

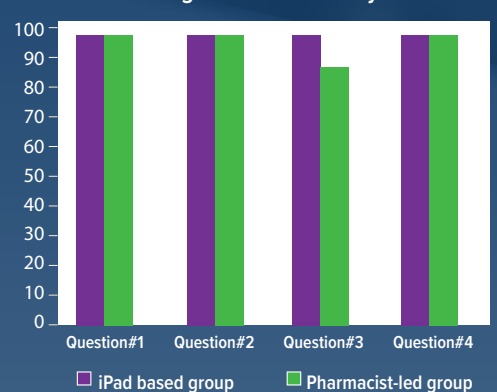
	Esophageal	Colorectal	Pancreas	Thyroid	Liver	Carcinoid	TOTAL
2015	1	7	6	0	2	1	17
2016	2	9	6	1	2	0	20

Patient Education

GI malignancies have complex presentations, care plans and specialized nutrition needs that make treatment of these cancers challenging. To ensure patients have access to vital resources, up to date information on trials and nutrition support, we developed our own brand of education materials, supported by an iPad-based tool, that we provide to GI cancer patients at Roswell Park.

In 2016 the GI program piloted an innovative iPad-based chemotherapy video teaching tool. Knowledge retention from verbal instruction and iPad teaching was examined and demonstrated iPad teaching is a valuable tool for offering high quality education to our patients.

Knowledge retention survey results



Renuka Iyer, MD

PATIENT INSTRUCTIONS:

If you have any of the following symptoms, please seek immediate medical attention:

Fever of 100.5/38 or higher, shaking chills, weakness, new abdominal pain or new jaundice (yellowing of your eyes and skin)

Carry this card with you and show it to medical personnel.

THE Cholangiocarcinoma FOUNDATION

For emergency guidelines to treat this patient, please go to **curecc.org/biliarycard** or scan this qr code

ROSWELL PARK CANCER INSTITUTE

Patient Information

Sally Smith

I have a PTC Tube which was placed on 06/2017

Gastroenterologist: Dr. Jones
Gastroenterologist Phone #: 716-XXX-XXXX
Medical Oncologist: Dr. Johnson
Medical Oncologist Phone #: 716-XXX-XXXX
Surgical Oncologist: Dr. Williams
Surgical Oncologist Phone #: 716-XXX-XXXX
Hospital Name: Roswell Park
Hospital Phone #: 716-845-2300

This patient is at risk for ascending cholangitis, a bacterial infection of the biliary system, which can be fatal. If this patient is presenting with the symptoms listed on this card, treat with IV fluids, antibiotics, admission, and GI consult for ERCP (this is the definitive treatment). Specific emergency treatment guidelines can be found at curecc.org/biliarycard.

Please consider this a physician to physician communication.

Biliary Emergency Card

In conjunction with the Cholangiocarcinoma Foundation, a national organization that provides support and funding for research and education for patients with cholangiocarcinoma, our physicians developed this emergency information card for patients with biliary stents. This card helps communicate to other physicians about the patient's condition and treatment needs to help biliary patients receive appropriate care in an emergency situation.

In addition, our patient education team distributed over 6,000 print materials in 2016, including new GI patient packets with cancer-specific and department-specific information for patients with liver, esophageal, pancreatic, gastric, esophageal, biliary and neuroendocrine cancers.

GENITOURINARY

Roswell Park takes a multidisciplinary approach to provide comprehensive and individualized care to patients with prostate, bladder, kidney and testicular cancer.

Our Volume

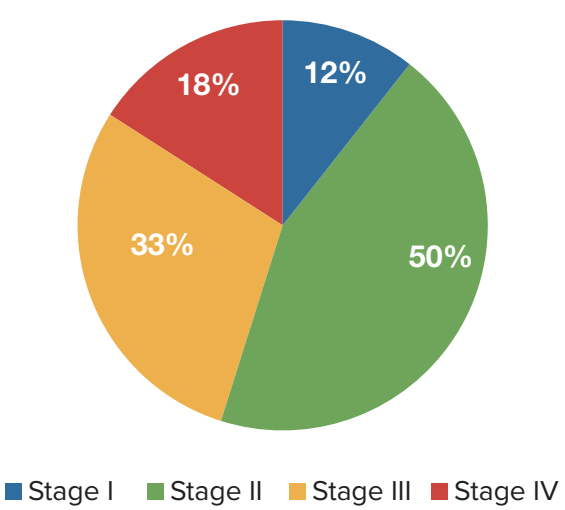
Annually, the genitourinary oncology center evaluates over 800 new patients, resulting in over 14,000 office visits.

PROSTATE CANCER

Our Patients

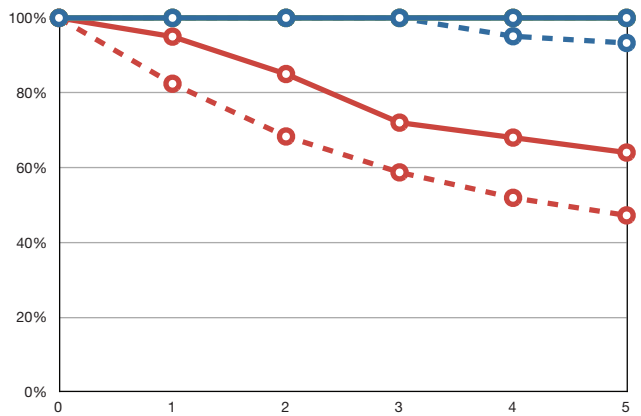
Cancer staging is an important first step in understanding the nature and severity of disease and provides guidance for determining the appropriate treatment plan for individual patients. The following graph and table display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group for Roswell Park prostate cancer patients.

AJCC Stage Group, Prostate Cancer
Stage at diagnosis for CY 2014-2015



[1] American Joint Commission on Cancer (AJCC) Stage I-IV Prostate Cancer

Survival Data
Five-Year Prostate Cancer Survival, Stages I, II, III, IV
Cases Diagnosed (2006-2013)



Time - Years from Diagnosis
Relative Survival Compares the Actual Observed Survival with the Expected Survival of Persons Unaffected by Cancer

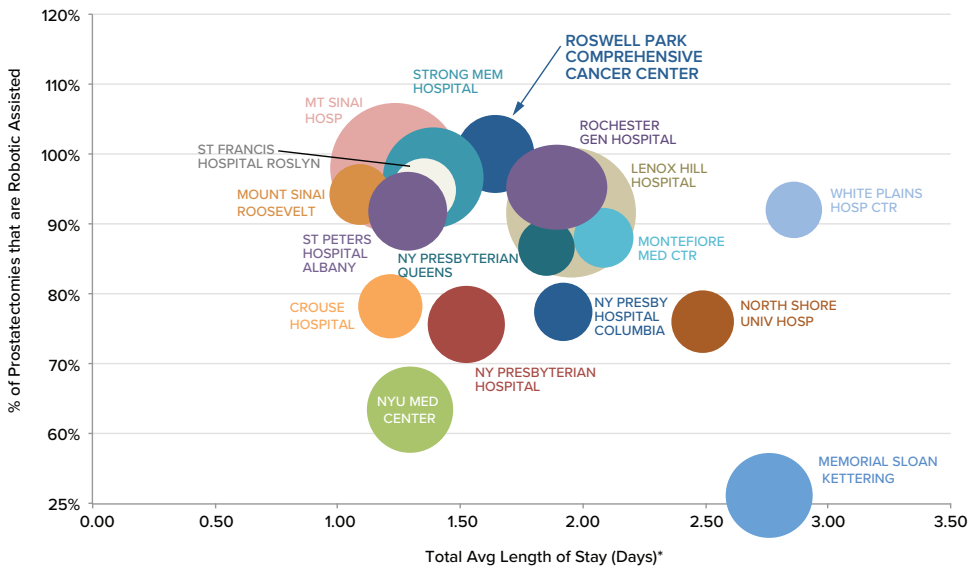
ROSWELL — Stage I — Stage II* — Stage III* — Stage IV
SEER — Stage I — Stage II* — Stage III* — Stage IV

*Survival for this Stage is 100%, the same as Roswell Park Stage I.

Roswell Park 5-Year Relative Survival for Prostate Cancer						
	Source	1	2	3	4	5
N=226	Roswell Park Stage I	100%	100%	100%	100%	100%
N=775	Roswell Park Stage II	100%	100%	100%	100%	100%
N=295	Roswell Park Stage III	100%	100%	100%	100%	100%
N=144	Roswell Park Stage IV	95%	85%	72%	68%	64%

[1] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 28, 2017
[2] SEER and Roswell Park data are matched based on age, sex, and race but are not risk adjusted for comorbidities.

Radical Prostatectomies in NYS (Robotic vs Non-Robotic)



NYS Hospitals with 75+ Prostatectomies in CY2015 (Prostatectomy equals Principal or Secondary procedure)	Number of Robot-Assisted Prostatectomies	Number of Non-Robot-Assisted Prostatectomies	Total Prostatectomies	% of Prostatectomies that are robot-assisted	Total ALOS*	Robotic ALOS*	Non-Robotic ALOS*	# of Patients excluded*
Roswell Park Comprehensive Cancer Center	**143**	**0**	**143**	**100%**	**1.65**	**1.65**	**N/A**	**2**
Mount Sinai Hospital	389	8	397	98%	1.24	1.21	2.67	3
Strong Memorial Hospital	230	8	238	97%	1.39	1.35	2.71	2
Rochester General Hospital	168	9	177	95%	1.87	1.84	2.44	3
St Francis Hospital Roslyn	91	5	96	95%	1.35	1.37	1.00	3
Mount Sinai Roosevelt	82	5	87	94%	1.09	1.06	1.60	0
White Plains Hospital Center	69	6	75	92%	2.86	2.79	3.80	2
St Peters Hospital Albany	134	12	146	92%	1.29	1.12	4.00	6
Lenox Hill Hospital	363	33	396	92%	1.95	1.92	2.32	2
Montefiore Medical Center	74	10	84	88%	2.09	2.08	2.13	3
New York-Presbyterian/Queens	65	10	75	87%	1.85	1.78	2.33	1
Crouse Hospital	76	21	97	78%	1.22	1.13	1.59	4
New York Presbyterian Hospital - Columbia	62	18	80	78%	1.92	1.57	3.43	5
North Shore Univ Hosp	70	22	92	76%	2.49	2.29	3.22	6
Ny Presbyterian Hosp	106	34	140	76%	1.53	1.42	1.85	5
Nyu Medical Center	111	64	175	63%	1.30	1.27	1.34	0
Memorial Sloan Kettering	48	146	194	25%	2.81	1.74	3.19	17
93 Hospitals with Less Than 75 Prostatectomies	832	433	1265	66%	2.18	1.84	2.88	43
Total	**3,113**	**844**	**3957**	**79%**	**1.85**	**1.64**	**2.71**	**107**

Patients with a LOS of 11+ days were excluded from the analysis
Note: Total procedures, not filtered by cancer diagnosis

NYS SPARCS Data CY2015 – Radical Prostatectomies

Khurshid Guru, MD

INNOVATION & RESEARCH

Robot-Assisted Procedures

At Roswell Park, 100% of prostatectomies are performed via robot-assisted procedures.

Comprehensive training and skill development among urological surgeons is necessary to optimize surgical outcomes and patient safety. Our physicians and researchers developed and validated an assessment tool to evaluate the performance of urological surgeons.

Development and Validation of an Objective Scoring Tool for Robot-Assisted Radical Prostatectomy:

PROSTATECTOMY ASSESSMENT AND COMPETENCY EVALUATION (PACE)

Intraoperative Measures			
		CY 2014	CY 2015
	N	102	136
Operative Time (minutes)	Median	231	219
Estimated Blood Loss (mL)	Median	150	150
Length of Stay (days)	Median	1	1
Conversions from Robot-Assisted to Open	N	0	0
Positive Surgical Margins		22%	21%
Positive Pelvic Lymph Nodes		4%	4%

QUALITY OF LIFE OUTCOMES

Outcomes Measures		
	CY 2014	CY 2015
	102	136
Social Incontinence @12 months	14%	10%
Urinary Incontinence Requiring Procedural Intervention	1%	1%
Biochemical Recurrence or Persistent Disease @12 months	17%	11%
Radiation Treatment after Radical Prostatectomy	16%	6%

Complications: Clavien Grade		
	CY 2014	CY 2015
Clavien Grade	(N=102)	(N=136)
3-4	1%	11%
5	0	0

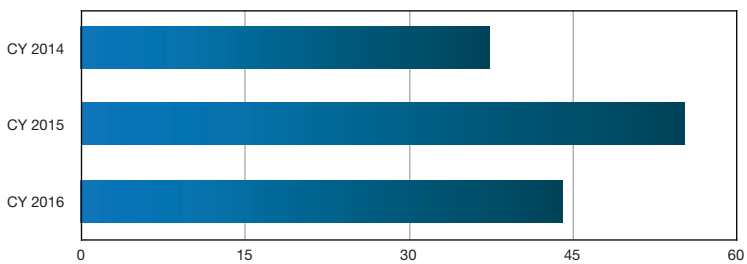
*Each patient may have more than one type of complication category

[1] Hussein AA, Ghani KR, Peabody J, Sarle R, Abaza R, Eun D, Hu J, Fumo M, Lane B, Montgomery J, Hinata N, Rooney D, Comstock B, Chan HK, Mane SS, Mohler JL, Wilding G, Miller D, Guru KA, for the Michigan Urological Surgery Improvement Collaborative and Applied Technology Laboratory for Advanced Surgery Program, Development and Validation of an Objective Scoring Tool for Robot-Assisted Radical Prostatectomy: Prostatectomy Assessment and Competency Evaluation (PACE), The Journal of Urology® (2016), doi: 10.1016/j.juro.2016.11.100.

Active Surveillance for Prostate Cancer

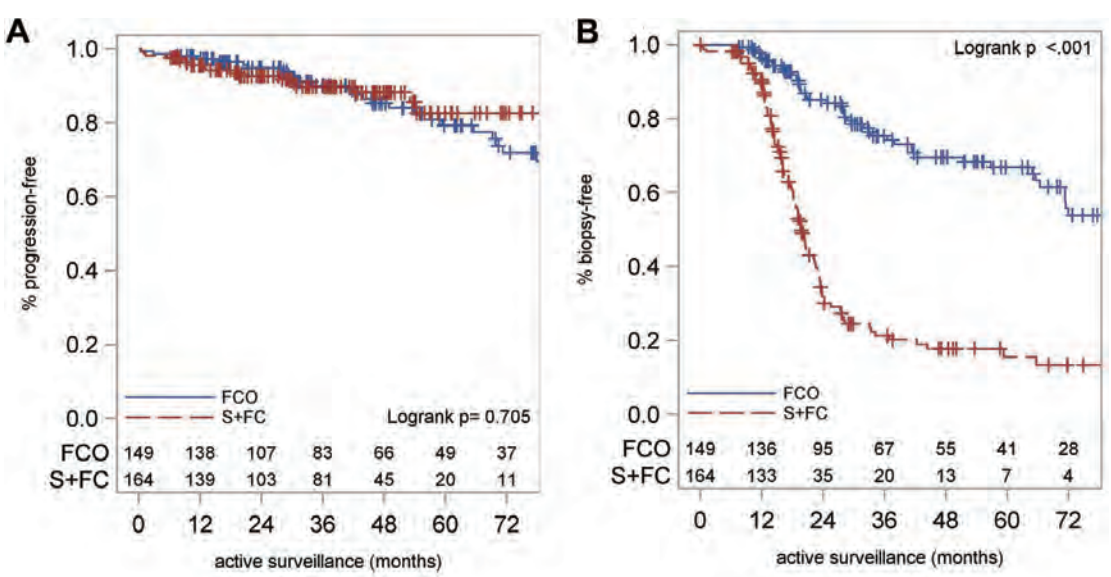
In most men with low risk prostate cancer, the best approach is to not treat the cancer right away. Instead, physicians monitor these men with regular checkups and blood tests, and proceed with treatment only if problems develop or the cancer demonstrates evidence of growth (PSA increases, nodule develops, Gleason grade increases). This approach, called "Active Surveillance," allows the many men who would never need treatment to avoid the significant side effects that can occur with surgery and radiation. Roswell Park physicians recommend active surveillance in appropriate circumstances, and a significant number of men choose this approach.

Roswell Park New Patients on Active Surveillance

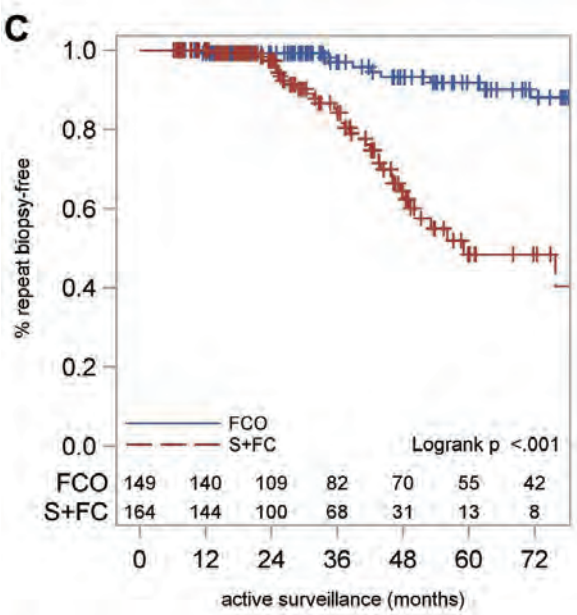


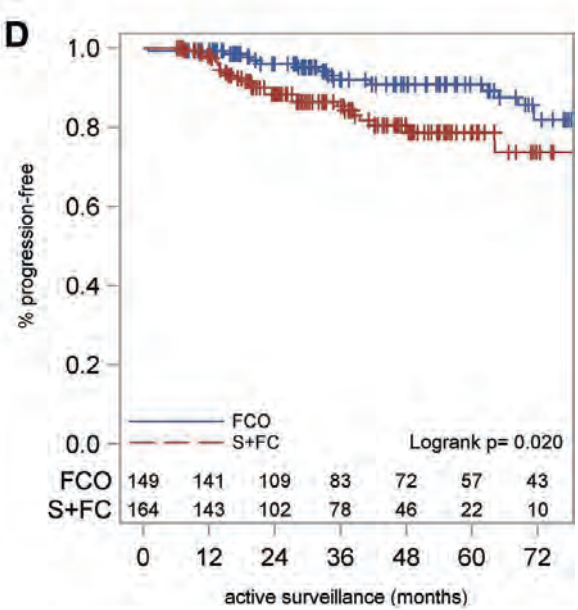
Studying Active Surveillance[1]

Standard active surveillance (AS) regimens for treating patients with low risk prostate cancer are lacking. Researchers at Roswell Park compared two standard biopsy regimens for AS patients treated at our center. Patients underwent either biopsy for-cause only (FCO) or for-cause as well as a scheduled annual or biannual surveillance biopsy (S+FC). This research demonstrated that restricting surveillance biopsies for AS patients decreased the biopsy burden and was associated with fewer treatment conversions.



[1] Al-Tartir T, Murekeyisoni C, Attwood K, Badkhshan S, Mehedint D, Safwat M, Guru K, Mohler JL, Kauffman EC. Outcomes of scheduled vs for-cause biopsy regimens for prostate cancer active surveillance. The Journal of Urology. 2016 Oct 31;196(4):1061-8.





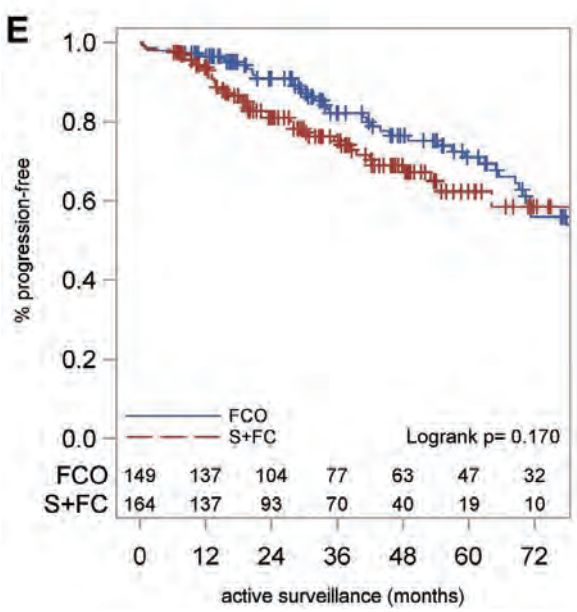


Table 1. Conversion from AS to treatment

	FCO	S+FC	p Value
No. pts	149	164	
No. conversion type (%):	**13 (9)**	**29 (18)**	**0.02**
Radical Prostatectomy	8 (62)	18 (62)	1.00
Radiation	3 (23)	9 (31)	0.72
Androgen deprivation therapy	2 (15)	2 (7)	0.58
No. treatment conversion reason (%):			
Pathological progression	6 (46)	19 (66)	0.31
Clinical progression only	2 (15)	3 (10)	0.63
Patient preference	5 (39)	7 (24)	0.46
No. prostatectomy pT stage (%):			
pT2	6 (75)	13(72)	1.00
pT3	2 (25)	4 (28)	
No. prostatectomy Gleason score (%):			
6	1 (13)	4 (23)	1.00
3+4	5 (63)	11 (67)	1.00
4+3	1 (13)	1 (6)	0.53
8+	1 (13)	1 (6)	0.53
No. prostatectomy any adverse pathology (%)*			
Median % gland prostatectomy CaP vol (IQR)	17 (7.5-53)	10 (5-10)	0.10 (0.48)

***Gleason primary pattern 4 or pT3.**

Figure 1. Kaplan-Meier survival curve comparisons of repeat biopsy and progression during AS in FCO and S+FC groups. A, freedom from clinical progression. B, freedom from repeat biopsy. C, freedom from 2 or more repeat biopsies. D, freedom from biopsy grade progression. E, freedom from NCCN risk progression.

[1] Al-Tartir T, Murekeyisoni C, Attwood K, Badkhshan S, Mehedint D, Safwat M, Guru K, Mohler JL, Kauffman EC. Outcomes of scheduled vs for-cause biopsy regimens for prostate cancer active surveillance. The Journal of Urology. 2016 Oct 31;196(4):1061-8.

NATIONAL QUALITY METRICS FOR UROLOGIC SURGICAL CARE AND PATIENT OUTCOMES

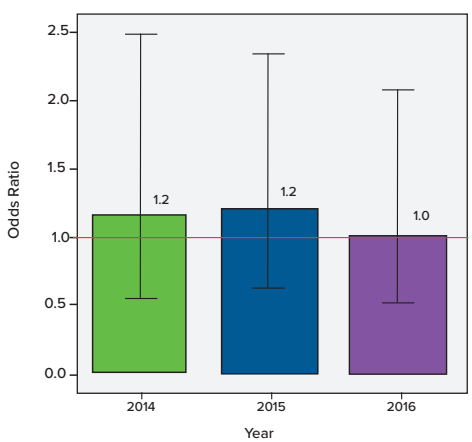
American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP)

NSQIP offers a Procedure Targeted option to allow participants to focus quality improvement efforts on high volume procedures. For prostate cancer the Procedure Targeted is **radical prostatectomy**. The following charts outline Roswell Park's performance on key quality metrics for this procedure. The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

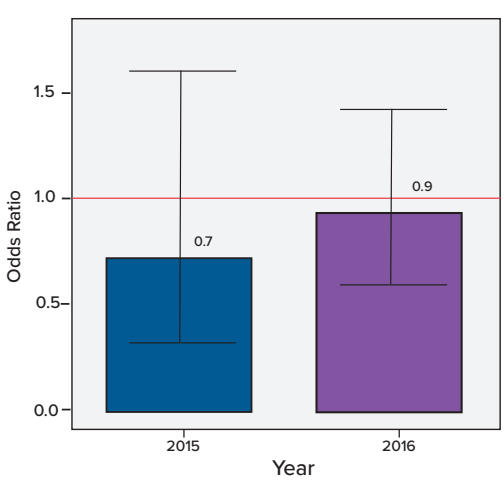
Morbidity

Time	Procedures	% Occurrence	% Expected
2014	98	4%	3%
2015	102	5%	3%
2016	154	4%	4%

Morbidity



Readmission



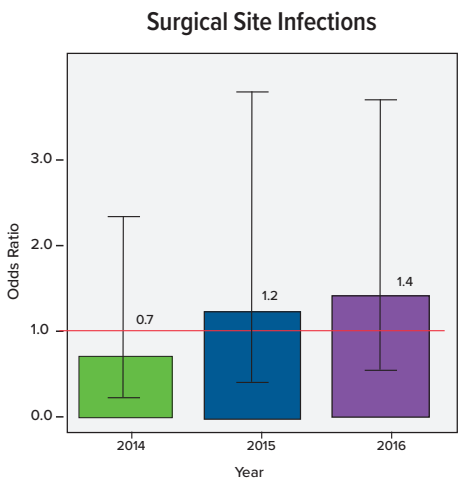
Readmission

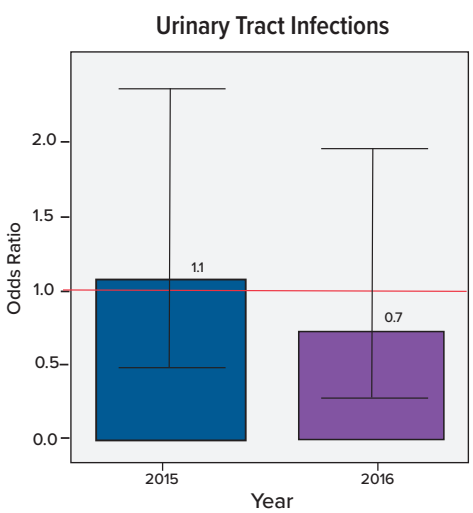
Time	Procedures	% Occurrence	% Expected
2015	102	1%	3%
2016	154	3%	4%

ACS NSQIP: RADICAL PROSTATECTOMY

Surgical Site Infections

Time	Procedures	% Occurrence	% Expected
2014	98	0%	1%
2015	102	3%	1%
2016	154	2%	1%





Urinary Tract Infections

Time	Procedures	% Occurrence	% Expected
2015	102	2%	2%
2016	154	1%	2%

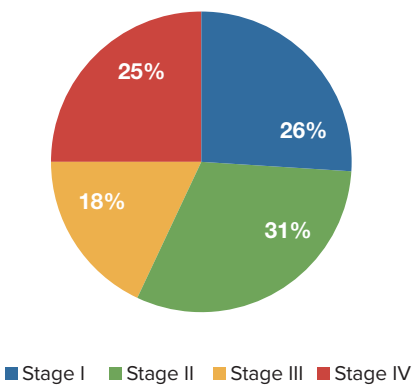
[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

BLADDER CANCER

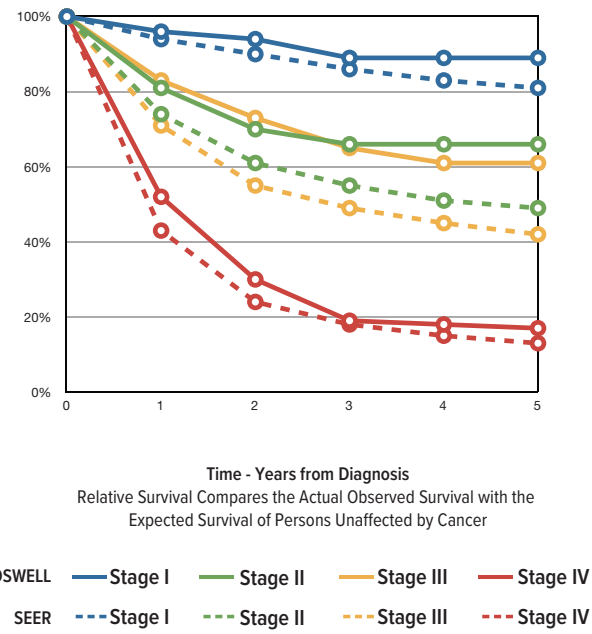
Our Patients

The following graph and table display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group for Roswell Park bladder cancer patients.

AJCC Stage Group, Bladder Cancer
Note: Stage at diagnosis for CY 2014-2015

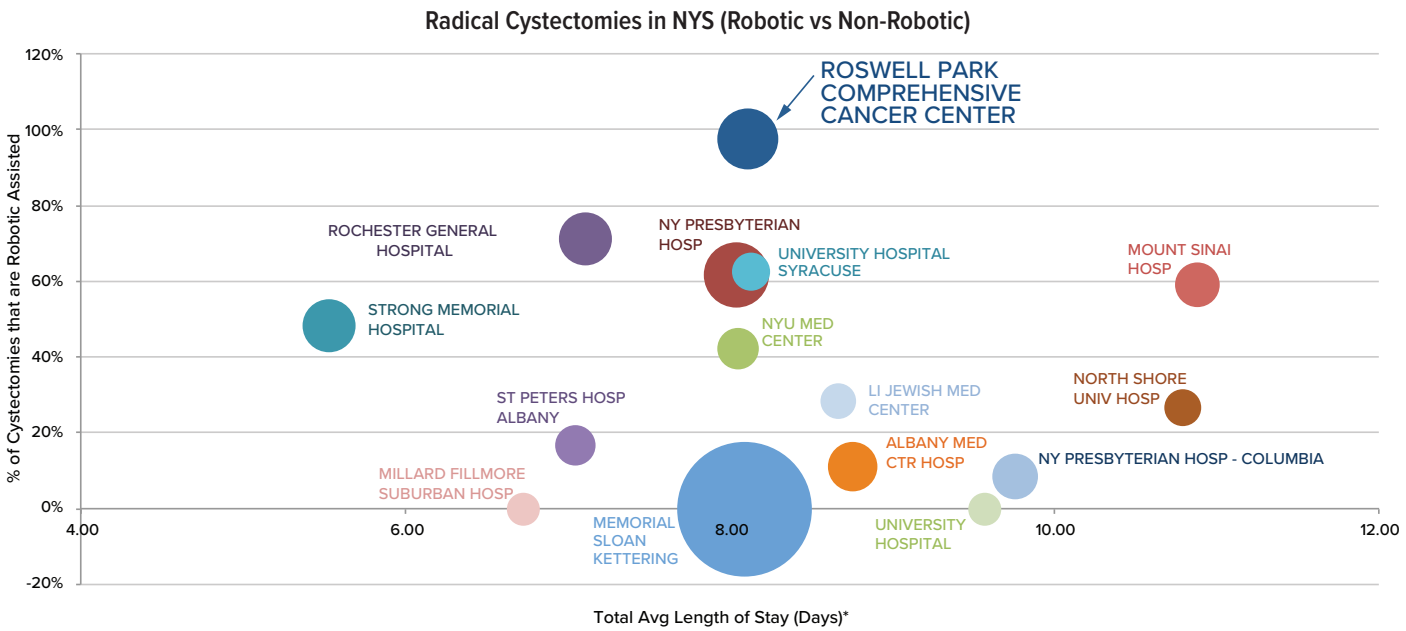


Survival Data
Five-Year Bladder Cancer Survival, Stages I, II, III, IV
Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival for Bladder Cancer						
	Source	1	2	3	4	5
N=135	Roswell Park Stage I	96%	94%	89%	89%	89%
N=108	Roswell Park Stage II	81%	70%	66%	66%	66%
N=63	Roswell Park Stage III	83%	73%	65%	61%	61%
N=110	Roswell Park Stage IV	52%	30%	19%	18%	17%

[1] American Joint Commission on Cancer (AJCC) Stage I-IV Bladder Cancer
[2] SEER and Roswell Park data are matched based on age, sex, and race but are not risk adjusted for comorbidities.
[3] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017



NYS Hospitals with 75+ Cystectomies in CY2015 (Cystectomy equals Principal or Secondary procedure)	Number of Robot-Assisted Cystectomies	Number of Non-Robot-Assisted Cystectomies	Total Cystectomies	% of Cystectomies that are robot-assisted	Total ALOS*	Robotic ALOS*	Non-Robotic ALOS*	# of Patients excluded*
Roswell Park Comprehensive Cancer Center	**40**	**1**	**41**	**98%**	**8.11**	**8.03**	**11.00**	**4**
Rochester General Hospital	22	9	31	71%	7.11	7.25	6.75	3
University Hospital Syracuse	10	6	16	63%	8.13	6.22	11.00	1
NY Presbyterian Hospital	29	18	47	62%	8.04	8.03	8.06	1
Mount Sinai Hospital	13	9	22	59%	10.88	9.58	10.42	3
Strong Memorial Hospital	15	16	31	48%	5.53	4.57	6.38	1
NYU Medical Center	8	11	19	42%	8.05	8.71	7.64	1
L I Jewish Medical Center	4	10	14	29%	8.67	7.25	9.38	2
North Shore Univ Hosp	4	11	15	27%	10.79	9.75	9.44	2
St Peters Hospital Albany	3	15	18	17%	7.05	12.00	6.07	0
Albany Medical Center Hospital	3	24	27	11%	8.76	8.67	8.77	2
NY Presbyterian Hospital - Columbia	2	21	23	9%	9.76	7.00	9.94	6
Memorial Sloan Kettering	0	200	200	0%	8.09	N/A	8.08	17
Millard Fillmore Suburban Hospital	0	12	12	0%	6.73	N/A	6.72	1
University Hospital	0	12	12	0%	9.57	N/A	9.57	5
41 Hospitals With Less Than 10 Cystectomies	35	116	151	23%	8.66	8.58	8.69	23
Total	**188**	**491**	**679**	**28%**	**8.17**	**7.90**	**8.28**	**72**

Patients with a LOS of 11+ days were excluded from the analysis
Note: Total procedures, not filtered by cancer diagnosis

NYS SPARCS Data CY2015 – Cystectomies

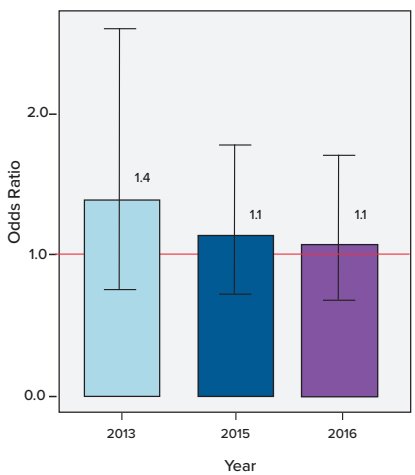
NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM

NSQIP offers a Procedure Targeted option to allow participants to focus quality improvement efforts on high volume procedures. One procedure targeted is **radical cystectomy**—most often used to treat bladder cancer. The following charts outline Roswell Park's performance on key quality metrics for this procedure.

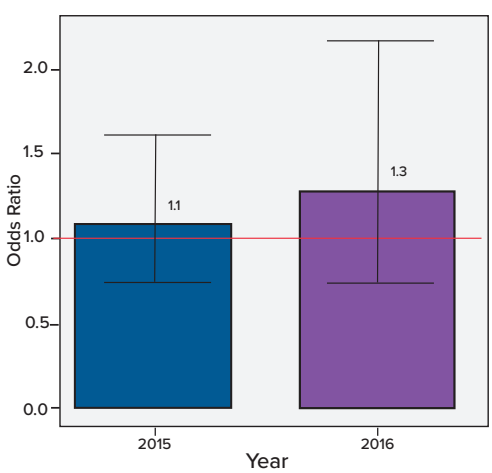
Morbidity

Time	Procedures	% Occurrence	% Expected
2013	29	41%	27%
2015	40	35%	25%
2016	37	27%	24%
*Note: No data available for 2014			

Morbidity



Readmission



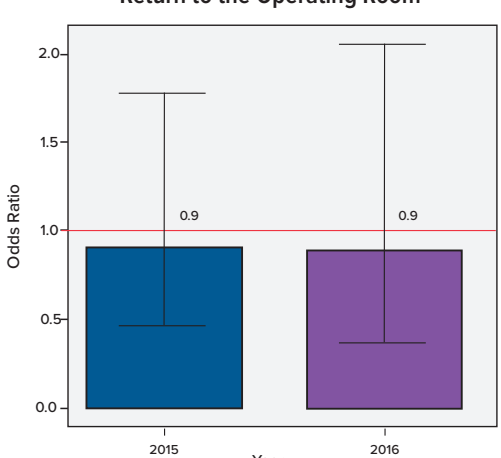
Readmission

Time	Procedures	% Occurrence	% Expected
2015	40	28%	20%
2016	37	30%	20%

Return to the Operating Room

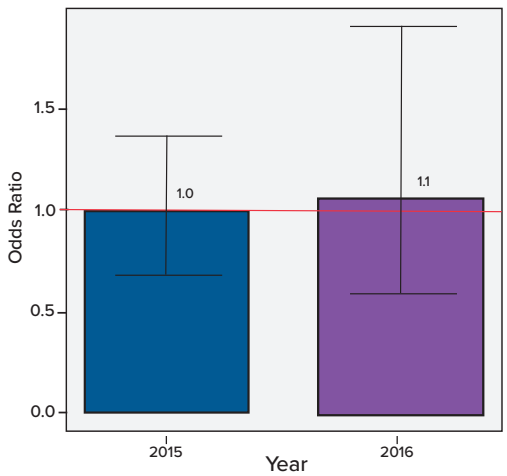
Time	Procedures	% Occurrence	% Expected
2015	40	3%	5%
2016	37	3%	5%

Return to the Operating Room



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

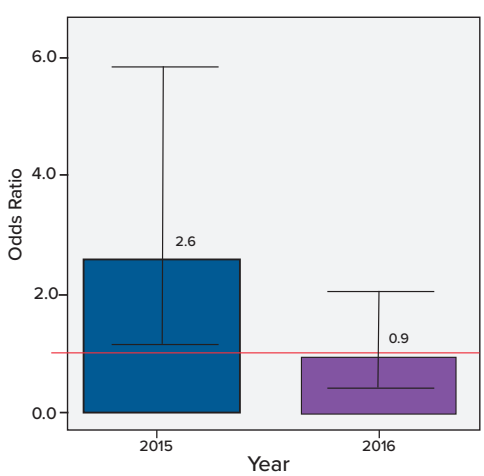
Sepsis



Surgical Site Infections

Time	Procedures	% Occurrence	% Expected
2014	49	16%	14%
2015	40	10%	10%
2016	37	11%	12%

Length of Stay

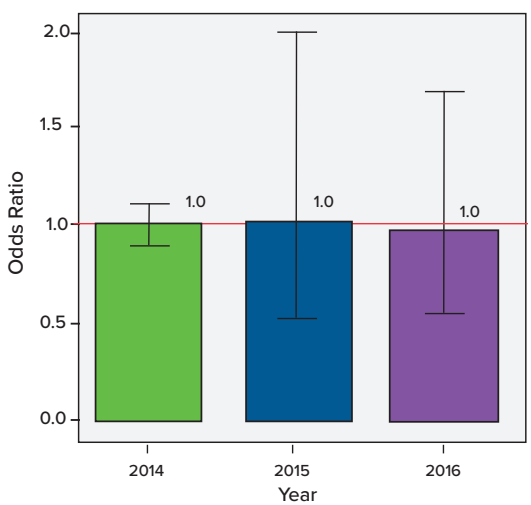


ACS NSQIP: RADICAL CYSTECTOMY

Sepsis

Time	Procedures	% Occurrence	% Expected
2015	40	8%	11%
2016	37	11%	9%

Surgical Site Infections



Length of Stay

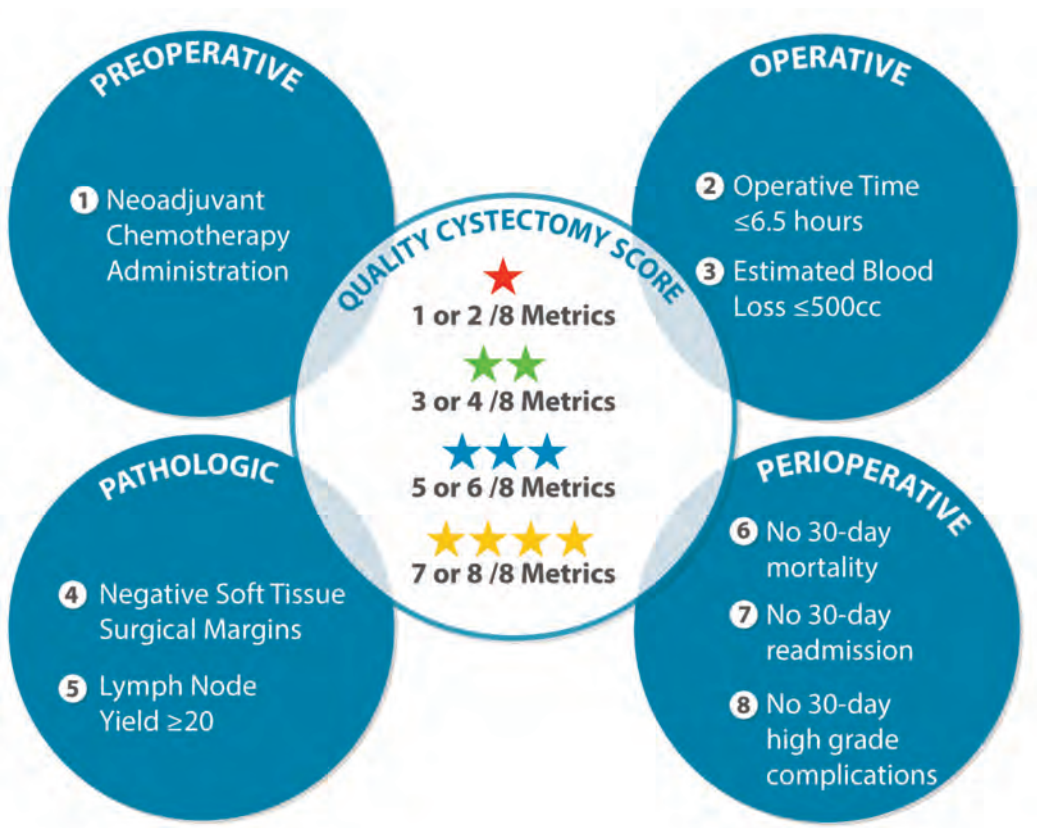
Time	Procedures	% Occurrence	% Expected
2015	24	42%	19%
2016	26	15%	17%

[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

[2] The ACS NSQIP defines a Length of Stay (LOS) event as a LOS greater than the 75th percentile LOS for that group of operations

Development and Validation of a Quality Assurance Score for Robot-assisted Radical Cystectomy: A 10-year Analysis[1]

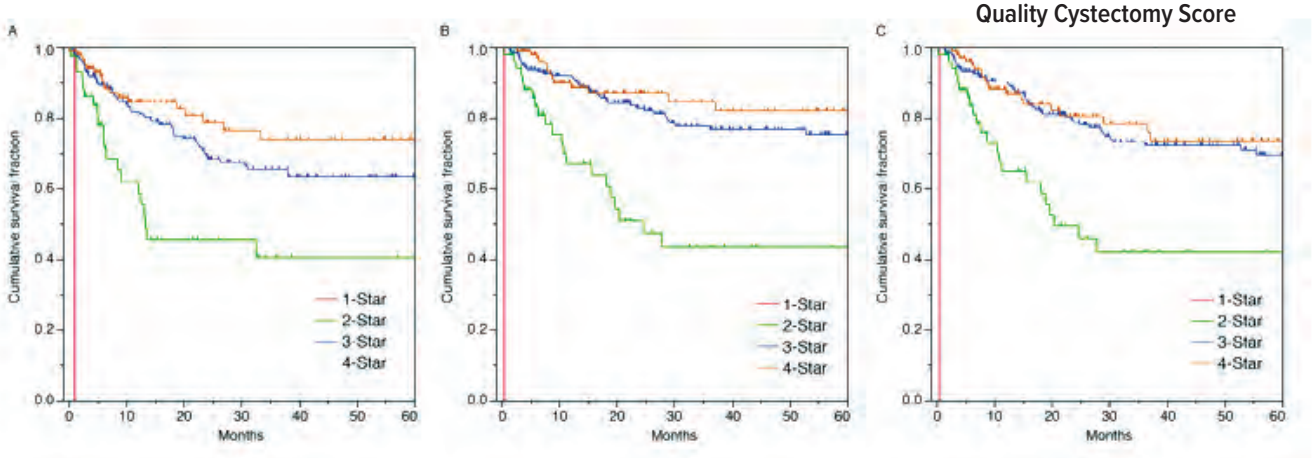
Radical cystectomy is a complex and highly morbid procedure with a 5-year survival rate of 50%-70%. The Quality Cystectomy Score (QCS) was developed to evaluate oncological outcomes (1 star: achieving ≤2 criteria or mortality within 30 days; 2 stars: 3 or 4 criteria met; 3 stars: 5 or 6 criteria met; and 4 stars: 7 or all criteria met). A prospectively maintained quality assurance database of 425 consecutive robot-assisted radical cystectomies performed at Roswell Park between 2005 and 2015 was reviewed retrospectively. High QCS was associated with better recurrence-free, cancer-specific and overall survival.



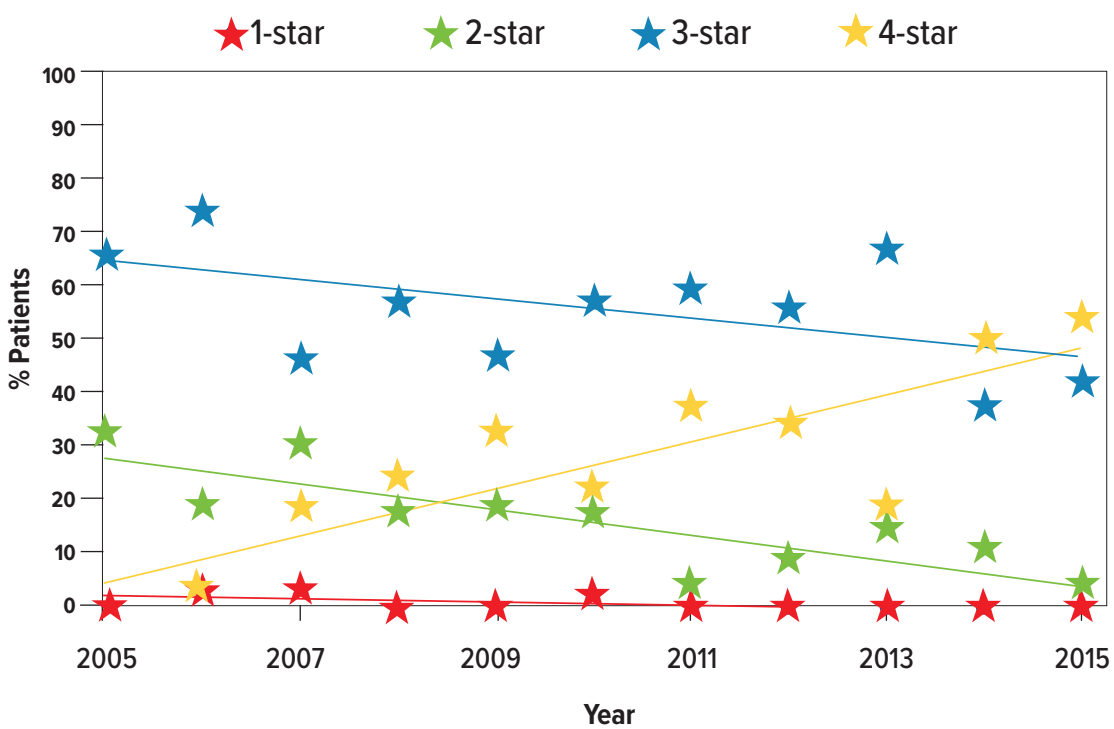
[1] Hussein AA, Dibaj S, Hinata N, Field E, O'leary K, Kuvshinoff B, Mohler JL, Wilding G, Guru KA. Development and validation of a quality assurance score for robot-assisted radical cystectomy: a 10-year analysis. Urology. 2016 Nov 30;97:124-9

Kaplan-Meier curves demonstrating:

(A) recurrence-free survival (B) disease-specific survival (C) overall survival based on Quality Cystectomy Score



Quality Cystectomy Scores for 425 patients who underwent robot-assisted radical cystectomy between 2005 and 2015



[1] Hussein AA, Dibaj S, Hinata N, Field E, O'leary K, Kuvshinoff B, Mohler JL, Wilding G, Guru KA. Development and validation of a quality assurance score for robot-assisted radical cystectomy: a 10-year analysis. Urology. 2016 Nov 30;97:124-9

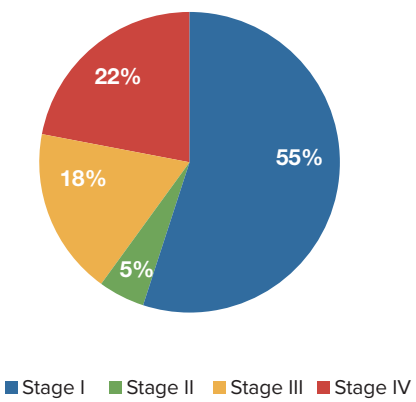
KIDNEY CANCER

Our Patients

The following graph and table display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group for Roswell Park kidney cancer patients.

AJCC Stage Group, Kidney Cancer

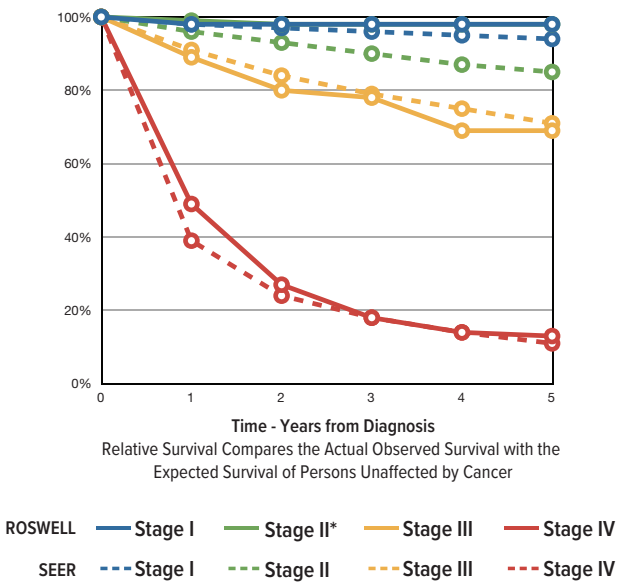
Note: Stage at diagnosis for CY 2014-2015



Survival Data

Five-Year Kidney and Renal Pelvis Cancer, Stages I, II, III, IV

Cases Diagnosed (2006-2013)



*Roswell Stage II is not visible because it is the same as Stage I.

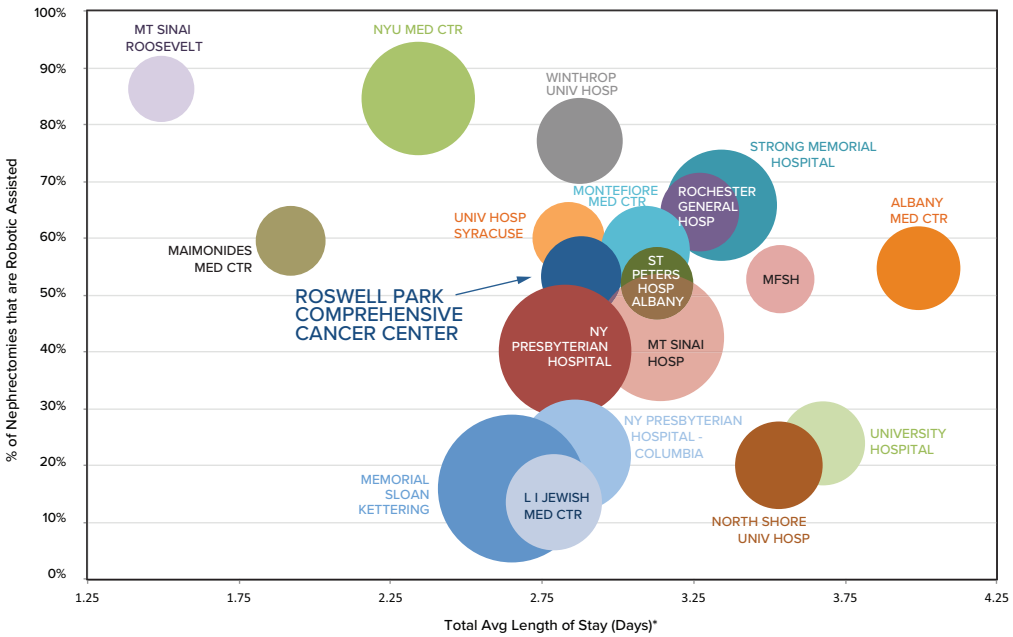
Roswell Park 5-Year Relative Survival for Kidney Cancer						
	Source	1	2	3	4	5
N=506	Roswell Park Stage I	98%	98%	98%	98%	98%
N=75	Roswell Park Stage II	99%	98%	98%	98%	98%
N=135	Roswell Park Stage III	89%	80%	78%	69%	69%
N=189	Roswell Park Stage IV	49%	27%	18%	14%	13%

[1] American Joint Commission on Cancer (AJCC) Stage I-IV Kidney Cancer

[2] SEER and Roswell Park data are matched based on age, sex, and race but are not risk adjusted for comorbidities.

[3] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017

Radical Nephrectomies in NYS (Robotic vs Non-Robotic)



NYS Hospitals with 75+ Nephrectomies in CY2015	# of Robot-Assisted Nephrectomies	# of Non-Robot-Assisted Nephrectomies	Total Nephrectomies	% of Nephrectomies that are robot-assisted	Total ALOS*	Robotic ALOS*	Non-Robotic ALOS*	# of Patients excluded*
Mount Sinai Roosevelt	69	11	80	86%	1.49	1.26	2.91	1
NYU Medical Center	199	36	235	85%	2.34	2.24	2.94	4
Winthrop University Hospital	104	31	135	77%	2.87	2.77	3.27	8
Strong Memorial Hospital	149	77	226	66%	3.34	2.80	4.53	15
Rochester General Hospital	73	40	113	65%	3.27	2.86	4.08	6
University Hospital Syracuse	57	38	95	60%	2.84	2.59	3.25	1
Maimonides Medical Center	53	36	89	60%	1.92	1.77	2.14	9
Montefiore Medical Center	84	61	145	58%	3.09	3.07	3.12	10
Albany Medical Center	70	58	128	55%	3.99	3.48	4.62	1
Roswell Park Comprehensive Cancer Center	**63**	**55**	**118**	**53%**	**2.88**	**2.21**	**3.67**	**13**
Millard Fillmore Suburban Hospital	45	40	85	53%	3.54	3.19	3.92	3
St Peters Hospital Albany	50	46	96	52%	3.13	2.67	3.64	3
Mount Sinai Hospital	126	170	296	43%	3.14	2.68	3.52	25
NY Presbyterian Hospital	129	192	321	40%	2.83	2.59	3.00	17
University Hospital	31	98	129	24%	3.68	2.83	3.97	14
NY Presbyterian Hosp - Columbia Presbyterian Cntr	50	180	230	22%	2.86	2.17	3.06	17
North Shore Univ Hosp	28	112	140	20%	3.53	3.33	3.59	14
Memorial Sloan Kettering	64	335	399	16%	2.65	2.41	2.70	19
L I Jewish Medical Center	23	146	169	14%	2.79	2.91	2.77	8
93 Hosp with less than 75 Nephrectomies (Partial/Radical)	*606*	*996*	*1,602*	*38%*	*3.49*	*3.00*	*3.81*	*156*
Total	**2,073**	**2,758**	**4,831**	**43%**	**3.11**	**2.7**	**3.45**	**344**

*Patients with a LOS of 11+ days were excluded from the analysis

NYS SPARCS Data CY2015 – Nephrectomies

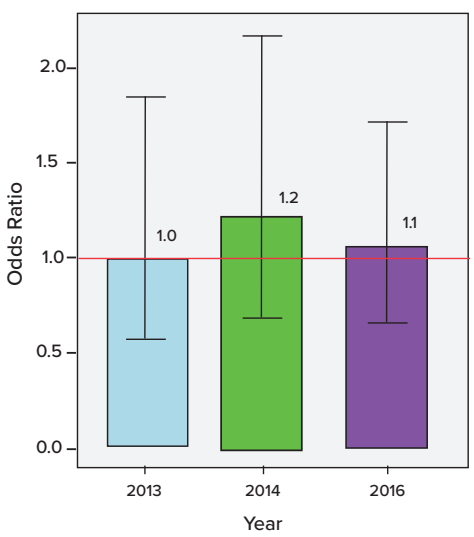
NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM

NSQIP offers a Procedure Targeted option to allow participants to focus quality improvement efforts on high volume procedures, such as **partial and radical nephrectomy**. The following charts outline Roswell Park's performance on key quality metrics for this procedure.

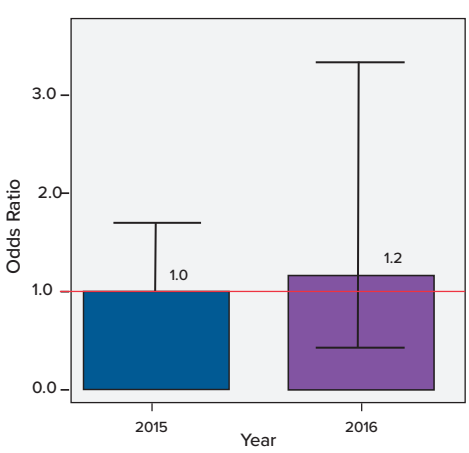
Morbidity[2]

Time	Procedures	% Occurrence	% Expected
2013	119	6%	6%
2014	97	9%	7%
2016	108	7%	6%

Morbidity[2]



Pneumonia



Pneumonia

Time	Procedures	% Occurrence	% Expected
2015	92	1%	1%
2016	108	2%	1%

[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

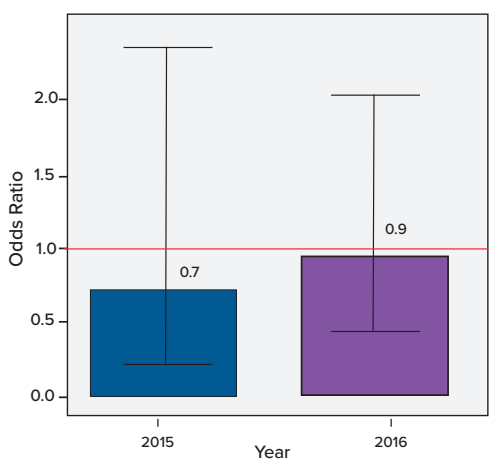
[2] Data not available for 2015 reporting period for this measure

ACS NSQIP: PARTIAL AND RADICAL NEPHRECTOMY

Readmission

Time	Procedures	% Occurrence	% Expected
2015	92	3%	6%
2016	108	7%	6%

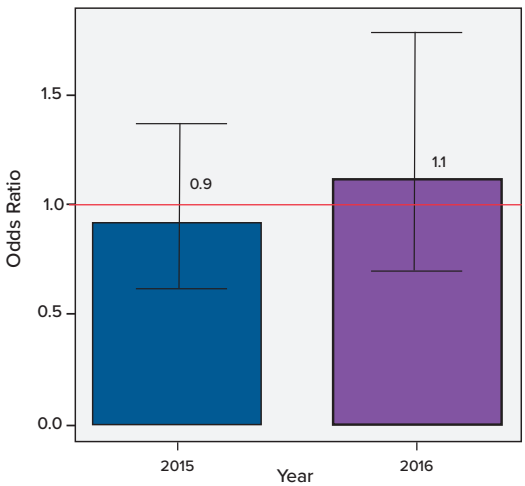
Renal Failure



Return to the Operating Room

Time	Procedures	% Occurrence	% Expected
2015	92	1%	2%
2016	108	2%	2%

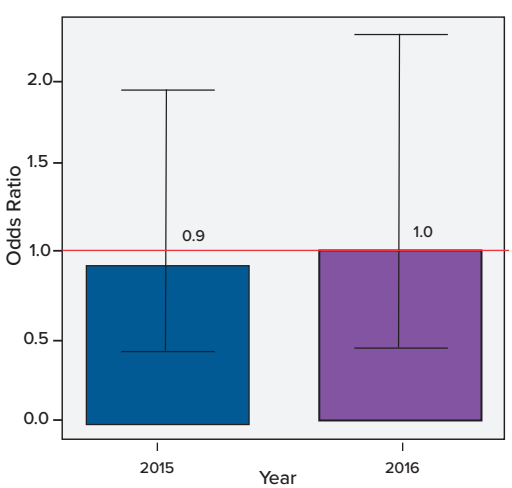
Readmission



Renal Failure

Time	Procedures	% Occurrence	% Expected
2015	92	0%	1%
2016	108	1%	1%

Return to the Operating Room

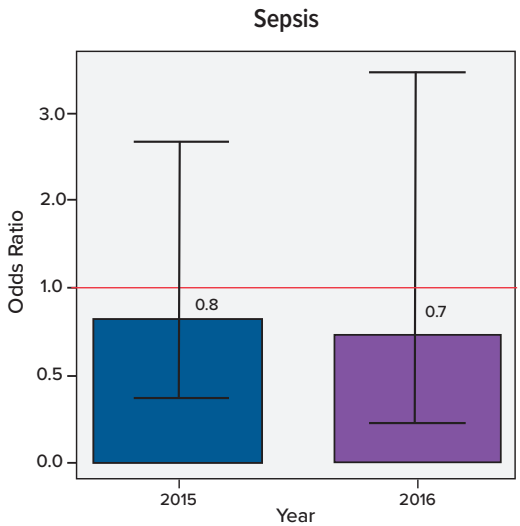


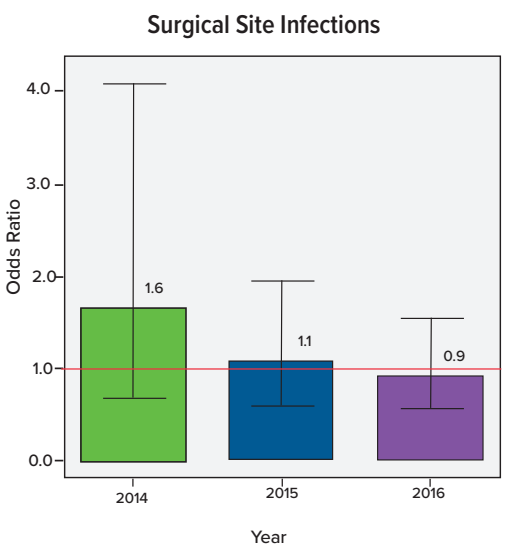
[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

ACS NSQIP: PARTIAL AND RADICAL NEPHRECTOMY

Sepsis

Time	Procedures	% Occurrence	% Expected
2015	92	0%	1%
2016	108	0%	1%





Surgical Site Infections

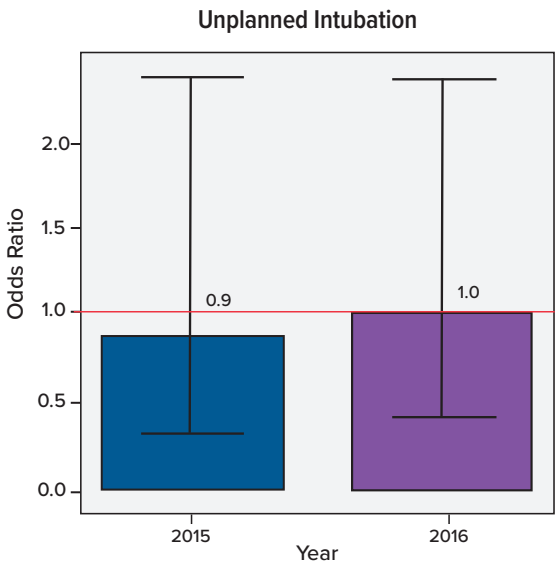
Time	Procedures	% Occurrence	% Expected
2014	96	5%	2%
2015	92	3%	2%
2016	108	1%	2%

[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

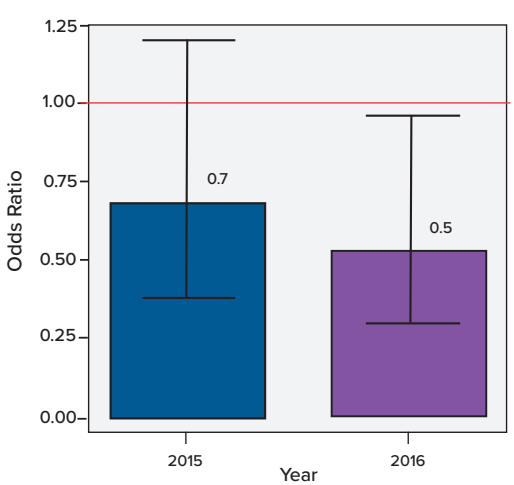
ACS NSQIP: PARTIAL AND RADICAL NEPHRECTOMY

Unplanned Intubation

Time	Procedures	% Occurrence	% Expected
2015	92	0%	1%
2016	108	1%	1%



Length of Stay



Length of Stay

Time	Procedures	% Occurrence	% Expected
2015	85	14%	20%
2016	98	11%	20%

[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

MINIMALLY INVASIVE PROCEDURES FOR NEPHRECTOMY[1]

Nephrectomies have been performed traditionally using an open approach. Our surgical team at Roswell Park recently published their outcomes for patients who underwent a minimally invasive nephrectomy. Minimally invasive nephrectomy is a safe approach with similar oncologic outcomes to an open approach.

Table 1. Post-operative Outcomes

	Open	MIS	Overall	p
Overall, *N*	**105 (61.0)**	**67 (39.0)**	**172 (100%)**	
LVI—Present, *n (%)*	82 (88.2)	40 (64.5)	122 (78.7)	<0.001
Extracapsular—Present, *n (%)*t	71 (76.3)	41 (62.1)	122 (70.4)	0.077
Margins, *n (%)*				
Negative	76 (76.8)	58 (87.9)	134 (81.2)	0.103
Positive	23 (23.2)	8 (12.1)	31 (18.8)	
Adrenal involvement, *n (%)*				
Negative	56 (82.4)	37 (90.2)	93 (85.3)	0.403
Positive	12 (17.6)	4 (9.8)	16 (14.7)	
Serum Cr (3-6 months)				
Mean	1.48	1.52	1.49	0.871
Median	1.41	1.38	1.40	
Nodal Status—Positive, *n (%)*	**18 (17.5)**	**13 (19.4)**	**31 (18.2)**	**0.840**
Pathologic stage, *n (%)*				
T3a	73 (69.5)	53 (79.1)	126 (73.3)	0.416
T3b/c	24 (22.9)	10 (14.9)	34 (19.8)	
T4	8 (7.6)	4 (6.0)	12 (7.0)	

LVI = lymphomavascular invasion

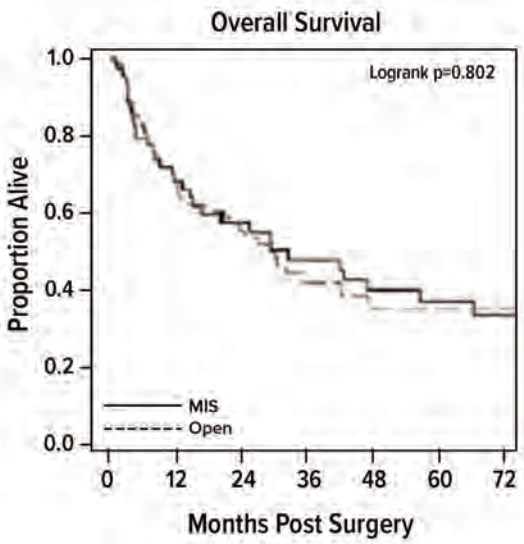
Table 2. Survival

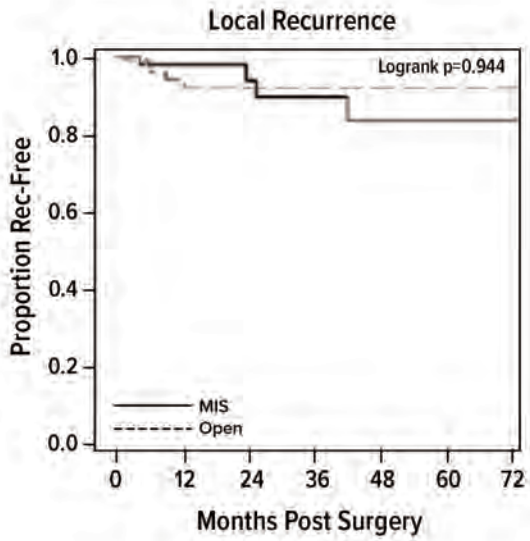
	3-year rate (95% CI)	5-year rate (95% CI)	Median (95% CI)	Median follow-up (range)
Total	0.68 (0.59–0.75)	0.45 (0.35-0.53)	30.0 (20.5-42.4)	32.8 (0.0-138.0)
MIS	0.68 (0.54-0.78)	0.48 (0.33-0.61)	32.2 (14.6-66.5)	48.2 (0.0-93.8)
Open	0.68 (0.57-0.77)	0.42 (0.29-0.54)	28.4 (17.1-46.9)	30.1 (0.1-138.0)

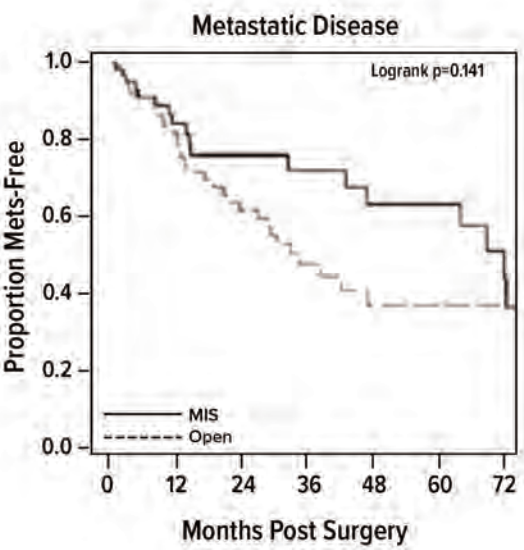
CI = confidence interval

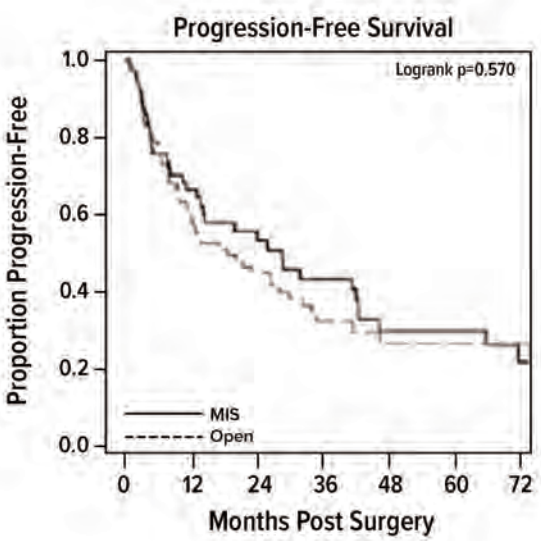
[1] Bragayrac LA, Abbotoy D, Attwood K, Darwiche F, Hoffmeyer J, Kauffman EC, Schwaab T. Outcomes of Minimal Invasive vs Open Radical Nephrectomy for the Treatment of Locally Advanced Renal-Cell Carcinoma. Journal of Endourology. 2016 Aug 1;30(8):871-6.

OVERALL SURVIVAL, RECURRENCE-FREE SURVIVAL, METASTATIC-FREE SURVIVAL AND PROGRESSION-FREE SURVIVAL.









[1] Bragayrac LA, Abbotoy D, Attwood K, Darwiche F, Hoffmeyer J, Kauffman EC, Schwaab T. Outcomes of Minimal Invasive vs Open Radical Nephrectomy for the Treatment of Locally Advanced Renal-Cell Carcinoma. Journal of Endourology. 2016 Aug 1;30(8):871-6.

OVERALL UROLOGIC SURGICAL CARE

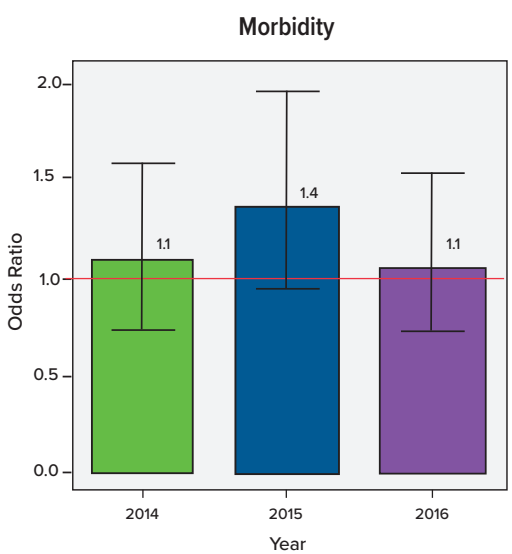
NATIONAL QUALITY METRICS AND PATIENT OUTCOMES

Roswell Park uses the **American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP)** to measure, monitor, and improve surgical care and patient outcomes. This program is designed to identify complications during and following surgery and provide a comparison of the hospital's rates to the national average. It also helps identify complications deemed preventable including morbidity, surgical site infections, urinary tract infections, and readmissions to the operating room.

The following graphs and tables represent the likelihood (as indicated by the odd's ratio) of an event occurring at Roswell Park compared with the national average. The error bars represent the 95% confidence interval. If the confidence interval crosses an Odds Ratio of 1, performance is on par with the national average. Roswell Park's performance on these measures from 2014-2016 are presented below:

Morbidity

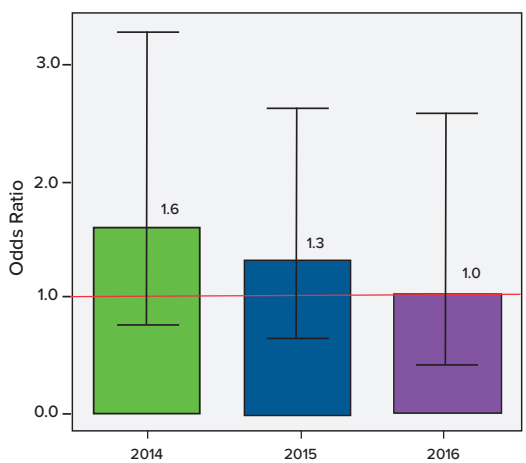
Time	Procedures	% Occurrence	% Expected
2014	260	10%	10%
2015	249	12%	8%
2016	319	8%	7%



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

ACS NSQIP: UROLOGIC SURGICAL CARE

Pneumonia



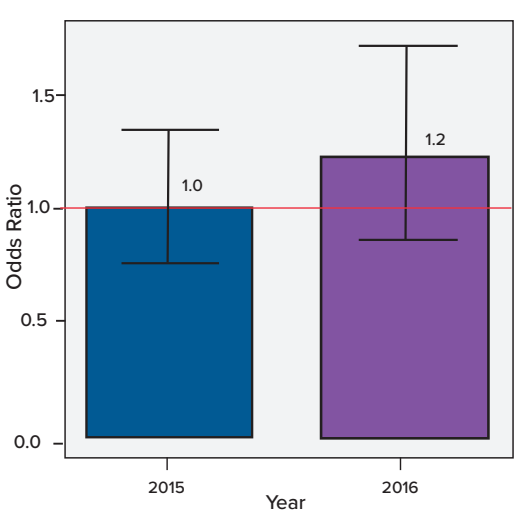
Pneumonia

Time	Procedures	% Occurrence	% Expected
2014	260	3%	1%
2015	249	2%	1%
2016	319	1%	1%

Readmission

Time	Procedures	% Occurrence	% Expected
2015	249	6%	6%
2016	319	8%	6%

Readmission



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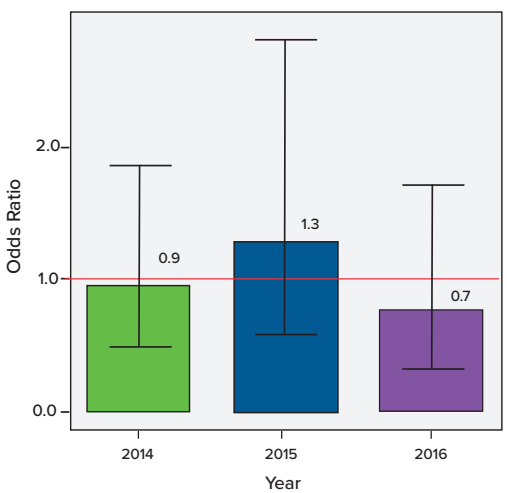
ACS NSQIP: UROLOGIC SURGICAL CARE

Renal Failure



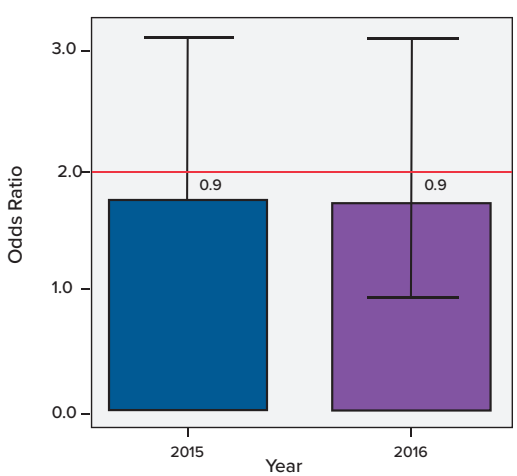
Renal Failure

Time	Procedures	% Occurrence	% Expected
2014	260	1%	1%
2015	249	2%	1%
2016	319	0%	1%

Return to the Operating Room

Time	Procedures	% Occurrence	% Expected
2015	249	1%	2%
2016	319	1%	2%

Return to the Operating Room



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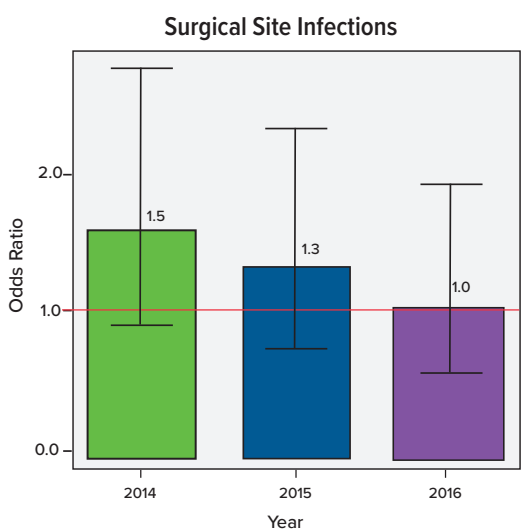
Thomas Schwaab, MD, PhD

ACS NSQIP: UROLOGIC SURGICAL CARE



Surgical Site Infections

Time	Procedures	% Occurrence	% Expected
2014	259	5%	3%
2015	249	4%	3%
2016	319	3%	2%

[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

GYNECOLOGY

The multidisciplinary team of Roswell Park's Gynecologic Oncology Center specializes in the care and management of diseases of the female reproductive system, including primary peritoneal cancer and cancer of the ovary, fallopian tube, uterus, endometrium, cervix, vulva and vagina, trophoblastic disease, pre-cancer lesions, and complex gynecologic conditions.

Roswell Park is the largest and most comprehensive gynecologic cancer care provider in Western New York.
We bring our team to the community through various outside clinics, surgical assistance and consultations to community OB/GYNs, frequent participation in fundraising events, and educational sessions offered to our patients and our community colleagues. Our center offers second opinions and enrollment in novel clinical trials to all patients nationally and internationally.

Our Volume

Roswell Park's Gynecologic Oncology team evaluates and treats approximately 950 new patients and manages over 10,000 outpatient office visits annually.

Our Approach

Our team includes five board-certified gynecologic oncologists who work closely with our pathologists and medical and radiation oncologists who specialize in gynecologic malignancies. Highlights of our expertise include:

- High-volume experience in ovarian, uterine, cervical and complex gynecological cancer surgery, which includes laparoscopic and robot-assisted approaches for the majority of our patients
- Molecular Testing and Personalized Medicine for targeted treatment of gynecologic cancers
- Center for Immunotherapy, which specializes in delivering novel immunotherapy approaches to patients with gynecologic malignancies, www.roswellpark.org/immunotherapy
- Clinical trials, including novel vaccines, targeted agents, and personalized therapeutics for patients with ovarian, uterine or cervical cancer
- High-risk Ovarian Cancer Clinic provides risk assessment, genetic counseling, screening, and risk reduction options for women at high risk
- Treatment options unavailable elsewhere such as photodynamic therapy (PDT) and intraperitoneal chemotherapy
- Specialized programs and services such as Oncofertility, Plastic & Reconstructive Surgery, Psychosocial Oncology, and Survivorship & Supportive Care

ACTIVE GYNECOLOGICAL CLINICAL TRIALS

	2015	2016
Cervical	1	1
Uterine	0	1
Various GYN sites	5	7
Total	**6**	**9**

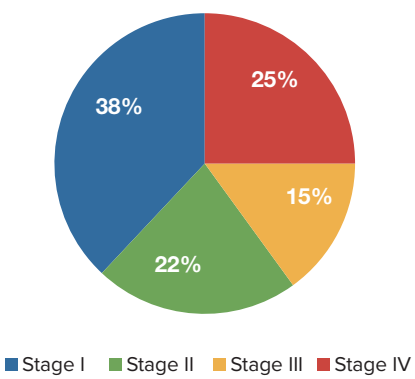
Please find the most up to date list of clinical trials at: www.RoswellPark.org/Clinical-Trials

CERVICAL CANCER

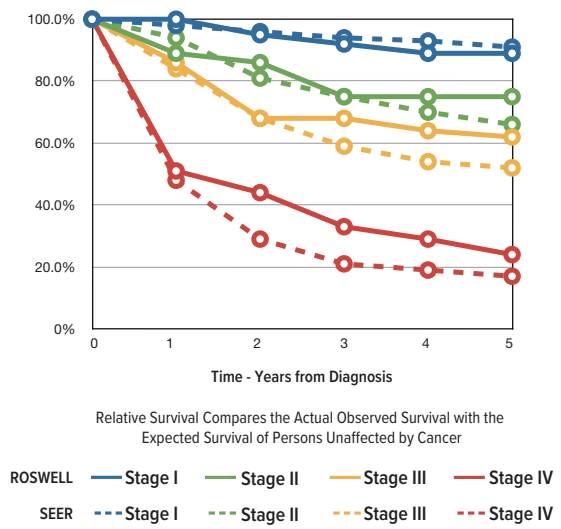
Our Patients

Cancer staging is an important first step in understanding the nature and severity of disease and provides guidance for determining the appropriate treatment plan for individual patients. The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group.

AJCC Stage Group, Cervical Cancer
Note: Stage at diagnosis for CY 2014-2015



Survival Data
Five-Year Cervical Cancer, Stages I, II, III, IV
Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival for Cervical Cancer						
	Source	1	2	3	4	5
N=104	Roswell Park Stage I	100%	95%	92%	89%	89%
N=32	Roswell Park Stage II	89%	86%	75%	75%	75%
N=55	Roswell Park Stage III	86%	68%	68%	64%	62%
N=28	Roswell Park Stage IV	51%	44%	33%	29%	24%

[1] The International Federation of Obstetricians and Gynecologists (FIGO) staging rules are incorporated into the AJCC staging system
[2] American Joint Commission on Cancer (AJCC) Stage I-IV Cervical Cancer
[3] SEER and Roswell Park data are matched for age, sex, and race but are not risk adjusted for comorbidities.
[4] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017.

Commission on Cancer of American College of Surgeons

Roswell Park's accreditation by the Commission on Cancer (CoC) of American College of Surgeons requires benchmarking treatment against national quality standards. The quality measures and Roswell Park's performance on these measures for Cervical Cancer are shown in the tables below. The CoC and other accrediting bodies do not expect, for many reasons (e.g., patient preference, medical contraindications), that compliance will reach 100%.

Roswell Park staff review every case where care is non-compliant with measures to ensure that the reason for non-compliance is recorded and appropriate.

Use of brachytherapy in patients treated with primary radiation with curative intent in any stage of cervical cancer (Surveillance)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	86%	85%	75%	73%	79%
Performance Rate Numerator / Denominator	6/7	11/13	6/8	8/11	31/39

Chemotherapy administered to cervical cancer patients who received radiation for stages IB2-IV cancer (Group 1) or with positive pelvic nodes, positive surgical margin, and/or positive parametrium (Group 2) (Surveillance)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	86%	100%	82%	100%	94%
Performance Rate Numerator / Denominator	6/7	16/16	9/11	16/16	47/50

Radiation therapy completed within 60 days of initiation of radiation among women diagnosed with any stage of cervical cancer (Surveillance)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	100%	83%	100%	93%	95%
Performance Rate Numerator / Denominator	5/5	5/6	12/12	13/14	35/37

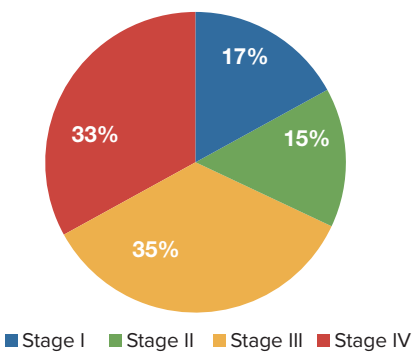
OVARIAN CANCER

Our Patients

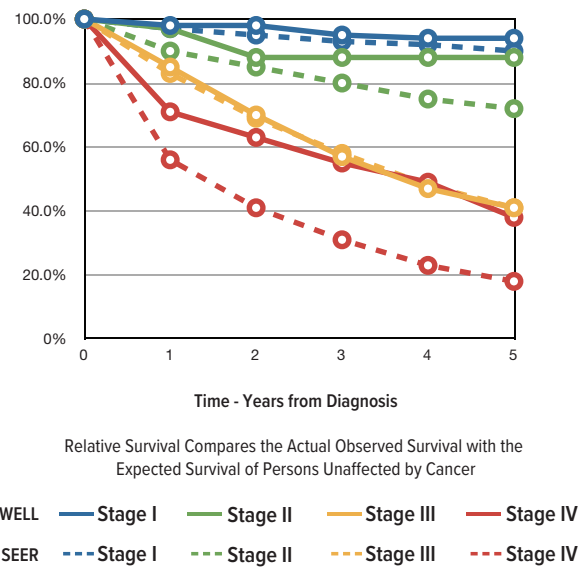
The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group.

AJCC Stage Group, Ovarian Cancer

Note: Stage at diagnosis for CY 2014-2015



Survival Data
Five-Year Ovarian Cancer, Stages I, II, III, IV
Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival for Ovarian Cancer						
	Source	1	2	3	4	5
N=117	Roswell Park Stage I	98%	98%	95%	94%	94%
N=45	Roswell Park Stage II	97%	88%	88%	88%	88%
N=179	Roswell Park Stage III	85%	70%	57%	47%	41%
N=102	Roswell Park Stage IV	71%	63%	55%	49%	38%

Commission on Cancer of American College of Surgeons

Salpingo-oophorectomy with omentectomy, debulking/cytoreductive surgery, or pelvic exenteration in Stages I-IIIC Ovarian cancer (Surveillance)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	76%	78%	91%	74%	79%
Performance Rate Numerator / Denominator	19/25	14/18	19/21	23/31	75/95

[1] SEER and Roswell Park data are matched for age, sex, and race but are not risk adjusted for comorbidities.
[2] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017.
[3] American Joint Commission on Cancer (AJCC) Stage I-IV Ovarian Cancer
[4] The International Federation of Obstetricians and Gynecologists (FIGO) staging rules are incorporated into the AJCC staging system

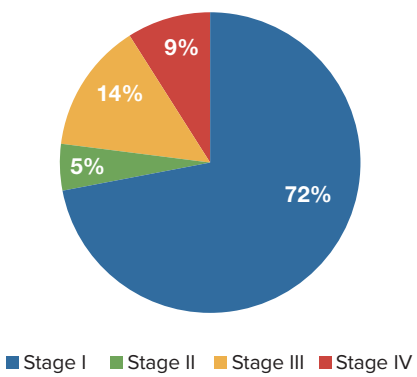
ENDOMETRIAL AND UTERINE CANCER

Our Patients

The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group.

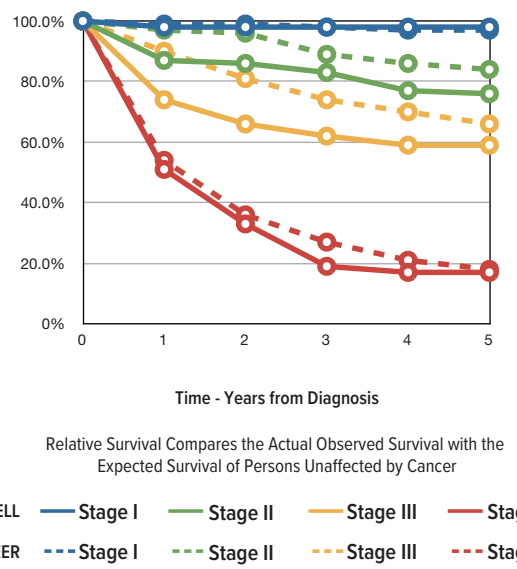
AJCC Stage Group, Endometrial and Uterine Cancer

Note: Stage at diagnosis for CY 2014-2015



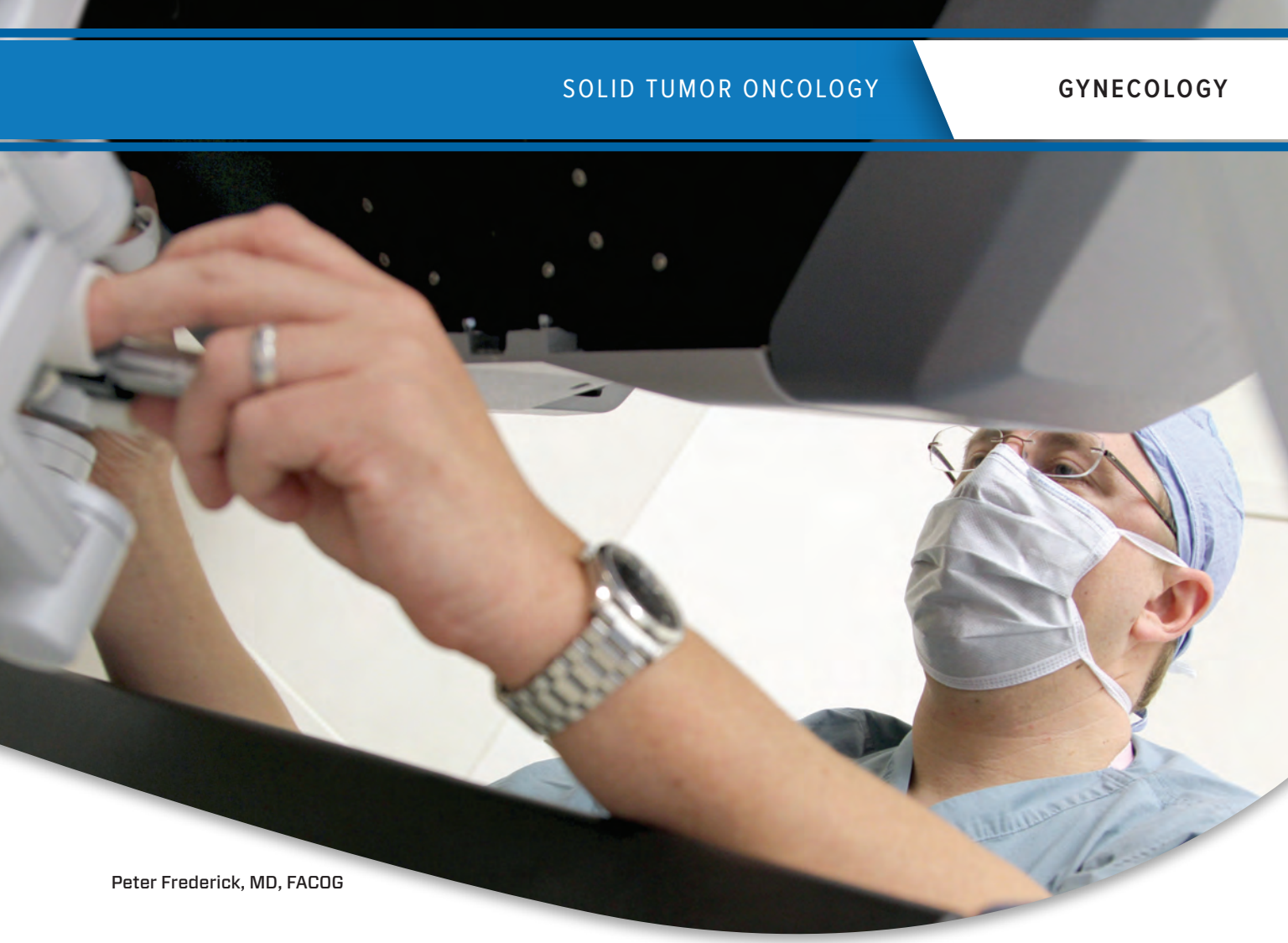
Survival Data
Five-Year Endometrial and Uterine Cancer
Stages I, II, III, IV

Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival for Uterine Cancer Only						
	Source	1	2	3	4	5
N=707	Roswell Park Stage I	98%	98%	98%	98%	98%
N=60	Roswell Park Stage II	87%	86%	83%	77%	76%
N=108	Roswell Park Stage III	74%	66%	62%	59%	59%
N=69	Roswell Park Stage IV	51%	33%	19%	17%	17%

[1] The International Federation of Obstetricians and Gynecologists (FIGO) staging rules are incorporated into the AJCC staging system
[2] American Joint Commission on Cancer (AJCC) Stage I-IV Endometrial and Uterine Cancer
[3] SEER and Roswell Park data are matched for age, sex, and race but are not risk adjusted for comorbidities.
[4] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 23, 2017.



Peter Frederick, MD, FACOG

Commission on Cancer of American College of Surgeons

Chemotherapy and/or radiation administered to patients with Stage IIIC or IV Endometrial cancer (Surveillance)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	88%	60%	80%	92%	80%
Performance Rate Numerator / Denominator	7/8	6/10	4/5	11/12	28/35

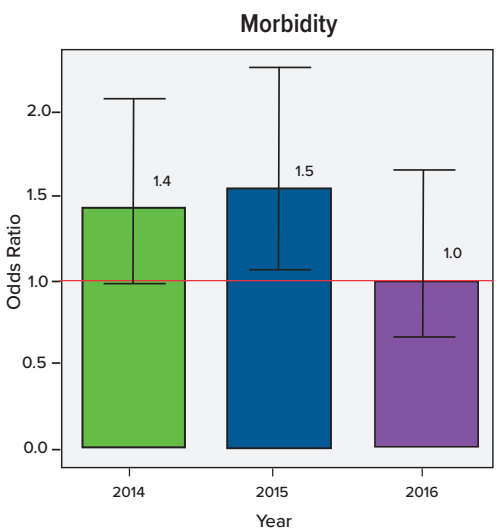
Endoscopic, laparoscopic, or robotic performed for all Endometrial cancer (excluding sarcoma and lymphoma), for all stages except stage IV (Surveillance)

Performance Rates and Reported Cases	2012	2013	2014	2015	All
Estimated Performance Rates	71%	82%	87%	82%	80%
Performance Rate Numerator / Denominator	62/87	75/91	46/53	59/72	242/303

NATIONAL QUALITY METRICS FOR SURGICAL CARE AND PATIENT OUTCOMES

Roswell Park uses the **American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP)** to measure, monitor, and improve surgical care and patient outcomes. This program is designed to identify complications during and following surgery and provide a comparison of the hospital's rates to the national average. Specific complications include overall morbidity, surgical site infections, urinary tract infections, and readmissions to the operating room.

The following graphs represent the likelihood (as indicated by the odd's ratio) of an event occurring within Roswell Park's **Gynecologic Oncology** program compared with the national average. The error bars represent the 95% confidence interval. If the confidence interval crosses an Odds Ratio of 1, performance is on par with the national average. Roswell Park's performance on these measures are presented below:

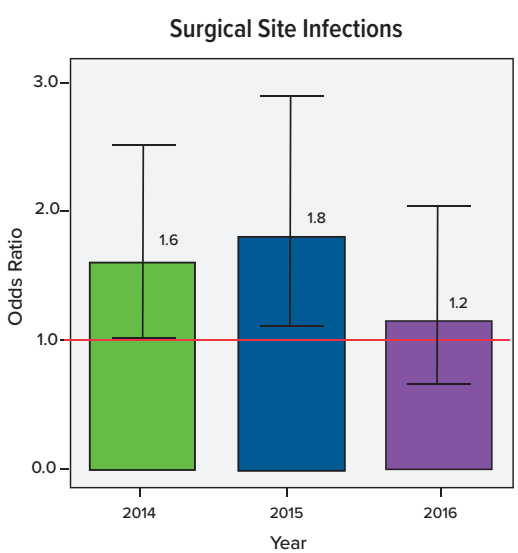


Morbidity

Time	Procedures	% Occurrence	% Expected
2014	259	12%	8%
2015	235	12%	7%
2016	229	7%	7%

Surgical Site Infections

Time	Procedures	% Occurrence	% Expected
2014	259	7%	4%
2015	235	8%	4%
2016	227	4%	3%

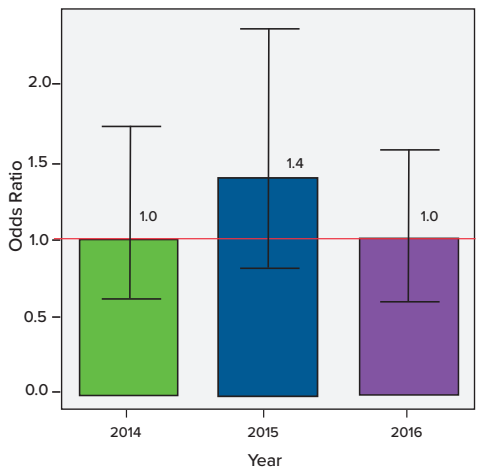


ACS NSQIP: GYNECOLOGIC ONCOLOGY

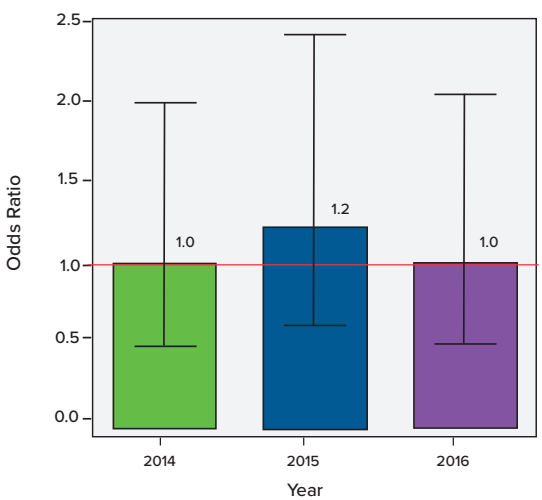
Return to the Operating Room

Time	Procedures	% Occurrence	% Expected
2014	259	2%	2%
2015	235	4%	2%
2016	229	1%	2%

Return to the Operating Room



Urinary Tract Infections



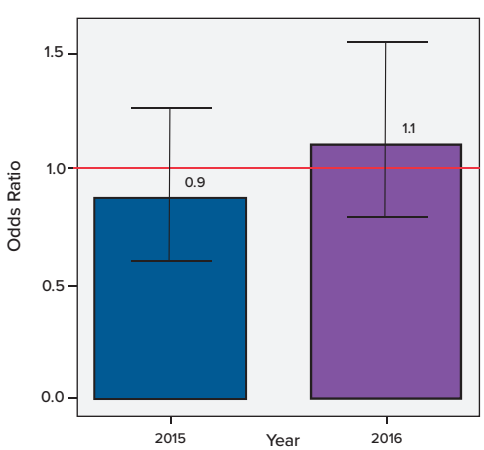
Urinary Tract Infections

Time	Procedures	% Occurrence	% Expected
2014	259	2%	2%
2015	235	3%	2%
2016	228	2%	2%

Readmission

Time	Procedures	% Occurrence	% Expected
2015	235	4%	6%
2016	229	6%	5%

Readmission



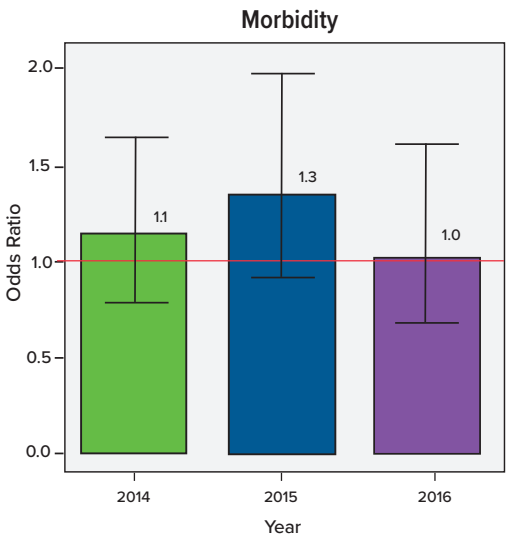
[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

ASC NSQIP: HYSTERECTOMY/MYOMECTOMY

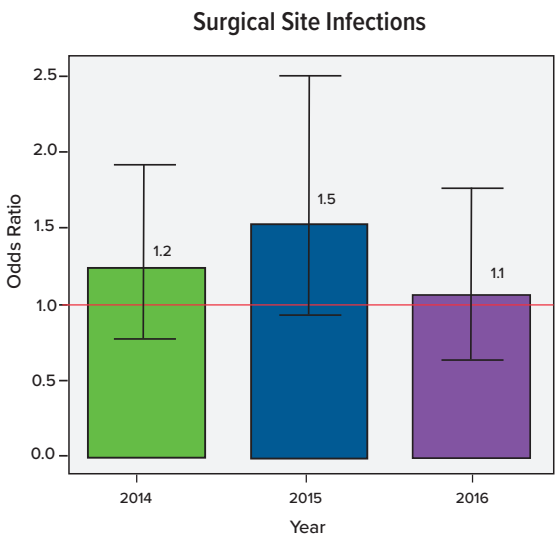
NSQIP also offers a Procedure Targeted option to allow participants to focus quality improvement efforts on high volume procedures. For gynecological cancers the Procedure Targeted is **hysterectomy/myomectomy**. The following charts outline Roswell Park's performance on key quality metrics for this procedure.

Morbidity

Time	Procedures	% Occurrence	% Expected
2014	231	9%	8%
2015	208	12%	8%
2016	218	7%	7%



Surgical Site Infections



Surgical Site Infections

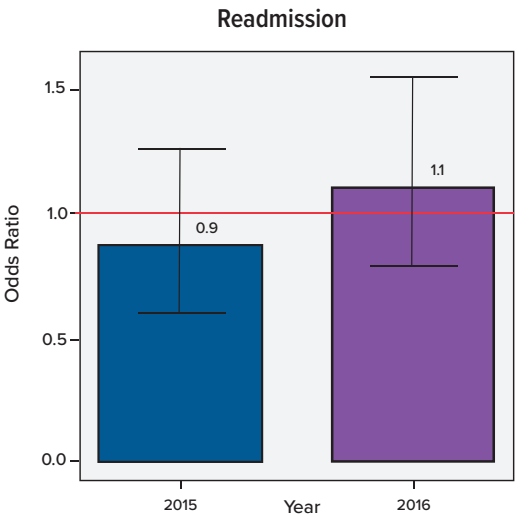
Time	Procedures	% Occurrence	% Expected
2014	231	6%	4%
2015	208	7%	4%
2016	216	4%	4%

[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

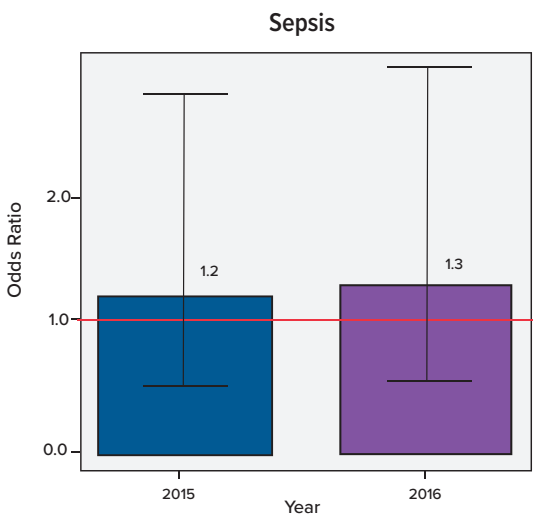
ACS NSQIP: HYSTERECTOMY/MYOMECTOMY

Readmission

Time	Procedures	% Occurrence	% Expected
2015	208	4%	6%
2016	218	6%	5%



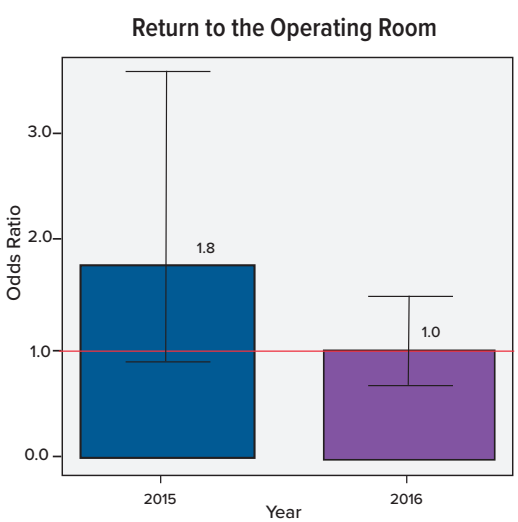
Sepsis



Time	Procedures	% Occurrence	% Expected
2015	208	1%	1%
2016	217	1%	1%

Return to the Operating Room

Time	Procedures	% Occurrence	% Expected
2015	208	4%	1%
2016	218	1%	1%



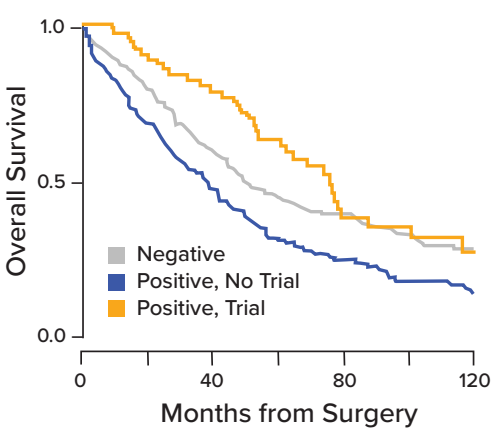
[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

INNOVATION & RESEARCH

NY-ESO-1 Predicts Aggressive Ovarian Cancer

The cancer testis antigen NY-ESO-1 is a promising target for immunotherapy. Our study analyzed more than 1,000 ovarian cancer patients for NY-ESO-1 expression frequency, immunogenicity, and clinical impact. The results demonstrated NY-ESO-1 expression in 41% of ovarian tumors. Spontaneous baseline humoral response was identified in 19% of 689 tested patients. Patients with NY-ESO-1 + ovarian cancer had higher stage disease, were less likely to have a complete response to initial therapy, had more grade 3 tumors, and experienced significantly shorter overall survival (42.9 vs. 50.0 months, $p = 0.003$). A subset analysis of NY-ESO-1 + patients that received immunotherapy with NY-ESO-1 vaccine demonstrated improved overall survival by > 2 years (52.6 vs. 27.2 months, $p < 0.001$). The study represents the largest analysis of NY-ESO-1 expression in any cancer type, and underscores the importance of testing for this antigen in all patients with ovarian cancer, in order to consider enrollment on NY-ESO-1 targeted immunotherapy trials.

Emese Zsiros, MD, PhD, FACOG



This study is the first demonstration of an association between NY-ESO-1 expression and an aggressive cancer phenotype. The relatively high expression frequency of NY-ESO-1 in ovarian cancer patients coupled with the poor clinical outcomes in NY-ESO-1+ patients reveals an underappreciated need for targeted therapy against this antigen. In support, our study reveals that NY-ESO-1+ patients enrolled on immunotherapy trials targeting the antigen exhibited an improvement in OS. NY-ESO-1+ patients that enrolled on trials had significantly improved OS when compared with both NY-ESO-1+ patients that didn't enroll on trial (75.3 vs. 38.0 median months, p<0.001) and NY-ESO-1 negative patients (75.3 versus 50.0 months, p=0.046).

[1] Szender JB, Papanicolau-Sengos A, Eng KH, Miliotto AJ, Lugade AA, Gnjatic S, Matsuzaki J, Morrison CD, Odunsi K. NY-ESO-1 expression predicts an aggressive phenotype of ovarian cancer. Gynecologic Oncology. 2017 Apr 6.

Joseph Skitzki, MD, FACS

SARCOMA AND MELANOMA

Roswell Park's Sarcoma and Melanoma program delivers multidisciplinary state-of-the-art care and long-term follow-up for patients. Our team holds a multidisciplinary discussion for all complex cases, including review of all pathology and diagnostic imaging, prior to formulating the patient's individualized treatment plan. The program promotes both basic science and clinical research to improve cancer treatment.

Our Volume

We evaluate 500 new sarcoma and melanoma patients, resulting in more than 500 chemotherapy infusion visits annually.

NEW TO INSTITUTE			
	CY14	CY15	CY16
Medicine	85	78	52
Surgery	416	405	486

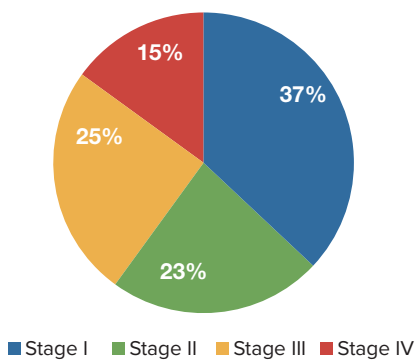
NEW TO SERVICE			
	CY14	CY15	CY16
Medicine	215	223	307
Surgery	651	608	799

SOFT TISSUE SARCOMA

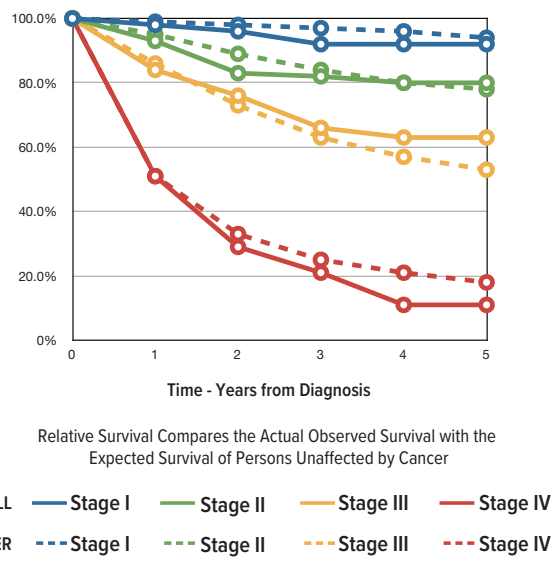
Our Patients

Cancer staging is an important first step in understanding the nature and severity of disease and provides guidance for determining the appropriate treatment plan for individual patients. The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group.

AJCC Stage Group, Soft Tissue Sarcoma
Note: Stage at diagnosis for CY 2014-2015



Five-Year Relative Survival, Soft Tissue Sarcoma, Stages I, II, III, IV, Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival 2006-2013, Soft Tissue Sarcoma						
	Source	1	2	3	4	5
N=130	Roswell Park Stage I	98%	96%	92%	92%	92%
N=87	Roswell Park Stage II	93%	83%	82%	80%	80%
N=101	Roswell Park Stage III	84%	76%	66%	63%	63%
N=48	Roswell Park Stage IV	51%	29%	21%	11%	11%

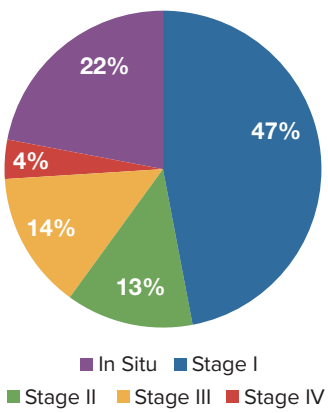
[1] American Joint Commission on Cancer (AJCC) Stage I-IV Soft Tissue Sarcoma
[2] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017
[3] SEER and Roswell Park data are matched for age, sex, and race but are not risk adjusted for comorbidities

MELANOMA

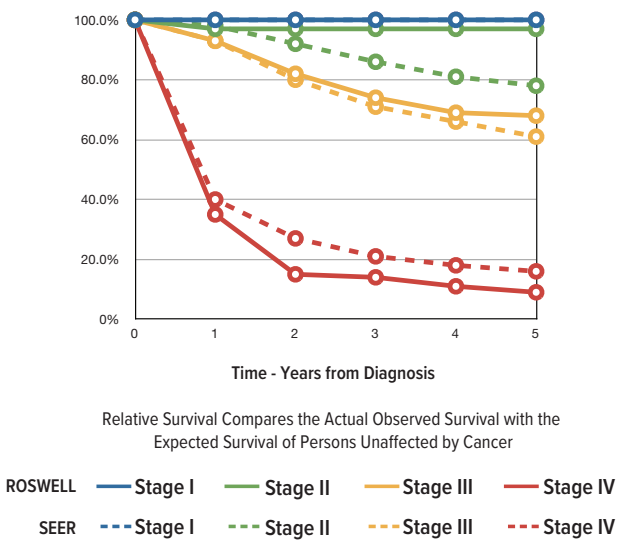
Our Patients

The following graphs display the American Joint Commission on Cancer (AJCC) defined cancer stage at the time of diagnosis, and the associated 5-year relative survival rates by AJCC stage group.

AJCC Stage Group Melanoma
Note: Stage at diagnosis for CY 2014-2015



Survival Data
Five-Year Relative Survival, Melanoma, Stages I, II, III, IV,
Cases Diagnosed (2006-2013)

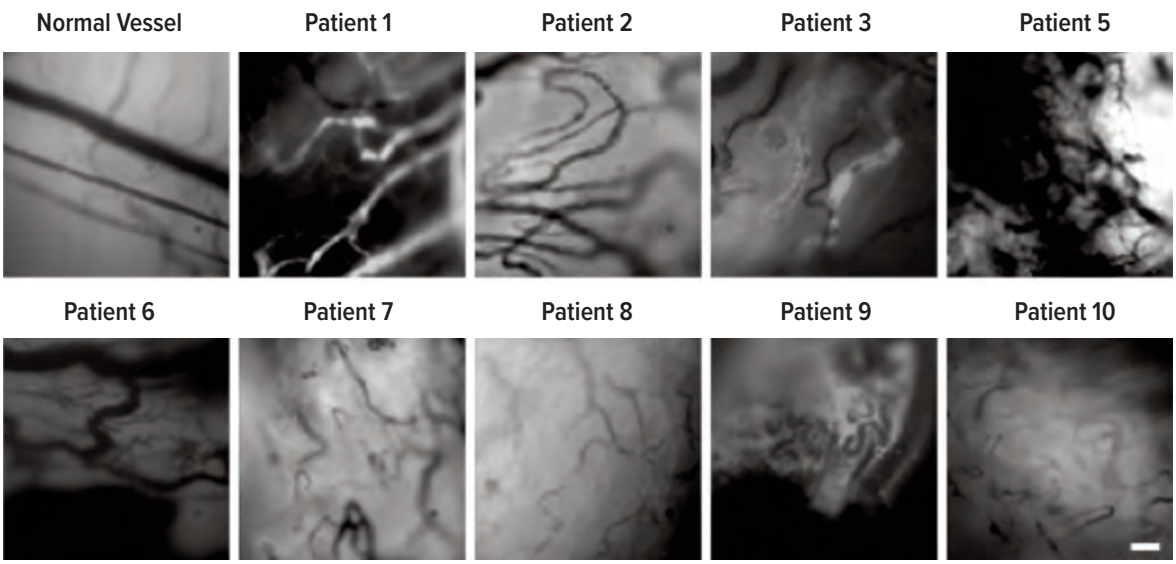


Roswell Park 5-Year Relative Survival 2006-2013, Melanoma						
	Source	1	2	3	4	5
N=1132	Roswell Park Stage I	100%	100%	100%	100%	100%
N=362	Roswell Park Stage II	97%	97%	97%	97%	97%
N=212	Roswell Park Stage III	93%	82%	74%	69%	68%
N=64	Roswell Park Stage IV	35%	15%	14%	11%	9%

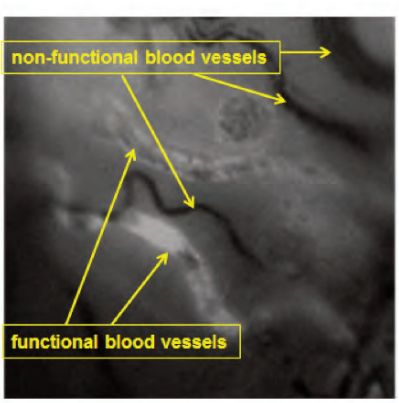
[1] American Joint Commission on Cancer (AJCC) Stage I-IV Melanoma
[2] SEER and Roswell Park data are matched for age, sex, and race but are not risk adjusted for comorbidities.
[3] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017

INNOVATION & RESEARCH

In a Roswell Park clinical trial, we performed the first-ever live, microscopic imaging of melanoma at the time of surgery, which allowed us to observe and measure tumor vessels for multiple variables. The first panel of images demonstrates the architecture of normal blood vessels versus the disorganized and tortuous melanoma tumor vessels.



*Patient #4 had a tumor that could not be visualized.



The second panel, left, shows that half of the tumor vessels could not support blood flow at any given time, thus revealing another mechanism of how melanoma tumors resist treatment. These results have spurred additional unique clinical trials at Roswell Park to improve the care of melanoma patients.

THORACIC

The Thoracic Oncology Center at Roswell Park provides comprehensive multidisciplinary cancer care for patients with lung, esophageal and pleural malignancies.

Our Volume

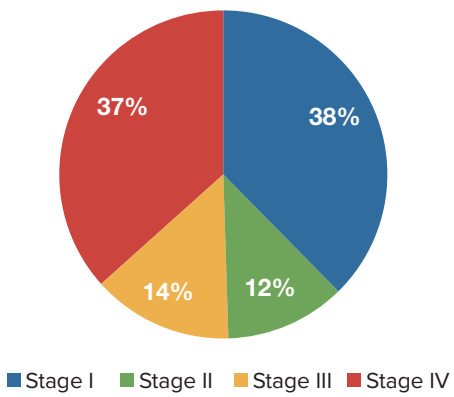
Our program evaluates more than 1,000 new patients annually, resulting in over 4,000 chemotherapy visits and 12,000 office visits with Roswell Park providers.

Our Patients

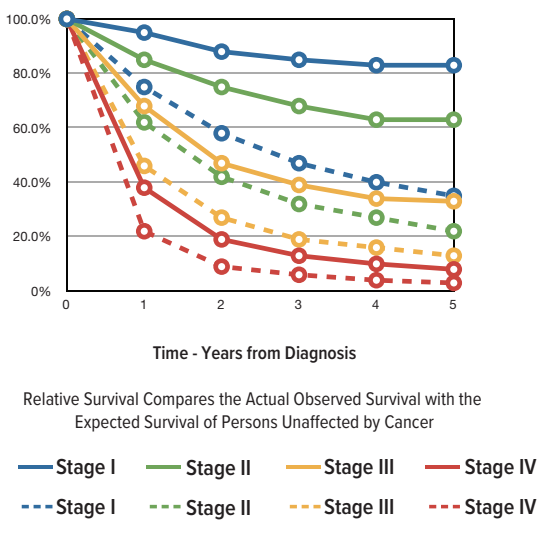
Cancer staging is an important first step in understanding the nature and severity of disease and provides guidance for determining the appropriate treatment plan for individual patients. The graphs below display the American Joint Committee on Cancer defined cancer stage group for our patients at the time of diagnosis.

NON-SMALL CELL LUNG CANCER

AJCC Stage Group Non-Small Cell Lung Cancer
Note: Stage at diagnosis for CY 2014-2015



Survival Data
Five-Year Relative Survival,
Non-Small Cell Lung Cancer, Stages I, II, III, IV,
Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival 2006-2013, Non-Small Cell Lung Cancer						
	Source	1	2	3	4	5
N=994	Roswell Park Stage I	95%	88%	85%	83%	83%
N=305	Roswell Park Stage II	85%	75%	68%	63%	63%
N=767	Roswell Park Stage III	68%	47%	39%	34%	33%
N=1430	Roswell Park Stage IV	38%	19%	13%	10%	8%

[1] American Joint Commission on Cancer (AJCC) Stage I-IV Non-Small Cell Lung Cancer
[2] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017
[3] SEER and Roswell Park data are matched for age, sex, and race but are not risk adjusted for comorbidities

Todd Demmy, MD, FACS

RESEARCH & INNOVATION

Safety of Thoracoscopic Lobectomy in Locally Advanced Lung Cancer

Lobectomies for advanced stage non-small cell lung cancer have traditionally been performed with an open approach. Video-assisted thoracoscopic approaches are associated with decreased postoperative pain, shorter hospitalization, and earlier administration of adjuvant chemotherapy if needed. Our surgical team at Roswell Park demonstrated that thoracoscopic lobectomy for advanced lung cancer can be safely performed with acceptable mortality.

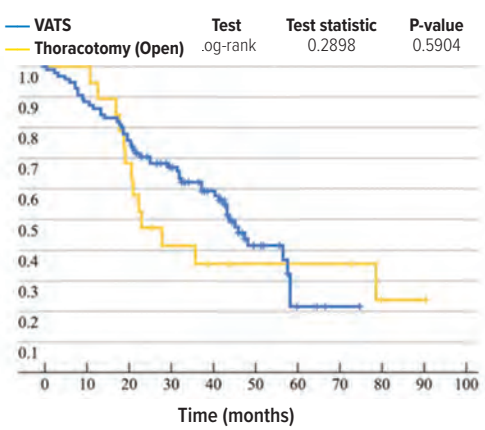
[1] Hennon M, Sahai RK, Yendamuri S, Tan W, Demmy TL, Nwogu C. Safety of thoracoscopic lobectomy in locally advanced lung cancer. Annals of Surgical Oncology. 2011 Dec 1;18(13):3732-6.

Table 1. Perioperative data

Characteristic	VATS (n = 95)	Open (n = 19)	P value
Operative, median (range)			
EBL (mL)	200 (20–1600)	150 (50–1000)	0.37
Time (minutes)	231 (96–574)	202 (105–317)	0.06
Length of stay (days), median (range)			
ICU	1 (0–23)	1 (1–7)	0.23
Hospital	4 (2–30)	5 (3–21)	0.08
Adjuvant treatment			
Patients, n (%)	35 (37.2)	1 (5.3)	0.01
Time to start (days)	49.5 (29–83)	45 (45)	0.64
Complication, n (%)			
Arrhythmia	17 (17.9)	4 (21.1)	0.75
Transfusion	12 (16)	14 (34.1)	0.82
Empyema	3 (3.2)	1 (5.3)	0.52
Pneumonia	21 (22.1)	4 (21.1)	1.00
Myocardial infarction	3 (3.2)	0	1.00
Prolonged air leak	17 (17.9)	1 (5.3)	0.30
Bronchopleural fistula	1 (1.1)	0	1.00
Death	1 (1.1)	0	1.00
Any complication	37 (38.9)	7 (36.8)	1.00

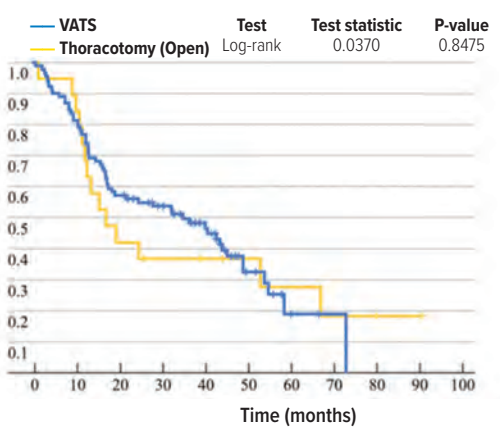
Note: VATS video-assisted thoracoscopic surgery, EBL estimated blood loss, ICU intensive care unit

Overall Survival



Procedure	Total	Number Failed	Number Censored	Median Estimate	95% CI
VATS	95	51	44	43.7290	(37.224, 57.626)
Open	19	13	6	22.9651	(19.023, 78.554)

Disease Free Survival

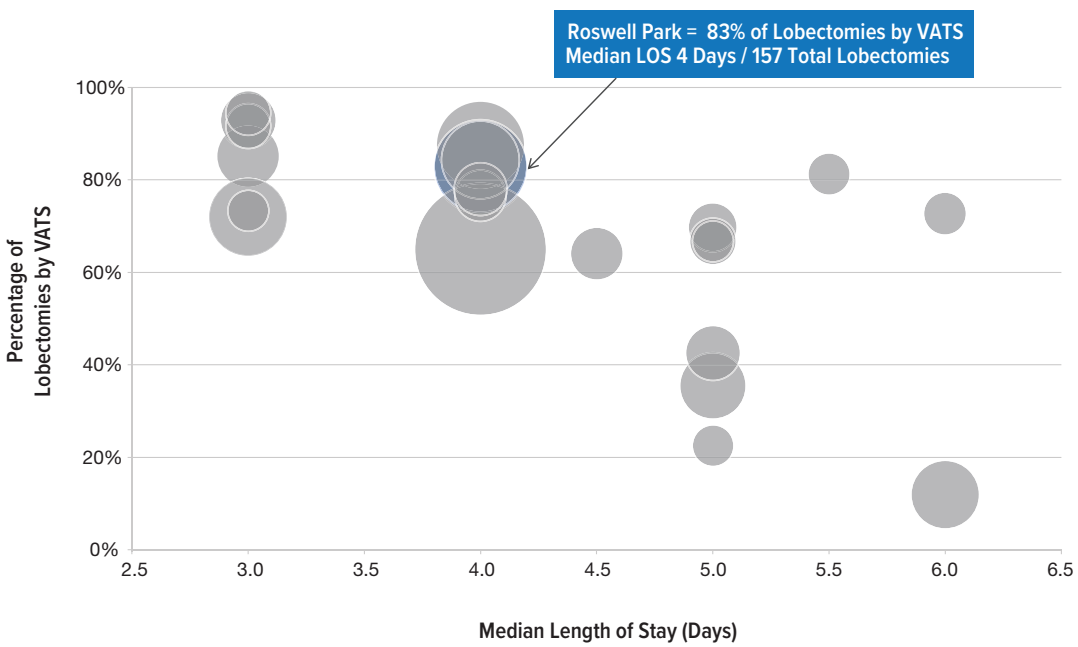


Procedure	Total	Number Failed	Number Censored	Median Estimate	95% CI
VATS	91	58	33	34.7269	(17.216, 45.043)
Open	19	14	5	16.6899	(11.762, 66.793)

[1] Hennon M, Sahai RK, Yendamuri S, Tan W, Demmy TL, Nwogu C. Safety of thoracoscopic lobectomy in locally advanced lung cancer. Annals of Surgical Oncology. 2011 Dec 1;18(13):3732-6.

HIGH PROPORTION OF LOBECTOMIES ARE PERFORMED VIA MINIMALLY-INVASIVE VIDEO-ASSISTED THORACOSCOPIC SURGERY (VATS)

NYS 2016 VATS Lobectomy Comparison
(Roswell Park compared with other NYS hospitals doing 30 or greater procedures?)



Descending Order by Total Lobectomy Volume

	Median LOS	Volume	VATS %
Memorial Sloan Kettering	4.0	311	65%
Roswell Park Comprehensive Cancer Center	**4.0**	**157**	**83%**
NY Presbyterian Hosp - Weill Cornell	4.0	153	83%
Long Island Jewish Medical Center	4.0	135	87%
New York Presbyterian/Columbia	4.0	108	84%
NYU Medical Center	3.0	107	72%
St Peters Hospital Albany	6.0	84	12%
Mount Sinai Hospital	5.0	79	35%
Rochester General Hospital	3.0	67	85%
Lenox Hill Hospital	3.0	56	93%
St Josephs Hospital	5.0	54	43%

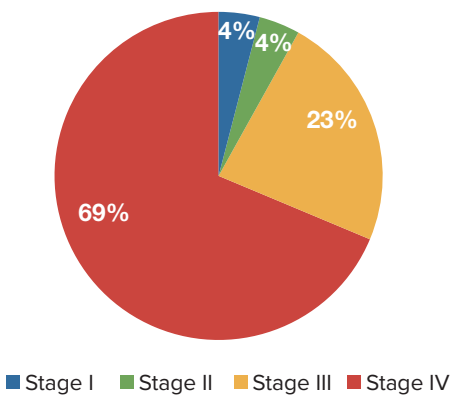
	Median LOS	Volume	VATS %
Winthrop University Hospital	4.5	50	64%
Albany Medical Center Hospital	4.0	50	78%
Strong Memorial Hospital	4.0	47	77%
John T Mather Mem Hosp	5.0	43	70%
University Hospital Syracuse	5.0	39	67%
New York-Presbyterian/Queens	3.0	36	94%
Maimonides Medical Center	3.0	36	92%
Westchester Medical Center	6.0	33	73%
White Plains Hospital Center	5.5	32	81%
Ellis Hospital	5.0	31	23%
Stony Brook University Hospital	5.0	30	67%
Mount Sinai Roosevelt	3.0	30	73%

[1] 2016 New York State SPARCS In patient Discharges extracted from WebMD hospital Performance Monitor. Median length of inpatient stay is median number of days for discharges from hospital.

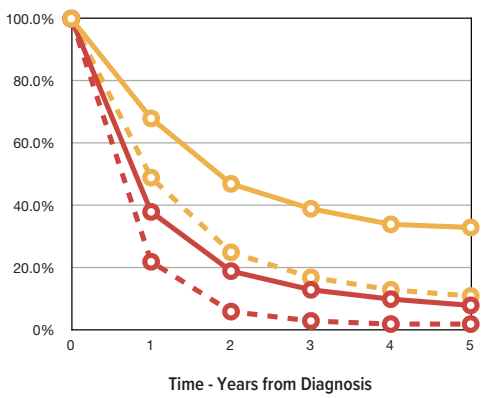
[2] NYS SPARCS Inpatient CY 2016. Filtered by NYS patient origin and primary procedure codes; no filtered on patient diagnoses.
[1] VATS Lobectomy = 32.41; 0BTC4ZZ; 0BTD4ZZ; 0BTF4ZZ; 0BTG4ZZ; 0BTJ4ZZ • [2] Open Lobectomy = 32.49; 0BTC0ZZ; 0BTD0ZZ; 0BTF0ZZ; 0BTG0ZZ; 0BTJ0ZZ

SMALL CELL LUNG CANCER

AJCC Stage Group, Small Cell Lung Cancer
Note: Stage at diagnosis for CY 2014-2015



Survival Data
Five-Year Relative Survival
Small Cell Lung Cancer, Stages I, II, III, IV,
Cases Diagnosed (2006-2013)



Relative Survival Compares the Actual Observed Survival with the Expected Survival of Persons Unaffected by Cancer

ROSWELL — Stage III — Stage IV
SEER — Stage III — Stage IV

Roswell Park 5-Year Relative Survival 2006-2013, Small Cell Lung Cancer*						
	Source	1	2	3	4	5
N=123	Roswell Park Stage III	64%	37%	24%	23%	19%
N=262	Roswell Park Stage IV	33%	11%	6%	4%	4%

*Stage I and II were omitted due to insufficient sample size (Stage I N=18 and Stage II N=16)

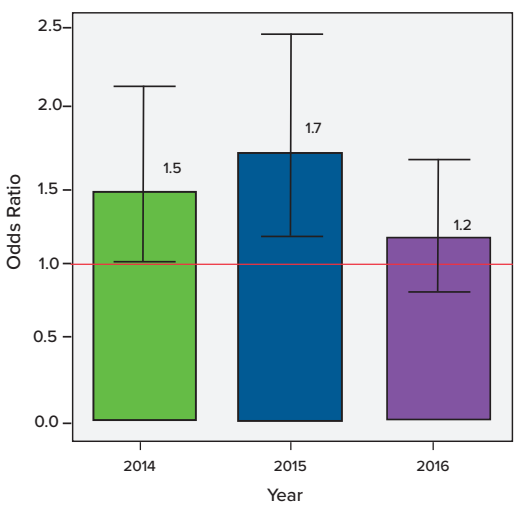
[1] American Joint Commission on Cancer (AJCC) Stage I-IV Small Cell Lung Cancer
[2] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017
[3] SEER and Roswell Park data are matched for age, sex, and race but are not risk adjusted for comorbidities

NATIONAL QUALITY METRICS FOR SURGICAL CARE AND PATIENT OUTCOMES

Roswell Park uses the **American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP)** to measure, monitor and improve surgical care and patient outcomes. This program is designed to identify complications during and following surgery and to provide a comparison of the hospital's rates to the national average. It also helps identify complications deemed preventable including morbidity, surgical site infections, urinary tract infections and readmissions to the operating room.

The following graphs represent the likelihood (as indicated by the odd's ratio) of an event occurring at Roswell Park compared with the national average for **thoracic surgery**. The error bars represent the 95% confidence interval. If the confidence interval crosses an Odds Ratio of 1, performance is on par with the national average. Roswell Park's performance on these measures is presented below.

Morbidity



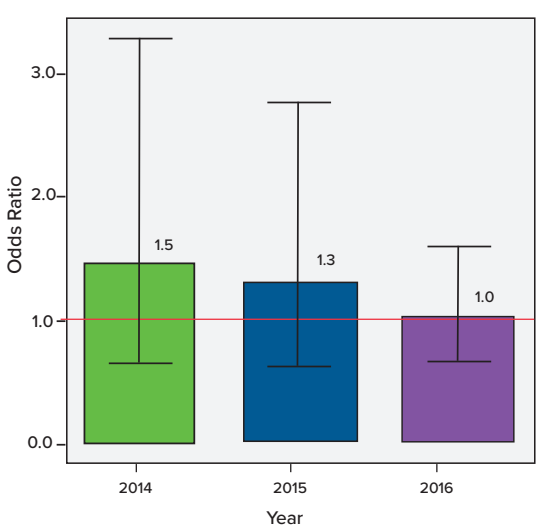
Morbidity

Time	Procedures	% Occurrence	% Expected
2014	278	11%	7%
2015	250	16%	8%.
2016	265	10%	8%

Mortality

Time	Procedures	% Occurrence	% Expected
2014	278	2%	1%
2015	250	2%	1%
2016	265	1%	1%

Mortality

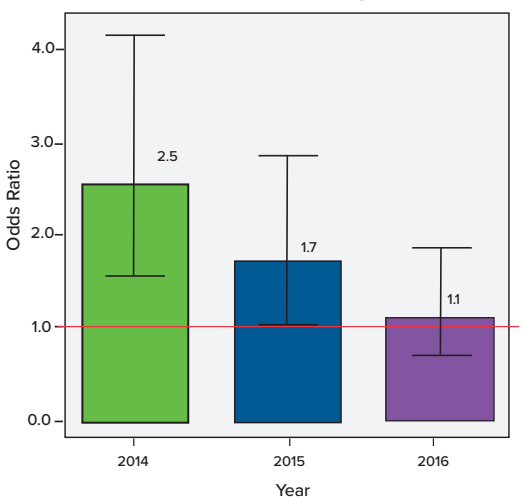


ACS NSQIP: THORACIC SURGERY

Pneumonia

Time	Procedures	% Occurrence	% Expected
2014	271	10%	3%
2015	248	10%	5%
2016	263	6%	4%

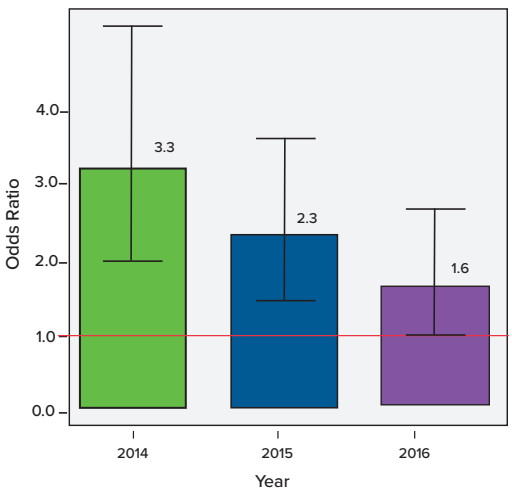
Return to the Operating Room



Unplanned Intubation

Time	Procedures	% Occurrence	% Expected
2014	278	4%	2%
2015	250	5%	2%
2016	265	4%	3%

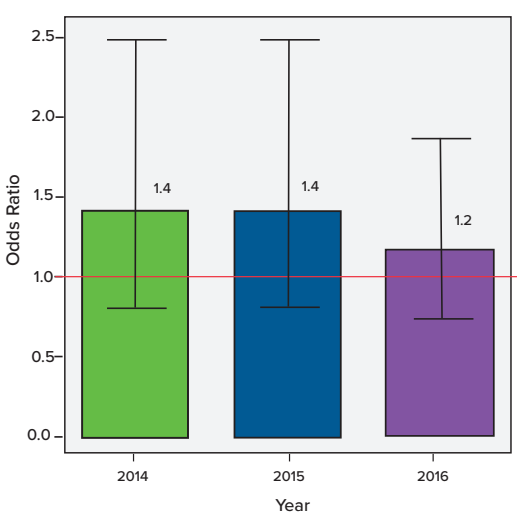
Pneumonia



Return to the Operating Room

Time	Procedures	% Occurrence	% Expected
2014	278	8%	3%
2015	250	7%	4%
2016	265	5%	4%

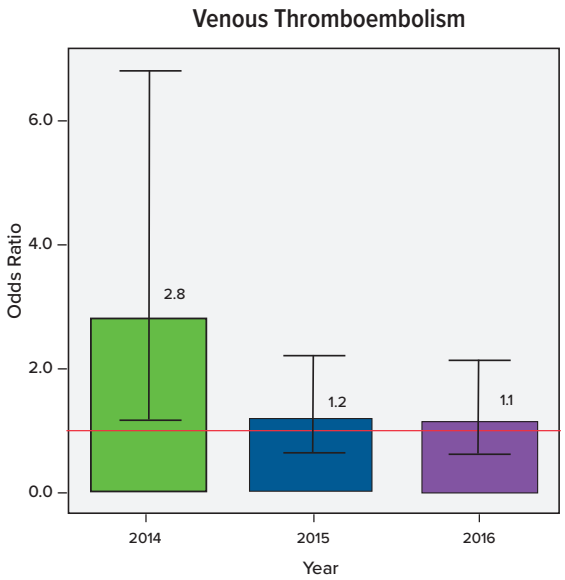
Unplanned Intubation



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

ACS NSQIP: THORACIC SURGERY

Venous Thromboembolism



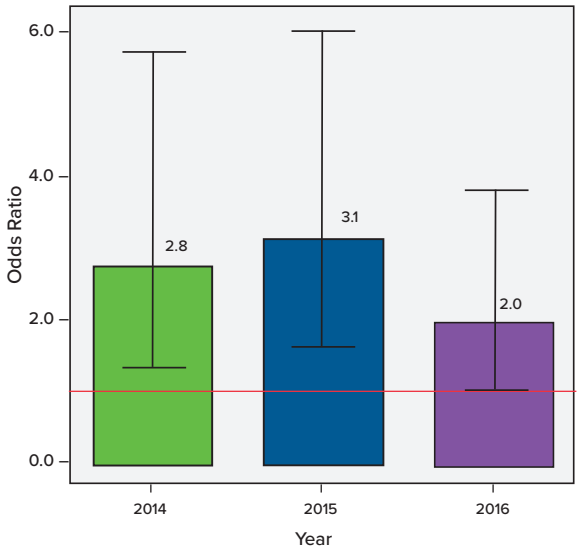
Venous Thromboembolism

Time	Procedures	% Occurrence	% Expected
2014	278	3%	1%
2015	250	2%	1%
2016	265	2%	1%

Ventilator > 48 Hours

Time	Procedures	% Occurrence	% Expected
2014	278	4%	1%
2015	250	6%	1%
2016	265	4%	2%

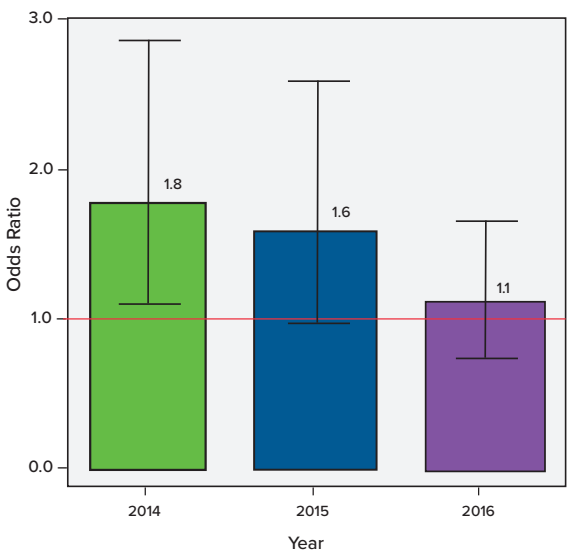
Ventilator > 48 Hours



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

NSQIP also offers a Procedure Targeted option to allow participants to focus quality improvement efforts on high volume procedures. For **thoracic cancers** one Procedure Targeted is **lung resection**. The following charts outline Roswell Park's performance on this key quality metrics for this procedure.

Morbidity



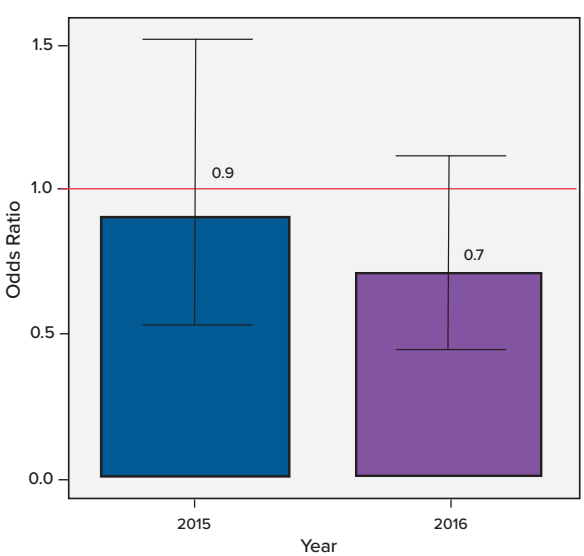
Morbidity

Time	Procedures	% Occurrence	% Expected
2014	200	13%	7%
2015	181	15%	8%
2016	218	10%	8%

Length of Stay

Time	Procedures	% Occurrence	% Expected
2015	152	11%	12%
2016	197	11%	15%

Length of Stay

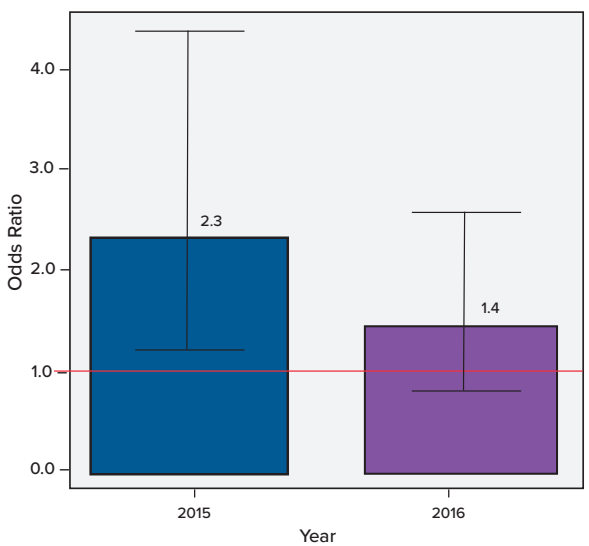


[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

[2] The ACS NSQIP defines a Length of Stay (LOS) event as a LOS greater than the 75th percentile LOS for that group of operations.

ACS NSQIP: THORACIC LUNG RESECTION

Pneumonia



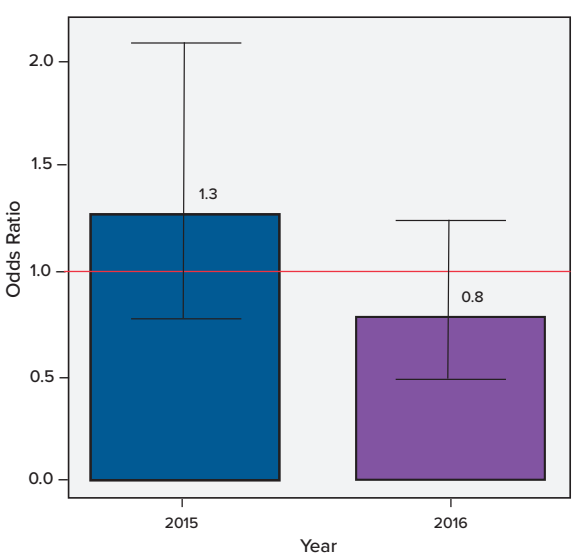
Pneumonia

Time	Procedures	% Occurrence	% Expected
2015	180	11%	4%
2016	217	7%	4%

Readmission

Time	Procedures	% Occurrence	% Expected
2015	181	9%	6%
2016	218	3%	6%

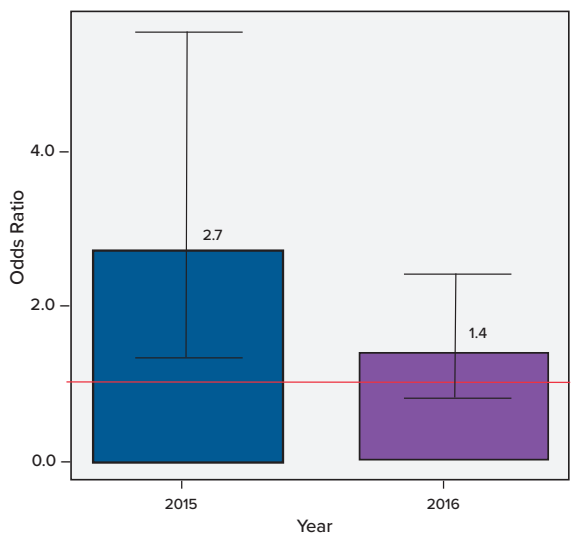
Readmission



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

ACS NSQIP: THORACIC LUNG RESECTION

Return to the Operating Room



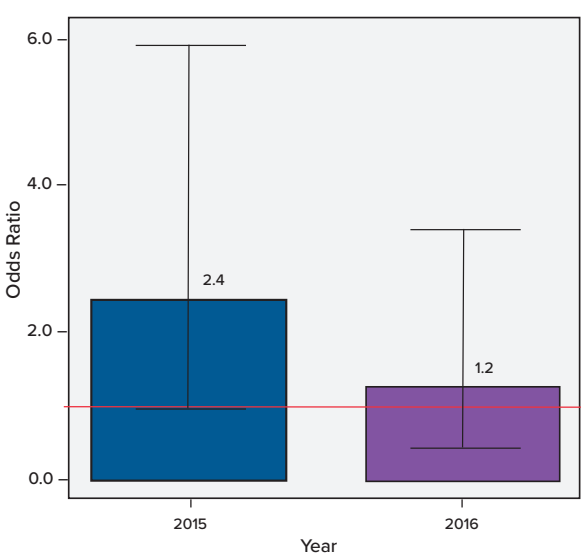
Return to the Operating Room

Time	Procedures	% Occurrence	% Expected
2015	181	8%	3%
2016	218	5%	3%

Sepsis

Time	Procedures	% Occurrence	% Expected
2015	181	5%	2%
2016	218	3%	1%

Sepsis



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

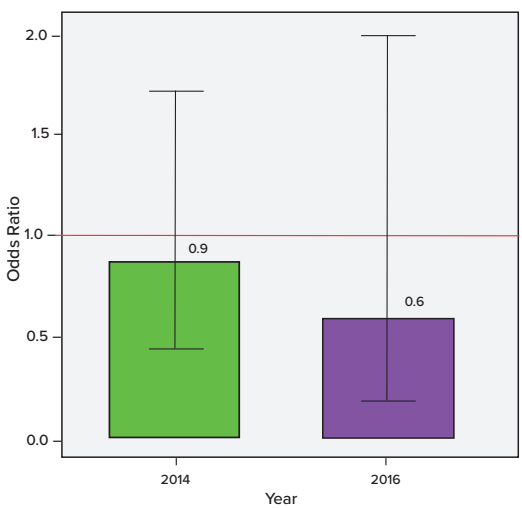
ACS NSQIP: THORACIC LUNG RESECTION

Surgical Site Infections

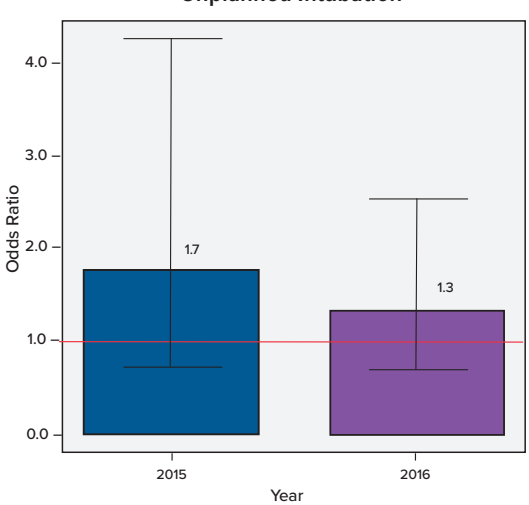
Time	Procedures	% Occurrence	% Expected
2014	200	1%	2%
2016	217	0%	1%

Data unavailable for 2015

Surgical Site Infections



Unplanned Intubation



Unplanned Intubation

Time	Procedures	% Occurrence	% Expected
2015	181	4%	2%
2016	218	4%	2%

[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals.

COMMISSION ON CANCER OF AMERICAN COLLEGE OF SURGEONS

Roswell Park's accreditation by the Commission on Cancer (CoC) of American College of Surgeons requires benchmarking treatment against national quality standards. The quality measures and Roswell Park's performance on these measures for Lung Cancer are shown in the table below. The CoC and other accrediting bodies do not expect, for many reasons (e.g., patient preference, medical contraindications), that compliance will reach 100%.

Roswell Park staff review every case where care is non-concordant with the metric to ensure that the reason for non-compliance is recorded and appropriate.

Systemic chemotherapy is administered within 4 months to day preoperatively or day of surgery to 6 months postoperatively, or it is recommended for surgically resected cases with pathologic lymph node-positive (pN1) and (pN2) NSCLC (Quality Improvement)

Performance Rates and Reported Cases	2012	2013	2014	2015	all
Estimated Performance Rates	85%	97%	88%	80%	88%
Performance Rate Numerator / Denominator	35/41	34/35	22/25	24/30	115/131

Surgery is not the first course of treatment for cN2, M0 lung cases (Quality Improvement)

Performance Rates and Reported Cases	2012	2013	2014	2015	all
Estimated Performance Rates	94%	91%	96%	81%	92%
Performance Rate Numerator / Denominator	48/51	41/45	25/26	17/21	131/143

At least 10 regional lymph nodes are removed and pathologically examined for AJCC stage IA, IB, IIA, and IIB resected NSCLC (Surveillance)

Performance Rates and Reported Cases	2011	2012	2013	2014	all
Estimated Performance Rates	70%	71%	69%	58%	67%
Performance Rate Numerator / Denominator	85/121	96/135	92/133	87/150	360/539

THORACOSCOPIC PNEUMONECTOMY: AN 11-YEAR EXPERIENCE

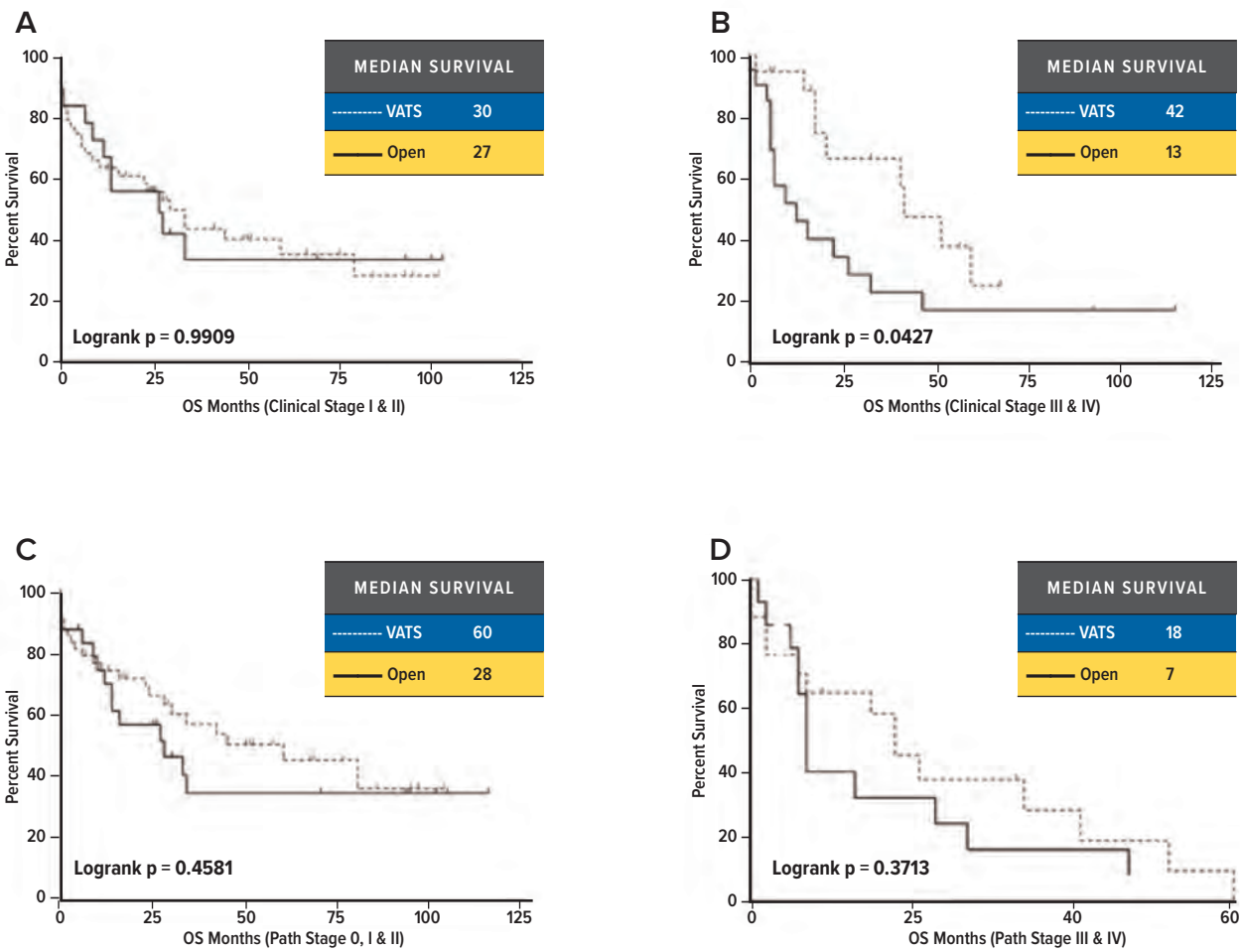
Our surgical team at Roswell Park demonstrated that video-assisted thoracoscopic approaches are safe at a comprehensive cancer center.

Table 1. Comparison of Postoperative Outcomes

Event	VATS (n = 67)	Open (n = 40)	P Value
Complications, No.	2	2	0.74
Blood transfusion	36	30	0.67
Pneumonia	19	25	0.63
Respiratory failure	18	15	0.79
Atrial fibrillation	13	13	1.00
Acute post-thoracotomy pain syndrome	12	20	0.28
Vocal cord paresis	7.5	12.5	0.50
Bronchopleural fistula	6	7.5	1.00
Empyema	4.5	2.5	1.00
Pulmonary embolism	4.5	2.5	1.00
DVT	3	5	0.63
Sepsis	3	5	0.63
Myocardial Infarction	1.5	2.5	1.00
Death within 30 *	7.5	5	0.71
Other values			
Hospital stay, days	5 (2-69)	6 (2-134)	0.19
ICU, days	2 (0-77)	3 (1-134)	0.24
Adjuvant therapy	50	37.5	0.23
Days to adjuvant therapy	49 (27-120)	50 (27-92)	0.81
Pain-free patients at 1 year	53	19	0.03

Data presented as % or median (minimum-maximum)
***Excludes emergent case deaths (one VATS and one open).**

[1] Battoo A, Jahan A, Yang Z, Nwogu CE, Yendamuri SS, Dexter EU, Hennon MW, Picone AL, Demmy TL. Thoracoscopic pneumonectomy: an 11-year experience. CHEST Journal. 2014 Nov 1;146(5):1300-9.
[2] SEER and Roswell Park data are matched for age, sex and race but are not risk adjusted for comorbidities



Stage-adjusted OS (in mo) shown by Kaplan-Meier curves for intent-to-treat VATS and open cases. A, Clinical state 1 and 2. B, Clinical stage 3 and 4. C, Pathologic stage 0, 1, and 2. D, Pathologic stage 3 and 4. Clin = clinical; OS = overall survival; Path = pathologic.

[1] Battoo A, Jahan A, Yang Z, Nwogu CE, Yendamuri SS, Dexter EU, Hennon MW, Picone AL, Demmy TL. Thoracoscopic pneumonectomy: an 11-year experience. CHEST Journal. 2014 Nov 1;146(5):1300-9.
[2] SEER and Roswell Park data are matched for age, sex and race but are not risk adjusted for comorbidities

HEMATOLOGIC ONCOLOGY

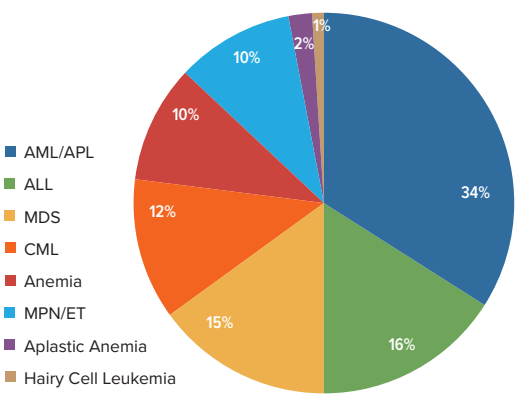
LEUKEMIA

Roswell Park's Leukemia Service of the Department of Medicine is dedicated to quality patient care, innovative research and the development of more effective treatments for all leukemia types, myelodysplastic syndrome, myeloproliferative neoplasms and other bone marrow failure disorders.

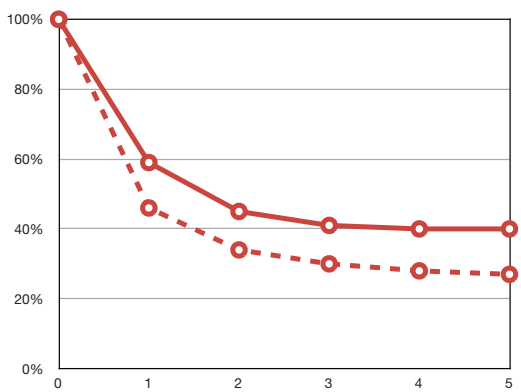
Our Volume

Our leukemia specialists evaluate more than 200 new patients annually, resulting in over 4,000 office visits and 6,500 chemotherapy visits per year.

Our Patients
Active Patients in 2016



Five-Year Relative Survival
Acute Myeloid Leukemia
Cases Diagnosed (2006-2013)



Time - Years from Diagnosis

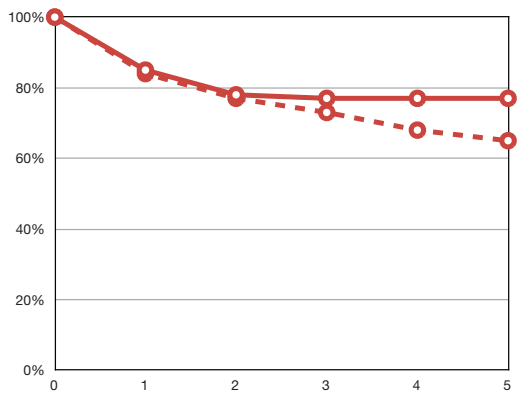
Relative Survival Compares the Actual Observed Survival with the Expected Survival of Persons Unaffected by Cancer

ROSWELL SEER

Roswell Park 5-Year Relative Survival, Acute Myeloid Leukemia						
	Source	1	2	3	4	5
N=566	Roswell Park	59%	45%	41%	40%	40%
	SEER	46%	34%	30%	28%	27%

[1] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017

Five-Year Relative Survival Chronic Myeloid Leukemia
Cases Diagnosed (2006-2013)



Relative Survival Compares the Actual Observed Survival with the Expected Survival of Persons Unaffected by Cancer

ROSWELL SEER

Roswell Park 5-Year Relative Survival, Chronic Myeloid Leukemia						
	Source	1	2	3	4	5
N=127	Roswell Park	85%	78%	77%	77%	77%
	SEER	84%	77%	73%	68%	65%

DIAGNOSTIC HEMATOLOGY

Integrated hematopathology report provided within 24 hours for leukemia cases

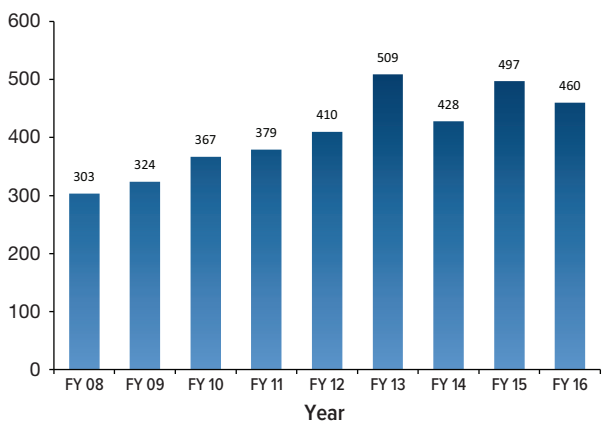
Roswell Park's Division of Diagnostic Hematology provides comprehensive reporting of diagnostic and prognostic information on hematologic malignancies, integrating the testing results from the bone marrow laboratory, lymph node pathology, flow cytometry, cytogenetics and FISH laboratories. Clinical molecular diagnostic services for hematologic malignancies are provided in collaboration with OmniSeq laboratory. For leukemia cases, where treatment decisions must be made promptly, Roswell Park provides the integrated diagnosis **within 24 hours**.

[1] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017

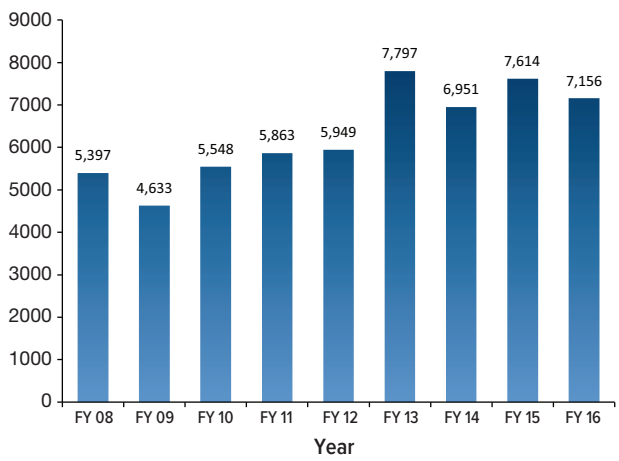
Leukemia Program Volume

The Leukemia Program at Roswell Park has shown increasing clinic visits while decreasing inpatient stays.

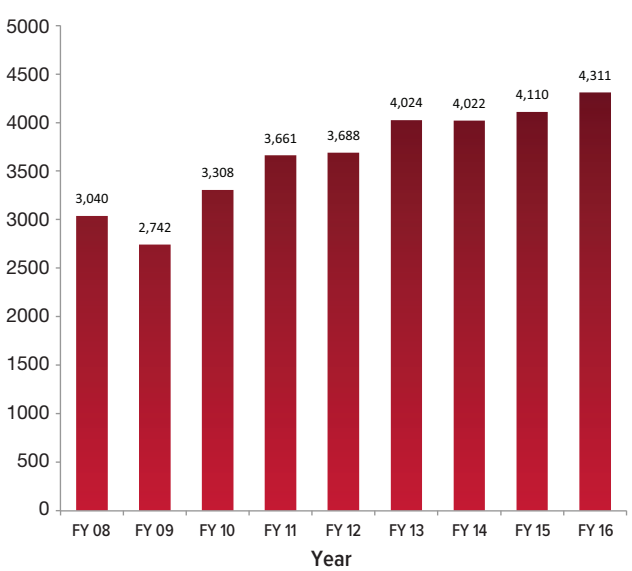
Inpatient Admissions



Inpatient Days



Outpatient Visits



HEMATOLOGIC ONCOLOGY

RESEARCH & INNOVATION

Clinical research conducted by Roswell Park consistently translates into new leukemia therapies and advances overall knowledge of the disease. About half of all leukemia patients at Roswell Park are enrolled in a clinical trial.

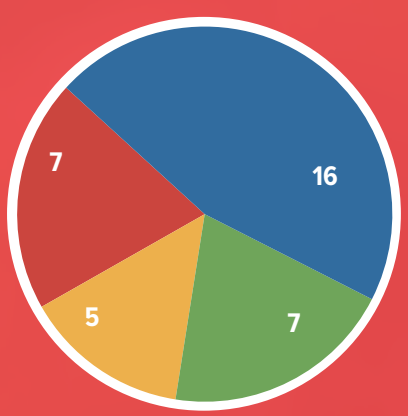
Elizabeth Griffiths, MD

LEUKEMIA CLINICAL TRIAL PORTFOLIO

Current research at Roswell Park includes investigations such as:

- Tyrosine kinase inhibitors for **chronic myeloid leukemia**
- Novel agents for FLT3-mutated **acute myeloid leukemia**
- Change in upfront **AML** therapy (Intensive-> HMA)
- Multi-gene mutational profiling for prognosis and therapy
- Targeting actionable mutations to improve outcomes
- Newer drugs and immunotherapy

36 total (23 Approved/Open)



Open Studies

Reviewed/ Approved

In Approval Process

Pending Submmission

Francisco Hernandez-Ilizaliturri, MD

LYMPHOMA

Roswell Park's multidisciplinary team provides comprehensive care for patients with all types and stages of lymphoma, chronic lymphocytic leukemia, multiple myeloma and other plasma cell disorders. We place a high priority on providing treatment options beyond the current standard of care. All of our lymphoma physicians are also scientists actively engaged in laboratory research in order to expand those options.

The two main forms of Non-Hodgkin Lymphoma (NHL) are Diffuse Large B-Cell Lymphoma (DLBCL) and Follicular Lymphoma. The most common type, DLBCL accounts for up to 30 percent of all newly diagnosed patients in the United States. This lymphoma grows and spreads aggressively and requires immediate treatment that includes chemotherapy with rituximab, (Rituxan®) a monoclonal anti-B cell therapy, and possibly radiation.

Roswell Park led the world's first clinical research study that combined standard chemotherapy with rituximab to treat lymphoma. Today, the addition of rituximab to chemotherapy is the worldwide standard-of-care treatment for most B-cell lymphomas.

Our Volume

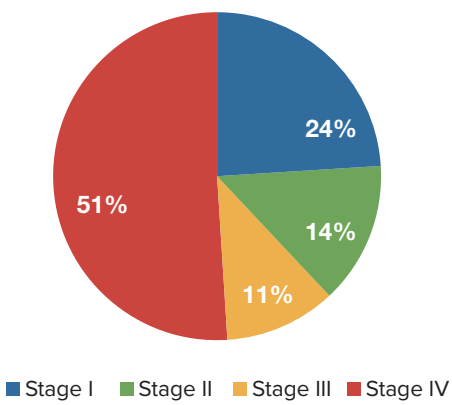
The lymphoma team evaluates over 500 new lymphoma patients a year, resulting in nearly 10,000 outpatient visits and 7,000 chemotherapy visits annually.

NON-HODGKIN LYMPHOMA (NHL)

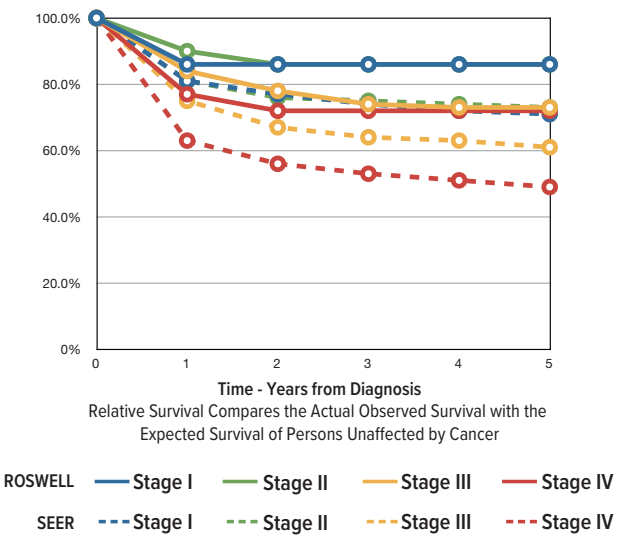
DIFFUSE LARGE B-CELL LYMPHOMA

Cancer staging is an important first step in understanding the nature and severity of disease and provides guidance for determining the appropriate treatment plan for individual patients. The graph below displays the American Joint Committee on Cancer defined cancer stage for our patients at the time of diagnosis for Roswell Park patients.

Our Patients 2014-2015
AJCC Stage Group
Diffuse Large B-Cell Lymphoma



Five-Year Relative Survival,
Diffuse Large B-Cell Lymphoma, Stages I, II, III, IV,
Cases Diagnosed (2006-2013)



Roswell Park 5-Year Relative Survival 2006-2013, Diffuse Large B-Cell Lymphoma						
	Source	1	2	3	4	5
N=121	Roswell Park Stage I	86%	86%	86%	86%	86%
N=89	Roswell Park Stage II	90%	86%	86%	86%	86%
N=78	Roswell Park Stage III	84%	78%	74%	73%	73%
N=207	Roswell Park Stage IV	77%	72%	72%	72%	72%

[1] American Joint Commission on Cancer (AJCC) Stage I-IV Diffuse Large B-Cell Lymphoma
[2] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017
[3] SEER and Roswell Park data are matched for age, sex and race but are not risk adjusted for comorbidities

Our Approach

Diffuse large B-cell lymphoma (DLBCL), the most common form of B-cell lymphoma, is an aggressive yet curable subtype of Non-Hodgkin's lymphoma. The management of DLBCL patients is challenging, as physicians need to balance the intense and rigid schedule of a curative treatment while addressing treatment related toxicities. Although a significant number of patients with diffuse large B-cell lymphoma benefit from standard rituximab-based chemotherapy (rituximab, cyclophosphamide, doxorubicin, vincristine and prednisone R-CHOP), a high percentage of patients fail to respond or relapse after initial remission as a result of intrinsic or acquired resistance.

Furthermore, the need to develop novel therapeutic strategies to treat relapsed/refractory aggressive lymphoma was delineated by the results of the prospective multicenter phase III Collaborative Trial in Relapsed Aggressive Lymphoma (CORAL) study. DLBCL patients previously treated with rituximab (R) in combination with standard doses of cyclophosphamide, doxorubicin, vincristine and prednisone (R+CHOP) had only a 34% event free survival (EFS) at 3 years after R-based salvage immunochemotherapy followed by high dose chemotherapy and autologous stem cell transplant (HDC-ASCT).

Our scientific efforts are focused on:

1. Defining the resistance pathways developed by lymphoma cells so we can incorporate novel therapeutic agents
2. Identifying patients with rare biologically resistant subtypes of DLBCL for which early treatment intensification strategies are necessary.

Molecular Subtypes and Clinical Outcomes:

- Molecular studies divide DLBCL into three subtypes with distinct pathogenesis and clinical outcomes: activated B-cell (ABC), germinal center B-cell (GCB) and primary mediastinal lymphoma (PML).

- Florescence in situ hybridization (FISH) studies identified another subgroup of DLBCL, classified as Double Hit DLBCL (DH-DLBCL), with a poor clinical outcome harboring concurrent gene rearrangements of the c-MYC, BCL2 and/or BCL6 proto-oncogenes, resulting in the over-expression of c-Myc, Bcl2 and Bcl6 proteins.

- DH-DLBCL is characterized by de-regulation of apoptosis and cell cycle progression, resulting in rapid cellular proliferation and resistance to apoptotic stimuli. Patients with Double Hit Lymphoma (DHL) have an estimated 8% overall survival when are treated with standard rituximab and CHOP chemotherapy stressing the need to use alternative approaches.

RESEARCH & INNOVATION

A new strategy for double hit lymphoma (DHL)

A retrospective review from our series revealed that 30 of 611 DLBCL patients had aberrations in c-MYC and BCL2 or BCL6 by FISH. These patients exhibited inferior response rates (RR) to rituximab-based chemotherapy, and a shorter progression-free survival (PFS)/overall survival (OS) when treated with standard R-CHOP chemotherapy, suggesting that newer therapies are in dire need.

[1] Gisselbrecht, C., Glass, B., Mounier, N., Singh Gill, D., Linch, D.C., Trneny, M., Bosly, A., Ketterer, N., Shpilberg, O., Hagberg, H., Ma, D., Briere, J., Moskowitz, C.H. & Schmitz, N. (2010) Salvage regimens with autologous transplantation for relapsed large B-cell lymphoma in the rituximab era. J Clin Oncol, 28, 4184-4190.

[2] Thieblemont, C., Briere, J., Mounier, N., Voelker, H.U., Cuccuini, W., Hirchaud, E., Rosenwald, A., Jack, A., Sundstrom, C., Cogliatti, S., Trougouboff, P., Boudova, L., Ysebaert, L., Soulier, J., Chevalier, C., Bron, D., Schmitz, N., Gaulard, P., Houlgatte, R. & Gisselbrecht, C. The Germinal Center/Activated B-Cell Subclassification Has a Prognostic Impact for Response to Salvage Therapy in Relapsed/Refractory Diffuse Large B-Cell Lymphoma: A Bio-CORAL Study. J Clin Oncol, 29, 4079-4087.

Over the last five years, Roswell Park has adopted a different strategy focused on identifying patients with DHL and treating them with a more intense approach. Every patient with DLBCL is screened for c-MYC, BCL2 or BCL6 gene rearrangements at diagnosis. Our therapeutic approach of patients with DH-DLBCL consists of the use of multi-agent chemo immunotherapy, central nervous system chemoprophylaxis and early consolidation with high dose chemotherapy and an autologous stem cell transplant (HDC-ASCT). As a result our clinical outcomes (i.e. cure rates) are better in this group of very aggressive B-cell lymphoma (Figure 1).

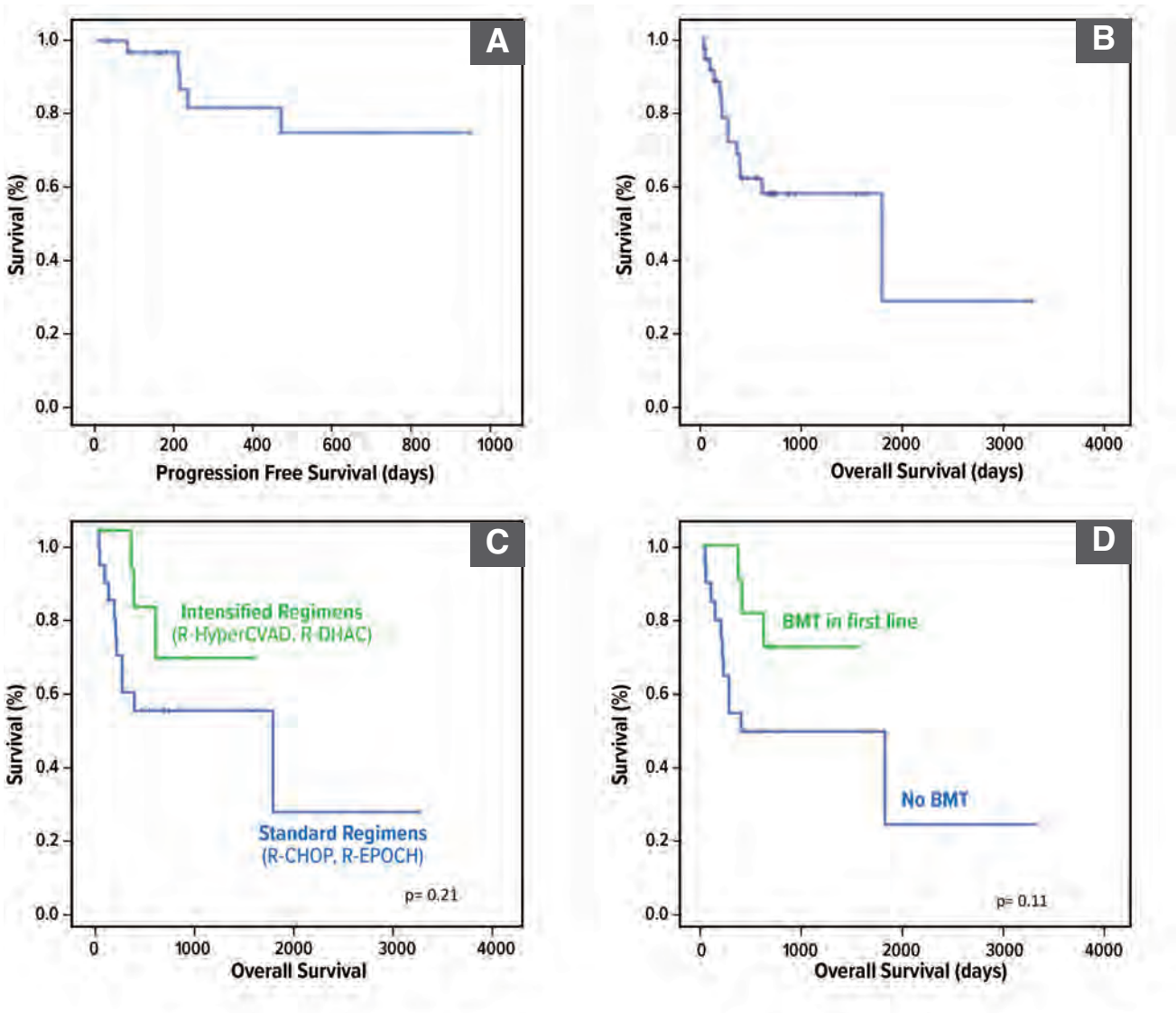


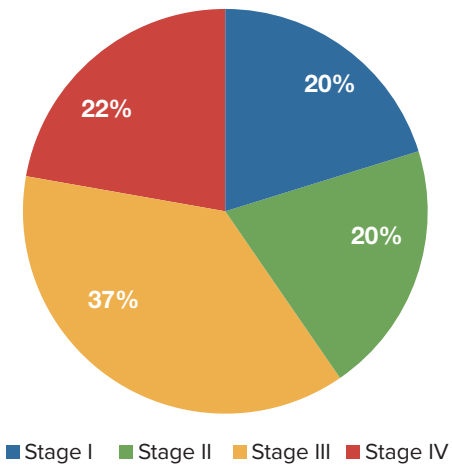
Figure 1. Clinical outcomes in double hit diffuse large B-cell lymphoma treated at our Institute. (A) Median progression free survival (PFS) not reached (NR) at 14.5 month follow up; (B) Median overall survival (OS) of 59.8 m; (C) OS with standard regimens (i.e. R-CHOP) is 59.8 months, while OS was NR with intensified regimens (R-HyperCVAD, R-DHAC); (D) High dose chemotherapy and autologous stem cell cell transplant (HDC-ASCT) associated with improved OS (median NR vs. OS of 12.7 months) when used in the first line setting.

NON-HODGKIN LYMPHOMA (NHL)

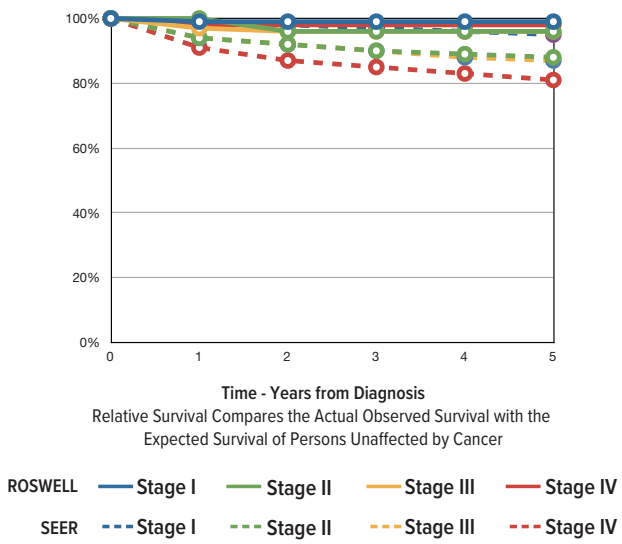
FOLLICULAR LYMPHOMA

Follicular lymphoma is a common type of NHL. It is also called indolent lymphoma as it spreads and grows at a slower pace.

Our Patients 2014-2015
AJCC Stage, Follicular Lymphoma



Five-Year Relative Survival,
Lymphoma, Stages I, II, III, IV,
Cases Diagnosed (2006-2013)

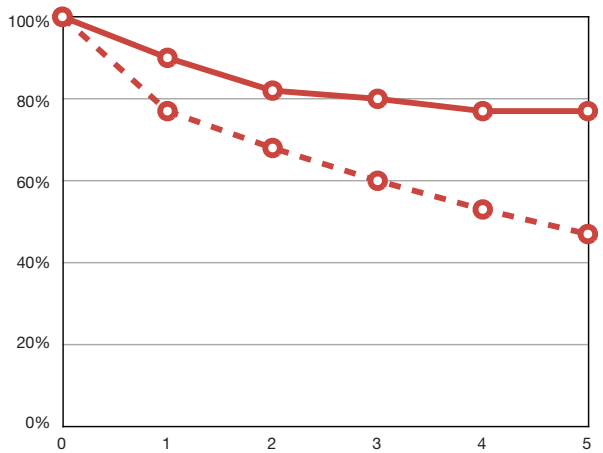


Roswell Park 5-Year Relative Survival 2006-2013, Follicular Lymphoma						
	Source	1	2	3	4	5
N=34	Roswell Park Stage I	99%	99%	99%	99%	99%
N=23	Roswell Park Stage II	100%	96%	96%	96%	96%
N=70	Roswell Park Stage III	97%	96%	96%	96%	96%
N=57	Roswell Park Stage IV	98%	98%	98%	98%	98%

[1] American Joint Commission on Cancer (AJCC) Stage I-IV Follicular Lymphoma
[2] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017
[3] SEER and Roswell Park data are matched for age, sex and race but are not risk adjusted for comorbidities

MULTIPLE MYELOMA

Five-Year Relative Survival, Multiple Myeloma, Stages I, II, III, IV,
Cases Diagnosed (2006-2013)



Time - Years from Diagnosis
Relative Survival Compares the Actual Observed Survival with the Expected Survival of Persons Unaffected by Cancer

ROSWELL **SEER**

Roswell Park and SEER Five-Year Relative Multiple Myeloma Survival (2006-2013)						
	Source	1	2	3	4	5
N= 384	Roswell Park	90%	82%	80%	77%	77%
	SEER	77%	68%	60%	53%	47%

[1] American Joint Commission on Cancer (AJCC) Multiple Myeloma
[2] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases Nov 2015 Sub (1973-2013 varying) - Linked To County Attributes - Total U.S., 1969-2014 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2016, based on the November 2015 submission. Accessed February 8, 2017
[3] SEER and Roswell Park data are matched for age, sex and race but are not risk adjusted for comorbidities

Kara Kelly, MD

PEDIATRIC ONCOLOGY

Roswell Park's pediatric program currently cares for children, adolescents and young adults up to 21 years of age with cancer and nonmalignant blood disorders. All of our physicians are board-certified in Pediatric Hematology Oncology and carry dual appointments at John R. Oishei Children's Hospital as well as Roswell Park. In the ambulatory center, we follow a pharmacist-directed process to ensure error prevention.

The pediatric program is the only program that provides this specialty care to patients in Western New York. With the opening of the new Oshei Children's Hospital, in November 2017, the two programs are enhancing their collaborative efforts to improve care to all children with cancer and blood disorders in Western New York and beyond. Through this working relationship, all patients will benefit from the specialization of an NCI-designated Comprehensive Cancer Center as well as the benefits of a freestanding children's hospital with pediatric subspecialists.

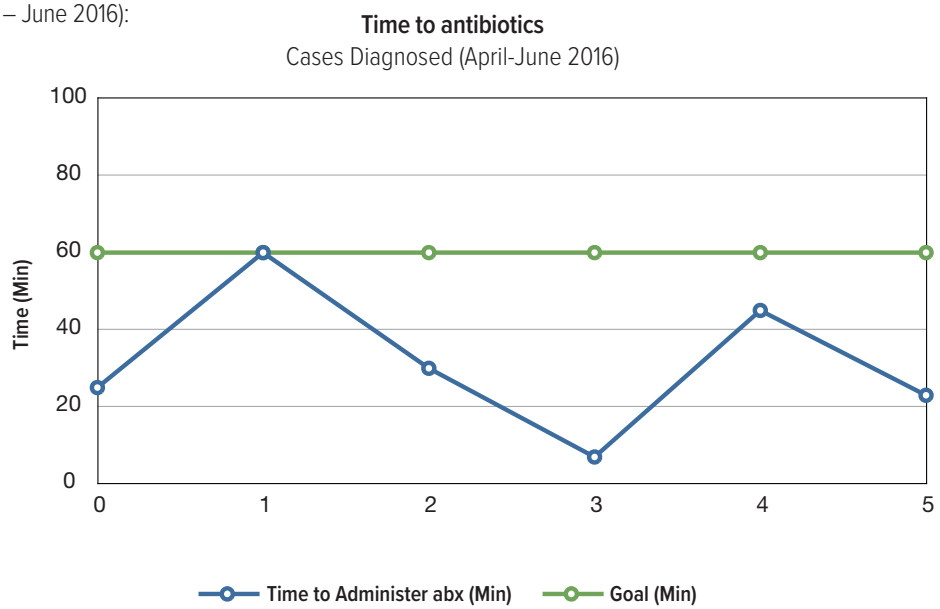
The pediatric program focuses on providing state-of-the-art patient care, and pioneering research as well as training and education of pediatric residents and fellows in pediatric hematology oncology.

Our program is a member of the Children's Oncology Group (COG) and the Pediatric Blood & Marrow Transplant Consortium (PBMTC), and participates in clinical trials through these cooperative groups.

New programs such as development of novel therapeutic agents like molecularly targeted therapies and MIBG-therapy for certain tumors, as well as expansion of the Pediatric Blood & Marrow Transplant program are under development with the joint collaboration. Further development of a pediatric-specific Quality Assurance program joining forces between the two hospitals is underway.

Time to antibiotics

Time to Antibiotics (TTA) has been recognized in the adult literature as the single most important factor for survival for many diseases. Mortality rate may increase with every hour of delay for antibiotic administration. Time to antibiotics for our pediatric patients (April – June 2016):



DISEASE FREE SURVIVAL

Pediatric Patients Alive			
	2010	**2011**	**5-Year DFS (%)**
Acute Lymphocytic Leukemia (ALL)	15/15	18/18	33/33 (100%)
Acute Myeloid Leukemia (AML)	2/3	1/2	3/5 (60%)
Neuroblastoma (NBL) (Stage I & II)	2/2	2/2	4/4 (100%)
Neuroblastoma (NBL) (Stage III & IV)	2/2	1/1	3/3 (100%)

Philip McCarthy, MD

BLOOD AND MARROW TRANSPLANT

The Blood and Marrow Transplant program at Roswell Park brings together a multidisciplinary team of specialists with decades of experience in transplant, radiation, pharmacy, infectious disease, dental oncology, cardiology, pulmonary, renal and gastrointestinal medicine, plus physical therapy and nutritional and psychosocial support. Uniquely, our BMT team also includes an epidemiologist who monitors patient outcomes and provides oversight of the program's dedicated database. Our examination of outcomes data leads to a robust quality assurance program and provides our clinicians with critical feedback to optimize patient care.

Roswell Park's BMT Program provides blood and marrow transplantation for many diseases, including:

- acute lymphoblastic and myeloid leukemias
- chronic lymphocytic and myeloid leukemias
- myelodysplastic syndrome and other myeloproliferative disorders
- multiple myeloma
- amyloidosis
- Hodgkin and non-Hodgkin lymphoma
- anemias (includling aplastic, Fanconi and Diamond-Blackfan)
- selected solid tumors

Our Approach

Roswell Park's team of specially trained clinicians and healthcare professionals supports a wide range of transplant services, including:

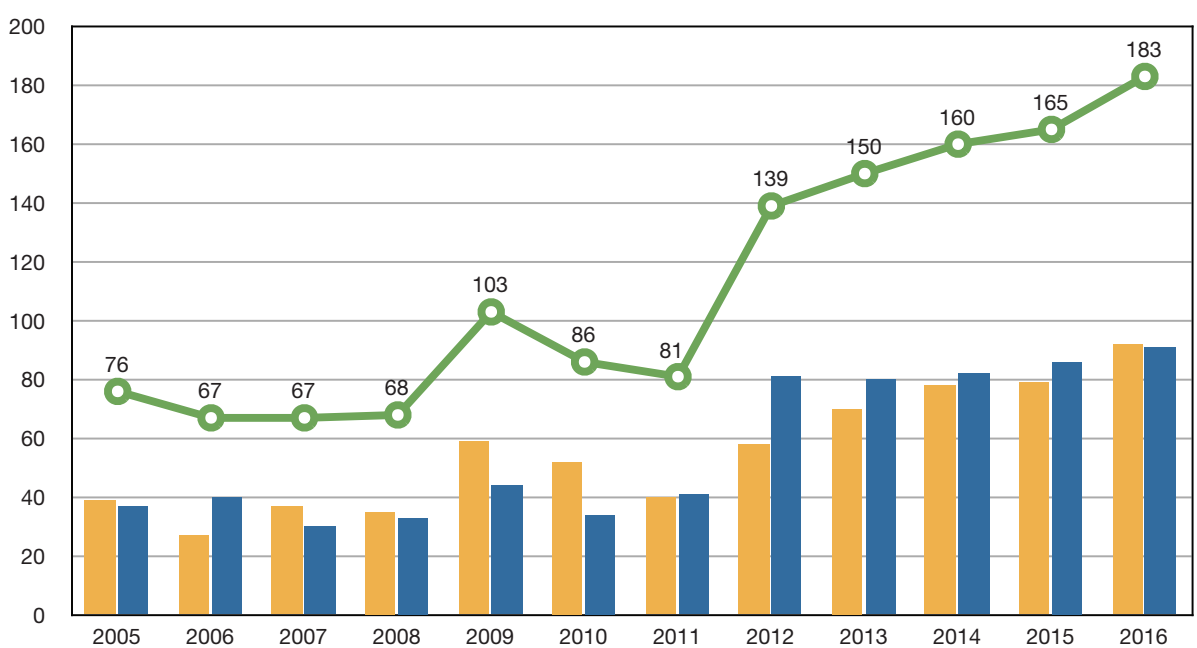
- Autologous transplantation using peripheral blood or bone marrow as the hematopoietic stem cell source
- Allogeneic transplantation (requiring a related or unrelated donor) using peripheral blood, bone marrow, or cord blood
- Haploidentical transplantation when no matched donor is available
- Reduced intensity and non-myeloablative transplants
- Onsite blood and marrow collection and processing
- Financial counselors, case management and discharge planning
- A dedicated inpatient and outpatient service with expertise in the care of immune-compromised patients
- A survivorship clinic providing care for more than 10 years specifically for BMT survivors

Our Volume

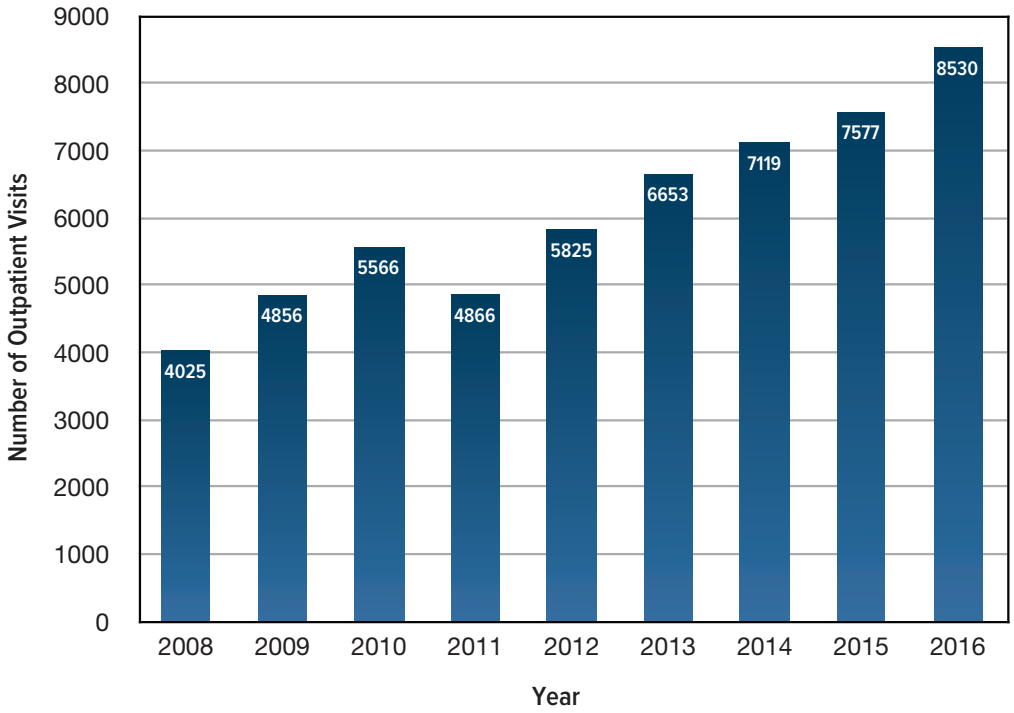
Since 1991, the BMT Program at Roswell Park has performed over 2300 transplants for more than 2100 patients. In the last two years (2015-16), we performed 348 transplants—171 allogeneic and 177 autologous.

Total Unique Patients Transplanted (excludes DLIs and 2nd BMTs)

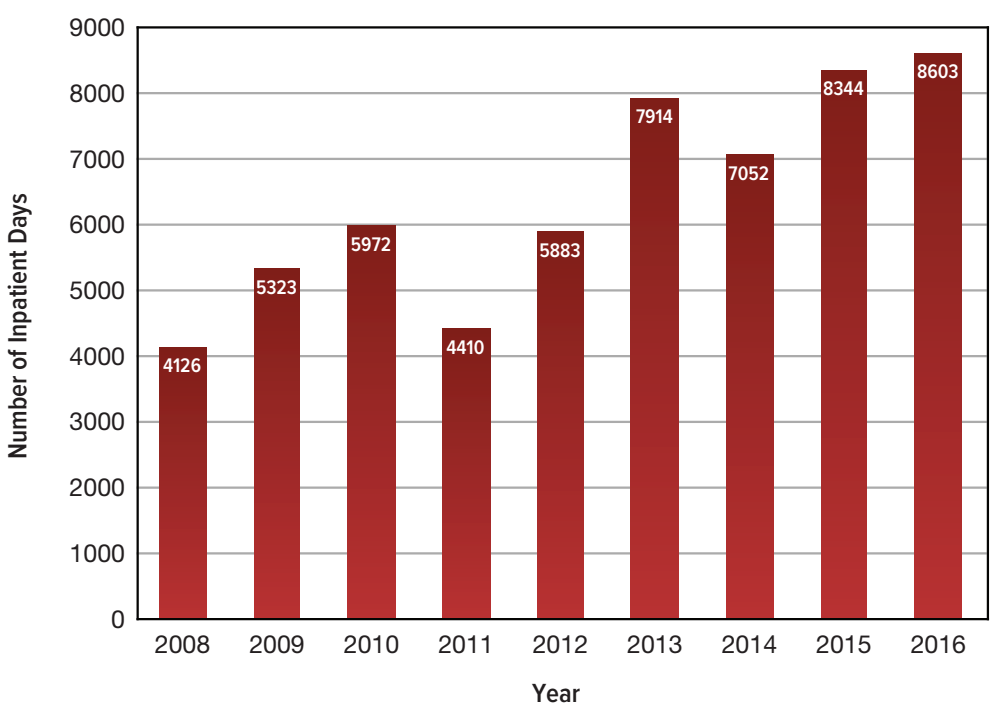
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Allo	39	27	37	35	59	52	40	58	70	78	79	92
Auto	37	40	30	33	44	34	41	81	80	82	86	91
Total	76	67	67	68	103	86	81	139	150	160	165	183



Outpatient Encounters 2008-2016



Inpatient Days 2008-2016



ACCREDITATIONS

- **Foundation for the Accreditation of Cellular Therapy (FACT).** We were first accredited in 2002 and held it continuously, with five successful reinspections, most recently in 2017. FACT accreditation confirms that our BMT Program meets or exceeds global standards in patient care and laboratory services.
- **Blue Distinction Center by the BlueCross BlueShield Association** in recognition of meeting high-quality transplant standards.
- **Be the Match®** (formerly the National Marrow Donor Program) approved donor collection center.

OUR TRANSPLANT PHYSICIANS ARE MEMBERS OF THE FOLLOWING:

- **American Society of Blood and Marrow Transplantation (ASBMT)**
- **American Society of Hematology (ASH)**
- **American Society of Clinical Oncology (ASCO)**
- **American Association for Cancer Research (AACR)**

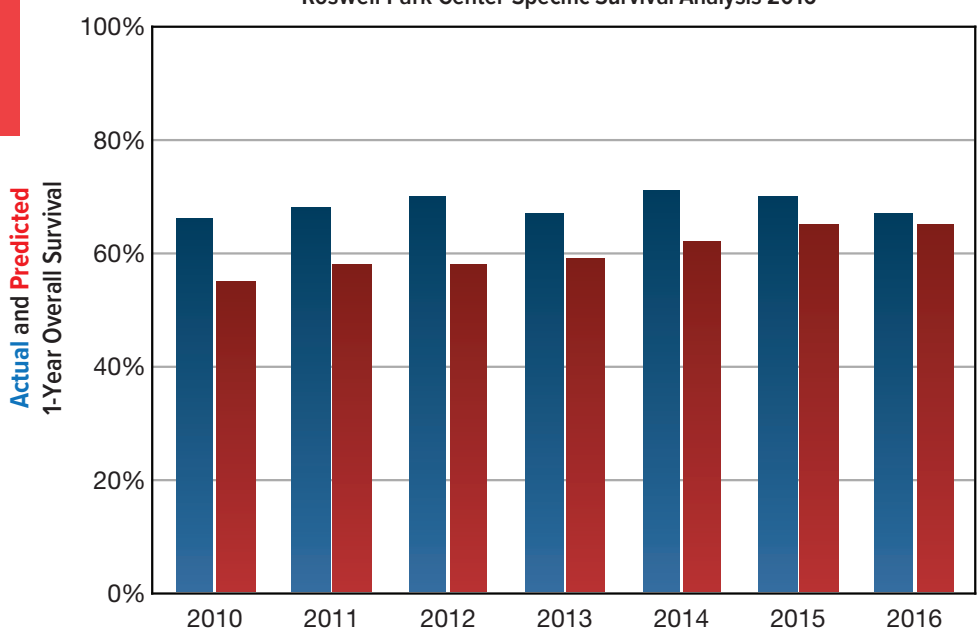
Roswell Park's BMT patients had a one-year observed survival rate of 70% — better than CIBMTR's prediction model of 65% (based on patients transplanted from 2011 to 2013).

[Source: 2015 CIBMTR Center Outcomes Report]

Survival Data

Roswell Park's actual one-year survival rate for BMT patients has consistently exceeded the expected one-year survival rate, as calculated by the Center for International Blood and Marrow Transplant Research (CIBMTR). The CIBMTR, under contract by the federal government and mandate by the Stem Cell Therapeutic and Research Reauthorization Act of 2010, collects outcome data on every allogeneic transplant performed in the United States. As a result, their clinical database now contains information on more than 350,000 transplant recipients.

Roswell Park Center-Specific Survival Analysis 2016



	2010	2011	2012	2013	2014	2015	2016
Actual Survival	66%*	68%*	70%*	67%*	71%*	70%	67%
Predicted Survival	55%	58%	58%	59%	62%	65%	65%

Analysis prepared by the CIBMTR (Center for International Blood and Marrow Transplant Registry). The 2016 report analyzes allogeneic BMT patients from 2012 to 2014, giving the expected and actual overall survival at 1 year. *There is a significantly higher survival rate than predicted for 2010 to 2014, (above the 95% CI). For 2015 and 2016, the allogeneic BMT survival rate is higher & within the 95% CI. The predicted survival is based on patient characteristics and type of transplant.

SURVIVORSHIP CARE

Our Survivorship Clinic, specifically for BMT patients, helps our patients receive exceptional life-long post-transplant care. Our clinic provides a full patient assessment, follow-up recommendations and subsequent referrals to gastrointestinal, renal, pulmonary, dental and dermatologic specialists as needed.

RESEARCH & INNOVATION

Our BMT Program emphasizes clinical research, including both investigator-initiated and cooperative group clinical trials, providing our patients access to care regimens and new treatments that may be unavailable at other centers.

We participate in the following:

- Blood and Marrow Transplant Clinical Trials Network (Roswell Park is a core member)
- Alliance for Clinical Trials in Oncology Foundation
- Chronic Graft Versus Host Disease Consortium.

SUPPORTIVE CARE

Combining the skills and resources of licensed social workers, psychologists and pastoral care staff, our program provides patients and families with the information, assistance and resources they need to face the many challenges related to transplant.

Our comprehensive services include:

- Educational programs such as BMT support groups and patient/family orientations.
- Emotional support including individual counseling and support groups to address anxiety, depression, and life changes.
- Practical resources for financial and legal concerns; advocates to secure insurance authorization and coverage for transplant and clinical trials, advance care planning; interpreters; information about disability, nursing home placement and hospice; and arrangements for transportation and lodging.
- Spiritual and coping assistance to meet the needs of the patient and family.

The mission of the **Center for Immunotherapy** is to save lives and reduce suffering of cancer patients by developing effective treatments that direct the body's immune cells to seek and destroy all types of cancer cells.

THE CENTER FOR IMMUNOTHERAPY (CFI)

The **Center for Immunotherapy** at Roswell Park houses three important facilities and nine individual research laboratories:

- **Immune Analysis Facility (IAF)** is responsible for serial monitoring of immunologic functions in cancer patients who are treated with biologic therapies, and in patients who participate in clinical trials or research protocols at Roswell Park. The development of immune monitoring assays is essential to determine the immune responses in patients receiving novel immune therapies and ultimately transitioning these therapies from the clinical trial phase to standard of care.

- **cGMP Therapeutic Cell Production Facility (TCPF)** manufactures therapeutic cell products in support of Phase I and II cell therapy clinical trials.

- **cGMP Vector Development and Production Facility (VDPF)** generates clinical-grade vectors/reagents that allow the genetic engineering of a patient's cells, boosting their ability to efficiently fight cancer.

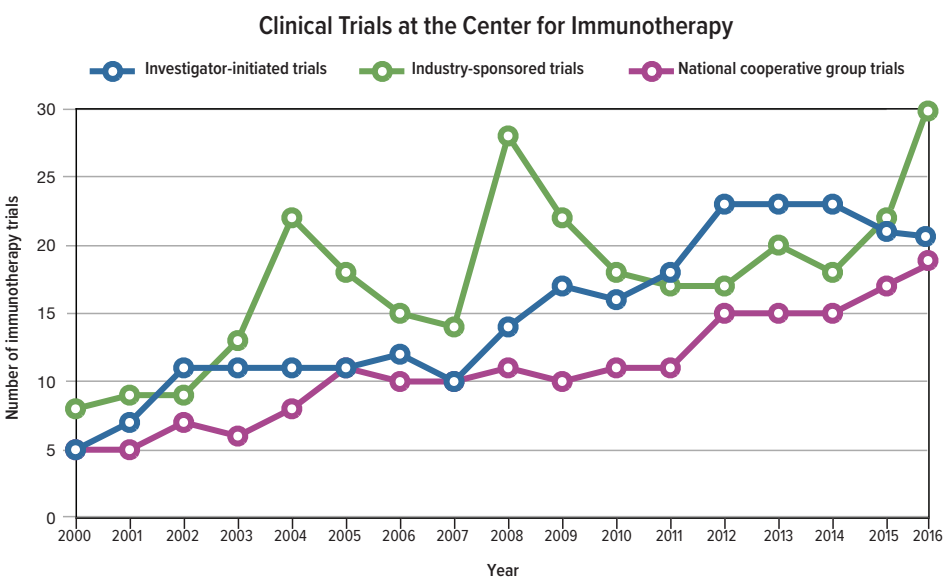
Our Research

Investigations in the CFI laboratories focus on the following areas:

- Cancer vaccines
- Oncolytic viral therapy
- Microenvironment
- TCR discovery
- Adoptive cell therapy
- Immunomodulation
- Cancer stem cells
- Genetic signatures

The CFI tests the variables in parallel clinical trials, rather than sequential trials, recognizing that several variables need to be brought together and tested individually in the construction of successful immunotherapies.

Our Volume



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Investigator-initiated trials	5	7	11	11	11	11	12	10	14	17	16	18	23	23	23	21	22
Industry-sponsored trials	8	9	9	13	22	18	15	14	28	22	18	17	17	20	18	22	30
National cooperative group trials	5	5	7	6	8	11	10	10	11	10	11	11	15	15	15	17	19

MODALITIES OF CURRENT IMMUNOTHERAPY TRIALS

What is it called?	How does it work?	What does it treat?
Checkpoint Blockades 	**Checkpoint blockades** are certain proteins in immune cells that act as "checkpoints," or brakes, on the immune system response. Drugs known as checkpoint inhibitors can be used to "release the brakes" on the immune system, allowing a stronger immune attack against cancer. If checkpoint inhibitors are drugs that let up on the brakes of the immune system, then immune modulators are drugs that "step on the gas" of the immune response.	CTLA-4 inhibitors. Yervoy® is currently FDA-approved for the treatment of melanoma and under study for use in non-small cell lung cancer and prostate cancer. Tremelimumab is under study in melanoma and mesothelioma PD-1/PD-L1 inhibitors. Keytruda® and Opdivo® are currently FDA-approved for the treatment of melanoma after failing prior treatment with Yervoy. Opdivo® is also FDA-approved for the treatment of non-small cell lung cancer. Other PD-1/PD-L1 inhibitors include MPDL3280A and MEDI4736, and have shown important benefits in patients with a number of cancer types, including: • **advanced melanoma** • **lung cancer** • **kidney cancer** Other checkpoint inhibitors, including ones targeting the immune proteins LAG-3 and KIR, are currently in development.
Oncolytic Viral Therapy 	**Oncolytic viruses** directly kill cancer cells and can also activate cells of the immune system, such as dendritic cells and T cells, to target and eliminate cancer throughout the body. Sometimes, oncolytic viruses are genetically modified to produce immune-stimulating chemicals, or to make them more specific for cancer cells.	No oncolytic virus immunotherapy is FDA approved. Oncolytic virus immunotherapies are currently under study in clinical trials for a number of cancers, including: • **bladder** • **lung** • **ovarian** • **prostate** • **breast** • **multiple myeloma** • **colorectal** • **melanoma**
Adoptive T Cell Transfer 	**Adoptive T cell transfer** is an anti-cancer approach that enhances the natural cancer-fighting ability of the body's T cells by removing immune system cells, growing and/or making changes to them outside of the body, and then re-infusing them back into the patient. There are 3 approaches to adoptive T cell transfer: • T cells are collected from a sample of a patient's tumor and multiplied in a laboratory. • T cells are taken out of the body and genetically modified to attack antigens on cancer cells. • T cells are taken out of the body and equipped with special receptors called chimeric antigen receptors (CARs). When given back to the patient, these "CAR T cells" recognize and attack cancer cells.	Several adoptive T cell transfer techniques have shown great promise in early clinical trials to treat: • **metastatic melanoma** • **lymphoma** • **leukemia** • **neuroblastoma and synovial cell sarcoma** • **ovarian cancer** Adoptive T cell transfer is currently under study for use in other solid tumors and blood cancers.
Vaccines 	**Cancer vaccines** trigger the immune system to recognize and attack certain markers, or antigens, present on or in cancer cells. Unlike preventive vaccines, which aim to prevent disease, cancer vaccines treat disease that is already there. Some cancer vaccines are made of individual proteins while others are made of whole cells. One promising type is made of antigen-presenting cells called dendritic cells. Cancer vaccines often require additional substances called adjuvants for optimal effectiveness.	The therapeutic cancer vaccine Provenge® is currently approved by the FDA to treat prostate cancer. Therapeutic cancer vaccines are being studied for treatment of many cancer types, including: • **Non-Hodgkin's lymphoma and Mantle cell lymphoma** • **Breast** • **Pancreatic** • **Brain** • **Colorectal**

BRIEF SELECTION OF IMMUNOTHERAPY CLINICAL TRIALS FROM CFI

	breast cancer	ovarian cancer	leukemia lymphoma	melanoma	lung cancer	colon cancer	prostate cancer
Checkpoint Blockade	I 243813 LUD2014-011 PH253914	I 243813 LUD2014-011 I 276015	PH 236713 PH 281816 P 35516	I 32216 291016 I 36716	I 286816 I 291016 PH 271415	PH 279015 I 291016 I 274515	I 279815 I 291016 PH 283216
Oncolytic Virotherapy			P 39716		P 39916		P 39716
Adoptive T Cell Transfer	I 258514 P 35216	I 258514 I 287616 I 283616	PH 251514 NCG 282816 NCG 27511	I 258514 P 35216 P 54117	I 258514	I 258514 P 35216	I 258514 I 223912
Cancer Vaccines	I 191511	I 248613 I 277115 I 288216	I 247913	I 215912	I 191511	I 191511	I 250113

For a full list of Roswell Park's Immunotherapy Clinical Trials, visit RoswellPark.org/Immunotherapy/Clinical-Trials

LANDMARK RESEARCH PROJECTS

- **New York State Stem Cell Science Program (NYSTEM) Project**
  The New York State Stem Cell Science Program (NYSTEM), which seeks to advance stem cell science in New York State, awarded Roswell Park's Deputy Director, Dr. Kunle Odunsi and his team an $11.8 million grant to accelerate therapeutic applications of stem cells and develop a new therapy for recurrent chemo-resistant ovarian cancer.

  Billions of mature immune cells can be "re-engineered" to become anti-tumor immune cells, and infused into patients. Unfortunately, these cells do not persist for long, and clinical responses are transient. Using a novel approach known as adoptive T cell therapy to harness the immune system, we hope to improve the odds for ovarian cancer patients. Dr. Odunsi and his team will re-engineer adult stem cells from a patient's blood, and infuse the reprogrammed cells back into that patient. Once inside the patient's body, the re-engineered stem cells become mature blood cells providing a continuous, potentially lifelong source of cancer-fighting immune cells for a sustained response. The preclinical data shows that human hematopoietic stem cells (hHSC) isolated from adult peripheral blood can be re-engineered to become mature T cells with the capacity to recognize and kill tumor cells.

In this clinical trial, re-engineered mature immune cells will be also utilized to provide the first attack on the cancer cells followed by help from the transgenic stem cell-derived progeny immune cells for a sustained long lasting anti-cancer response.

We hope that this stem cell approach will initially treat patients who have failed standard therapies, such as chemotherapy. In the future, we anticipate that it may also be used after remission to minimize the risk of relapse.

NYSTEM
NEW YORK STATE STEM CELL SCIENCE

SPORE Specialized Program of Research Excellence

- **Specialized Program of Research Excellence (SPORE) – Ovarian Cancer**
  Roswell Park Comprehensive Cancer Center and University of Pittsburgh Cancer Institute Ovarian Cancer SPORE
  NCI grant P50 CA159981
  www.roswellpark.org/research/ovarian-spore

Specialized Program of Research Excellence (SPORE) grants are a cornerstone of the National Cancer Institute's (NCI) efforts to promote collaborative, interdisciplinary translational cancer research. SPORE grants involve both basic and clinical/applied scientists and support projects that will result in new and diverse approaches to the prevention, early detection, diagnosis and treatment of human cancers. Each SPORE is focused on a specific organ site, such as ovarian, breast or lung, or on a group of highly related cancers, such as gastrointestinal cancers and sarcomas. SPOREs are designed to enable the rapid and efficient movement of basic scientific findings into clinical settings, as well as determine the biological basis for observations made in individuals with cancer or in populations at risk for cancer. The objective for all SPOREs is to reduce cancer incidence and mortality, and to improve survival and quality of life for cancer patients.

Roswell Park and University of Pittsburgh Cancer Institute (UPCI) Ovarian Cancer SPORE is a partnership between these two large and mature comprehensive cancer centers recognized as national leaders in the field of ovarian cancer. Through innovative translational clinically-focused research, this Ovarian Cancer SPORE aims to reduce the morbidity and mortality of ovarian cancer.

In order to achieve these objectives, the SPORE is designed around four individual research projects each with an associated clinical trial, four supportive shared resource cores, and developmental research and career development programs. The four research projects have been carefully designed with the potential to change clinical practice paradigms in ovarian cancer. By focusing on immune-based treatment approaches, this Ovarian Cancer SPORE aims to have a long-lasting impact on the outcome of ovarian cancer patients in a variety of clinical presentations. The varied immunologic approaches in the four "first-in-human" studies proposed will lead to:

1. **Improved response rates and outcomes** in patients newly diagnosed with ovarian cancer and those with relapsed chemo-resistant disease
2. **Development of novel strategies** to lengthen remission rates in ovarian cancer patients with recurrent disease
3. **Risk classification** for ovarian cancer development and prognosis
4. **Identification of factors** that may interfere with the efficacy of immunotherapeutic treatment approaches

www.RoswellPark.org/Immunotherapy

CLINICAL RESEARCH SERVICES

Clinical Research Services (CRS) is a National Cancer Institute-supported resource critical to the submission and implementation of research studies associated with our Clinical, Translational and Basic Science research programs. CRS works in collaboration with Roswell Park's investigators to provide oversight of the research process, accrual of participants to studies, and the collection of a complete and accurate study dataset.

Roswell Park participates in both intervention and non-intervention clinical studies.

- **Intervention studies** evaluate new cancer treatments, devices, diagnostic tools or prevention strategies and their effect on patients or individuals at risk for cancer.

- **Non-intervention studies** do not directly affect the study participant. Examples include observational, genetic and survey-driven studies.

Our volume

Active Clinical Research Studies

In CY 2016 Roswell Park had 446 active clinical research studies, including:

208 (47%) intervention studies

- 67 (32%) investigator initiated
- 69 (33%) industry sponsored
- 72 (35%) cooperative group studies

238 (53%) were non-intervention studies

Intervention Study Accrual

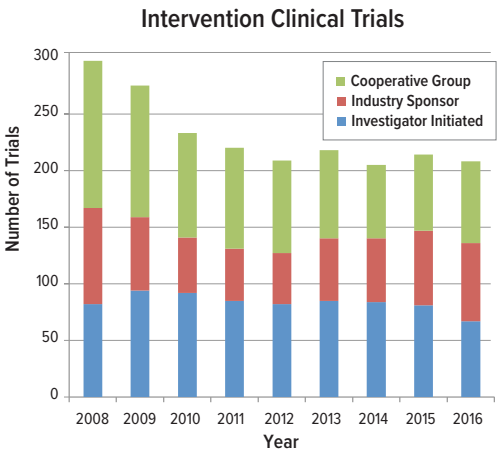
In 2016, Roswell Park enrolled 2021 participants to intervention studies, representing more than a two-fold increase from 2015, when 840 participants were enrolled. In 2016, enrolled participants included:

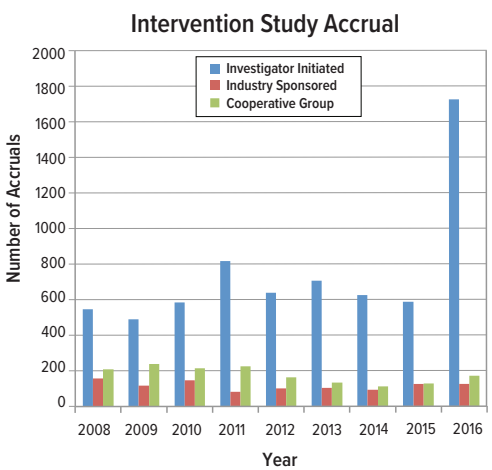
- **1725 (85%) to investigator initiated studies**
- **126 (6%) to industry sponsored studies**
- **170 (9%) to cooperative group studies**

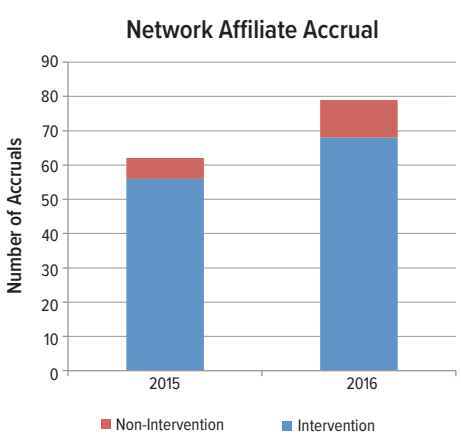
58 (3%) were accrued through the Roswell Park Affiliate sites.

Roswell Park Multi-Center Studies and National Clinical Trial Network (NCTN) Affiliates

Roswell Park Investigator Initiated studies are implemented at other NCI-designated comprehensive cancer centers and medical facilities across the nation. In addition, through the NCTN, Roswell Park has affiliate sites which allows state-of-the-art diagnostic, prevention and treatment studies conducted at Roswell Park to be shared with investigators outside of the Western New York area. This also allows patients outside the WNY region to have access to Roswell Park clinical trials closer to home. There are 23 active locations in 10 states.







In **2016** Roswell Park's CRS Network enrolled **79 participants**.

Roswell Park is a member site of the National Cancer Institute-funded **Cancer Immunotherapy Trials Network (CITN)**, a national multicenter group of top academic immunologists who work collaboratively to stimulate clinical research studies of high-priority and novel cancer immunotherapies.

THE STAGES OF CLINICAL RESEARCH STUDIES

Most clinical research involves the testing of a new drug. Each study progresses in an orderly series of steps, called phases. This allows researchers to ask and answer questions in a way that gives reliable results, while protecting patients. Clinical studies are usually classified in three phases:

- **Phase I studies**... are the first step in testing a new drug or intervention in humans. Researchers evaluate what dose is safe, how a new agent should be given, and how often.
- **Phase II studies...** continue to test the safety of the drug or intervention, and evaluate how well it works. Phase II studies usually focus on a particular type of cancer.
- **Phase III studies**... compare a new agent or intervention with the current standard. Phase III studies may include hundreds of people across the country.

PATIENT PROTECTION	SCIENTIFIC REVIEW COMMITTEE	INSTITUTIONAL REVIEW BOARD (IRB)
Before accepting patients, clinical studies at Roswell Park are subject to a rigorous review by two panels established to protect participants.	This committee is made up of a multidisciplinary team of experts who review the study to make sure it is based on sound science.	This board makes sure the risks involved in the study are reasonable when compared to the possible benefits; and closely monitors the study's progress from beginning to end. Federal rules require that each IRB be made up of at least 5 people. One member must be from outside the institution running the study. IRBs are usually made up of a mix of medical specialists and non-medical members of the community.

ROSWELL PARK'S EARLY PHASE PROGRAM

The multidisciplinary Early Phase program team meets weekly to review studies and patients on studies. A dedicated clinical research center and a translational oncology laboratory are among the unique aspects of this program.

Targeted therapies include:

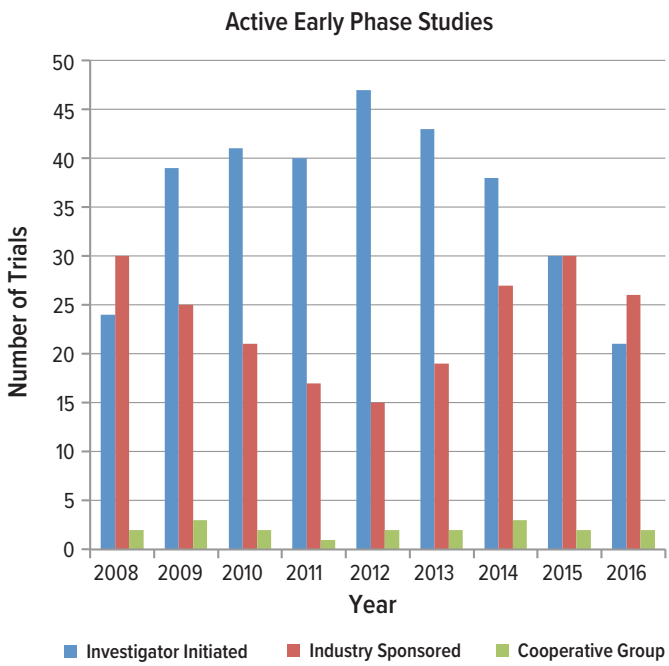
- SRC kinase and tublin polymerization inhibitor
- P13K/MTOR targeting
- Notch receptor targeted antibody – drug conjugate against DLL
- Carbazole Compound – Inhibits NF-κB and activates p53
- Antibody drug conjugate for patients with cancer expressing C4.4a
- Anti CTLA4
- Histone Deactelase inhibitor
- ALK targeting

Immunotherapies include:

- Cancer Vaccines
- Anti PD-1
- Anti PDL-1
- Cellular Therapy
- Engineered T-Cell Therapy

Active Early Phase Studies

In **2016**, Roswell Park had **49 active early phase clinical research studies**, including **21 investigator-initiated trials.**



CLINICAL RESEARCH CENTER

Roswell Park's Clinical Research Center focuses specifically on the development of new cancer treatments. The Center provides more treatment options for patients through clinical trials, and expanded Roswell Park's Early Phase program, the critical first step toward FDA approval.

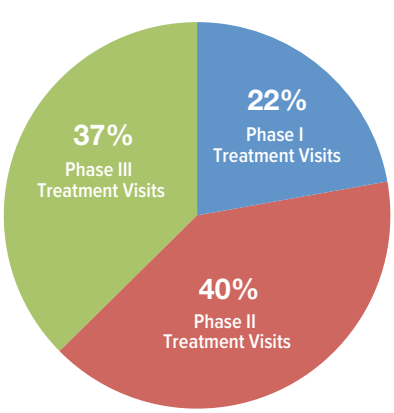
The Clinical Research Center provides the highest level of patient safety and quickly generates precise data on potential new treatments. These capabilities help attract studies sponsored by the National Cancer Institute and sponsoring pharmaceutical companies, while supporting studies launched by our own scientists.

Our Volume

Total Patient Visits for CY 2016 was 2,919, which included:

- 508 Phase I patient treatment visits
- 925 Phase II patient treatment visits
- 856 Phase III patient treatment visit

Average patient wait time = 6 minutes
Average length of a Phase I treatment visit = 5 hours 38 minutes




Anurag Singh, MD

RADIATION MEDICINE

Roswell Park's Radiation Medicine department is devoted to being the regional leader in innovative treatment methodologies supported by research and multidisciplinary partnerships.

Radiation therapy (or radiotherapy) uses high-energy radiation, in the form of waves or particles, to destroy cancer cells by damaging their DNA. Because radiation can harm healthy cells, treatment must be carefully planned and precisely conducted to minimize side effects.

The Radiation Medicine team plans your treatment carefully choosing:

- The type of therapy
- The dose of energy to be delivered (how much, over how many treatments)
- The area to be radiated

HYPOFRACTIONATION

One of the most successful new approaches in radiotherapy involves hypofractionation, which divides treatment into larger doses delivered in fewer sessions over a shorter time period than standard radiotherapy.

Roswell Park has participated in numerous clinical trials with other national and international cancer centers that demonstrate giving radiation over a shorter time (hypofractionation, stereotactic radiosurgery, stereotactic body radiotherapy) results in similar efficacy to prolonged treatments, with potential advantages that include:

- Increased convenience to patients because of fewer treatment days
- Lower cost to patients from fewer copays and reduced travel expenses
- Improved use of resources for physicians from a fewer number of treatments per patient and overall.

Some highlights of our work in Radiation Medicine in particular disease sites:

NON-SMALL CELL LUNG CANCER

Patients receiving stereotactic body radiotherapy (SBRT) as treatment for non-small cell lung cancer (NSCLC) benefit as much from a single fraction (or dose) of radiation as they would from the standard three-dose treatment schedule — and with significant advantages in terms of convenience for patients and caregivers.

The study involved 98 patients treated for locally controlled peripheral NSCLC, or tumors located along the outside edges of the lung, between 2008 and 2015. The research team found that overall survival at two years was 72% for patients treated with a single dose of 30 grays (Gy) of radiation, compared to 59% for those who received 60 Gy total delivered through three 20-Gy doses. Incidence and severity of adverse events was similar for the two groups of patients, with 14 patients (29%) treated on the one-dose 30-Gy schedule experiencing side effects of grade 3 or higher, compared to 17 patients (35%) those receiving three 20-Gy doses.

Used as an alternative to surgery for some patients with solid tumor cancers, SBRT allows oncologists to deliver radiotherapy in briefer, higher-intensity doses and with more precise targeting of the tumor compared to standard radiotherapy.

PROSTATE CANCER

To date, three multicenter randomized trials comparing modern hypofractionation (20-28 treatments) with conventional fractionation (37-41 treatments) have reported similar effectiveness and toxicity for early stage prostate cancer. Roswell Park participated in one of these trials (NRG Oncology 0415) that randomized 1,115 patients to a two-arm trial that compared conventional fractionation (a total of 41 daily treatments) to a shorter, hypofractionated course of radiation (a total of 28 treatments). Results show that the 5-year disease-free survival rates were similar, as were the patient-reported outcomes for bowel, urinary and sexual function. Taken together, the three trials involving 5,500 patients, found that patients with low- and intermediate-risk prostate cancer who were treated with a shorter radiation course (4 or 5 weeks) had similar cancer control and side effects as longer radiation courses lasting 8 weeks In addition:

- Toxicity was uncommon after 5 years, and no difference was noted between the shorter and longer treatment arms
- Long-term toxicity after the shorter treatment has now been reported and remains minimal.

An estimated 15 to 25% of prostatectomy patients will develop prostate specific antigen (PSA) recurrence. In three randomized trials, post-prostatectomy radiotherapy to the prostate bed was shown to reduce the risk of recurrence in patients with disease through the prostate capsule or those who had positive surgical margins. Post-prostatectomy radiotherapy is a well-accepted standard practice for adverse pathological features following surgery or at a sign of PSA recurrence. In this setting, radiation has traditionally been delivered over 6 to 8 weeks.

At Roswell Park, Michael Kuettel, MD, PhD, MBA, and his colleagues are exploring an alternative dose-fractionation schedule that exploits the radiobiological properties of prostate cancer to shorten overall treatment time.

GYNECOLOGICAL CANCERS

In the treatment of gynecological tumors, radiation therapy has typically been employed with external beam radiotherapy to the whole pelvis followed by a boost to the primary tumor using interstitial brachytherapy. Complication risks including bleeding, infection and coagulopathy are managed with IV antibiotics and blood thinners over the course of the procedure. While the ability to deliver a high dose of radiation to the tumor results in good local control with less radiation toxicity to normal surrounding tissue, the treatment-related side effects are not insignificant.

SBRT is an emerging alternative to deliver the boost dose of radiation to the tumor without the surgical risks of brachytherapy. SBRT utilizes external beam radiotherapy to focus the dose to the tumor while minimizing the dose to surrounding normal tissue. In order to further reduce the risk for side effects, Roswell Park's David Mattson, MD, developed a vaginal applicator to hold the tumor in place thereby increasing the precision of treatment and resulting in fewer side effects. Vaginal-applicator-guided SBRT for treating gynecological cancer offers a less-invasive, targeted approach that recent reports suggest are effective and safe.

BREAST CANCER

Breast conservation includes both breast-conserving surgery and adjuvant radiation. The role of radiation in breast cancer treatment is to reduce the risk of recurrence. Over time, the options for radiation in this setting have expanded tremendously and include shorter courses of therapy, partial breast radiation, and consideration of omitting radiotherapy altogether. For select patients with early stage breast cancers at lower risk for recurrence, omission of radiation is an option.

Traditionally, radiation to the whole breast was given over a course of 5 to 5.5 weeks using conventional fractionation (doses of 1.8-2 Gy per fraction). At Roswell Park, shorter, hypofractionated courses using doses of >2 Gy given over 3 weeks are now a standard option for whole breast radiation. Accelerated partial breast radiation treats the surgical site and surrounding tissue using a variety of techniques, such as brachytherapy (use of a radioactive source through a catheter or device) or external beam radiation in a manner similar to whole breast radiation. Roswell Park participated in a multicenter randomized trial of partial breast radiation (NSABP B-39) for which preliminary results are anticipated soon.

A boost delivers additional radiation to the surgical site, and is used in some patients with higher risk features to further reduce their recurrence risk. This boost is usually given over an additional 1 to 1.5 weeks following whole breast radiation. Roswell Park participated in clinical trial RTOG 1005 to evaluate whether boost treatment could be given concurrently with whole breast radiation versus sequentially, thus maintaining the benefits of both shorter treatment courses and the boost's role reducing recurrence risk. Preliminary results have been published and longer data is anticipated.

Post-mastectomy radiation to the chest wall and regional lymph nodes is used to improve locoregional control and overall survival. Indications for post-mastectomy radiation have evolved and expanded over the past few decades and are based on an individual patient's risk factors for recurrence. Ongoing advancements in systemic therapy options, increasing use of neoadjuvant treatment, evolving surgical management of the axilla (use of sentinel lymph node biopsy and/or axillary lymph node dissection), and reconstruction all influence radiation treatment decision making and planning. An updated ASCO Post-Mastectomy Radiotherapy Guideline was recently published to address recent practice changing data and complexities in treatment. Roswell Park participated in developing this guideline.

Regional nodal radiation remains standard for patients with advanced nodal disease, but it is no longer solely for patients with 4 or more positive lymph nodes. Regional nodal radiation should be strongly considered for patients with 1 to 3 positive lymph nodes, and for select high risk node negative patients. These definitions apply in the upfront surgical setting. For patients treated with neoadjuvant therapy, indications for radiation are based on both clinical (prechemotherapy) staging and surgical pathologic results, thus patients who are node positive at presentation should be seen by a radiation oncologist to discuss regional nodal irradiation regardless of pathologic response. Patients with residual nodal disease following neoadjuvant chemotherapy are at high risk for recurrence and adjuvant radiation is recommended. Roswell Park participated in the MA 20 trial of regional nodal radiation, which was pivotal in defining the role for radiation in patients with 1 to 3 positive lymph nodes and/or high-risk node disease.

BONE METASTASES

Bone metastases are a common manifestation of distant relapse or initial presentation of incurable disease, from many types of solid malignancies—especially from cancers of the lung, breast and prostate. Palliative treatment of bone metastases may provide symptom relief and is frequently used to palliate pain. However, it is also recommended for palliation of other symptoms including neurological symptoms caused by spinal cord compression, neuroforaminal compression, and pathologic or impending fracture of involved bones.

The American Society for Radiation Oncology (ASTRO) has been a leader in defining appropriate duration of treatment of bone metastases. At Roswell Park, over 95% of palliative radiation courses for bone metastases utilize fractionation schemes that are compatible with the ABIM/ASTRO Choosing Wisely campaign and are 10 fractions or less. Moreover, approximately 20% of these courses are single-fraction courses, and this percentage has increased over the past two years.

BRAIN AND SPINE

Roswell Park leads the nation and the world in the use of Gamma Knife Radiosurgery (GKRS) in lieu of whole brain radiation therapy (WBRT). We have demonstrated that this approach results in significantly lower doses to the brain as a whole and to the hippocampus, resulting in significantly better neuro-cognitive outcomes for our patients. This approach also allows the reduction of time the patient spends in our department from 3 weeks to 3 hours on a single day. This time savings means patients may begin or resume systemic therapy sooner, having a direct impact on their systemic disease control, which yields a lower risk of subsequent brain metastases.

RESEARCH AND INNOVATION

After analyzing over nearly 3,000 patients with brain metastases, researchers at Roswell Park showed a control rate is 95% with a complication rate of less than 5%. Subsequent surgical removal of tumors not responding to radiosurgery was less than 1%.

By using repeated radiosurgery, we have reduced the need for WBRT in our patients by 67%. In the pre-GKRS, 100 patients would undergo a collective 1500 visits for managing their brain tumors, now the standard is less than 500 visits.

The duration over which these patients are managed when treated with repeated SRS has changed significantly compared with systemic therapy options.

Time frame for new brain metastasis among 94 patients treated with repeated stereotactic radiosurgery

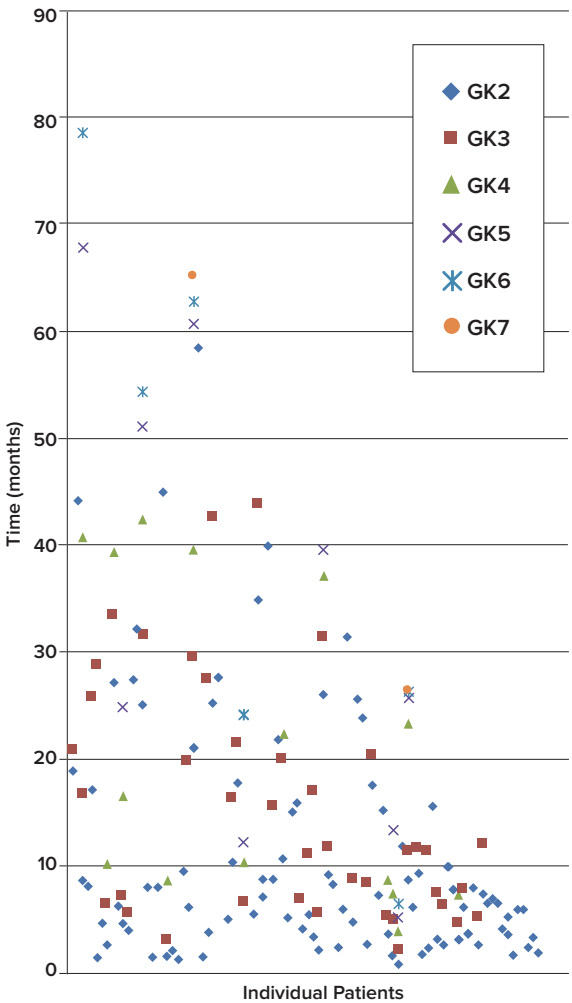
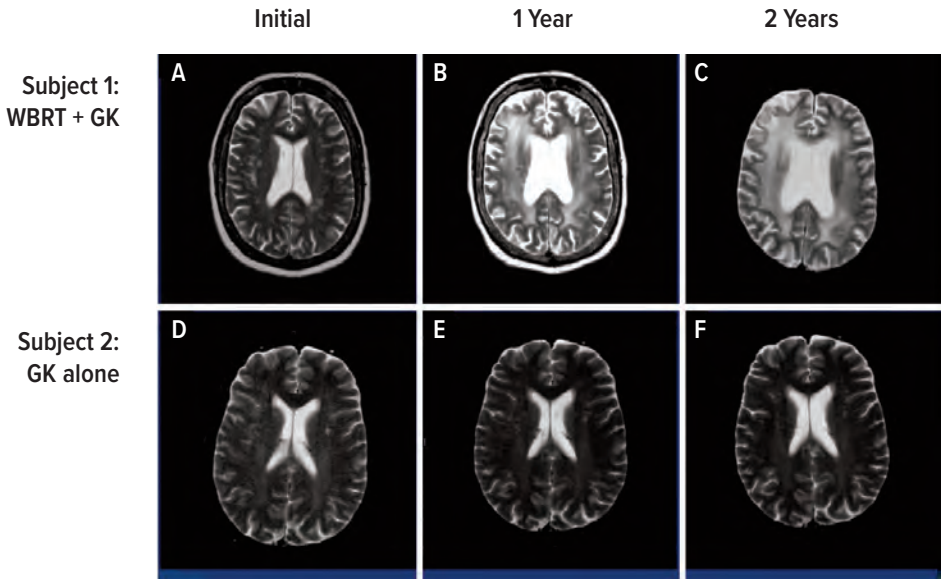


Figure 1: First SRS treatment for all patients represents the beginning of their timeline. The individual 3-hour visits for these patients are distributed over months of survival[1]

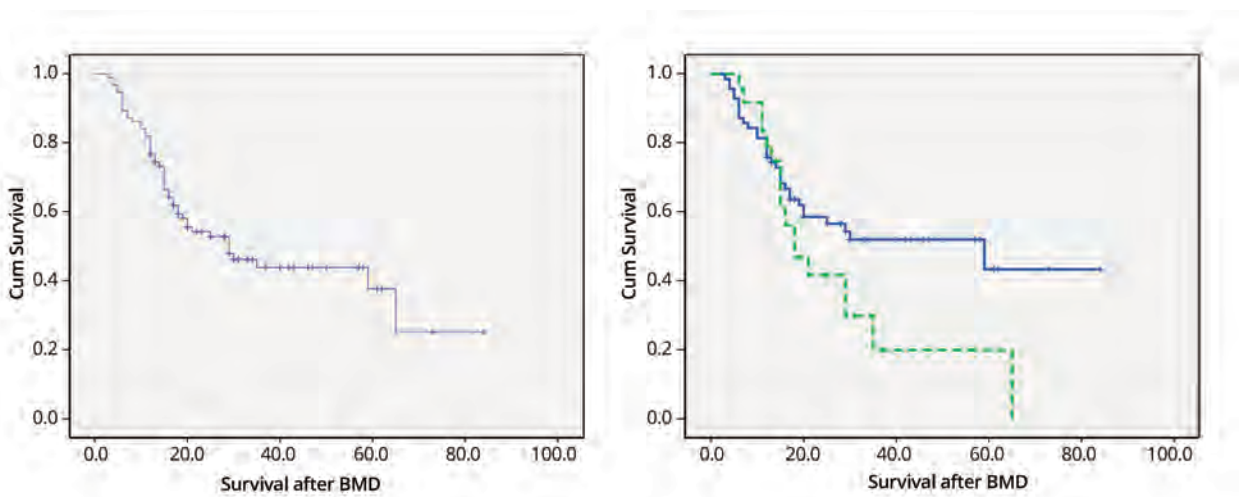
[1] Rivers C, Prasad S, Bass M, Tranquilli M, Malhotra H, Plunkett RJ, Fenstermaker RA, Prasad D. Brain and hippocampal doses in patients with repeated stereotactic radiosurgery for brain metastasis. Journal of Radiation Oncology. 2017 Mar 1;6(1):49-56.

By replacing early use of WBRT with gamma knife radiosurgery, we observe decreased changes in the white matter—or leukoencephalopathy — as seen by the reduced whiteness of the brain on panels D and F.



Improved Median Survival

Left panel shows overall outcomes in patients treated with repeat GKRS, with or without WBRT. Right panel shows that patients who required WBRT (green) represent a poorer prognosis group than those managed with GKRS alone. Delaying the use of WBRT saves cognitive abilities for more patients for longer duration of time.

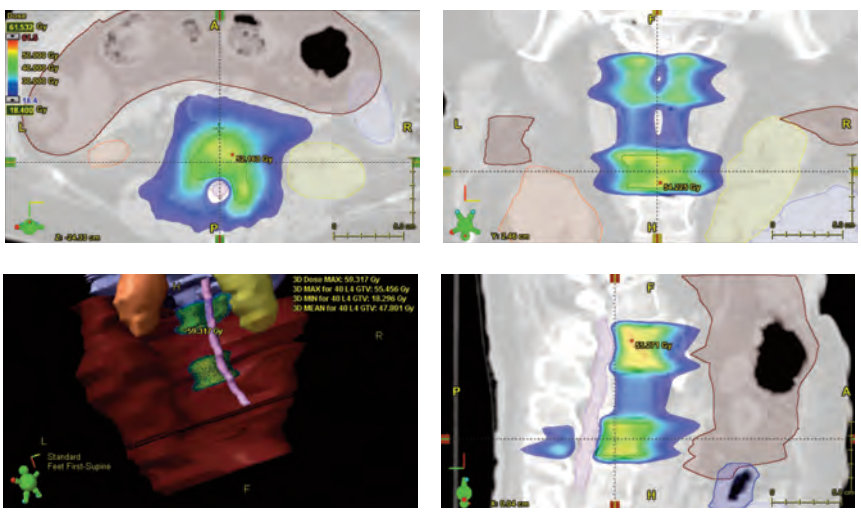


SPINE SBRT — REDUCING SPINAL RADIATION FROM 10 DAYS TO 10 MINUTES

Roswell Park has offered spine stereotactic radiotherapy since 2006, which has allowed the successful management of spine tumors (malignant and benign) with fewer fractions and better outcomes in terms of pain control and tumor control.

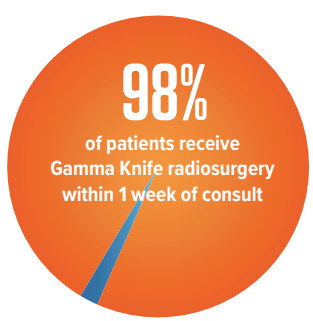
Integrating use of the best image-guided LINACS including TrueBeam® and a team of highly skilled and experienced medical physicists, dosimetrists and therapists makes this possible.

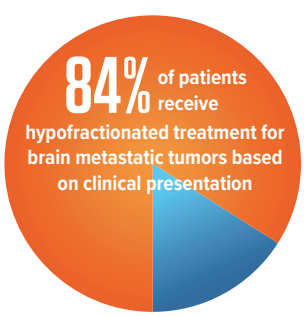
We combine SBRT with vertebroplasty to manage collapsed vertebrae and radiofrequency ablation as indicated.

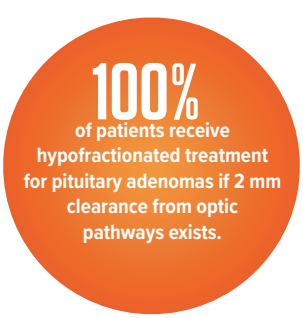


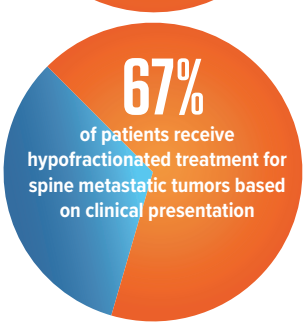
Two individual vertebral bodies are targeted in green while the intervening vertebra and surrounding tissues are spared (blue). Pre-SBRT, this would have been a treatment that included three vertebrae, including one vertebra above and one below, with considerable spill to surrounding tissues, and take 2 weeks to complete. This was delivered in 3 days.

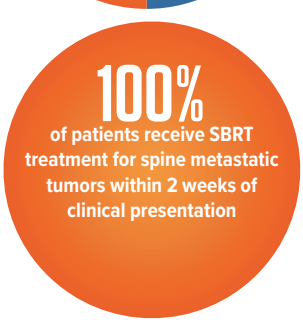
HIGHLIGHTS OF THE BRAIN & SPINE PROGRAM

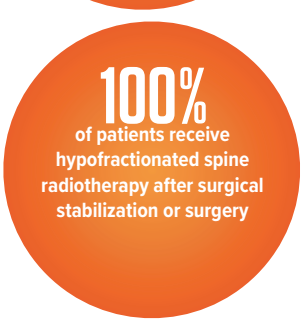












In 2016
The Resource Center issued an average of
150 wigs and hats
per month,
amounting to more than
1800
for the year.

PATIENT EXPERIENCE

As a comprehensive cancer treatment center, a goal of Roswell Park is to ensure that we put our patients and families first. Roswell Park measures the quality of the care our patients receive not only through clinical outcomes, but also by the emotional and physical journey they experience. We value our patients' feedback and ask them to take an active role in their care.

Roswell Park employs a patient-centered care model through:

- Multidisciplinary care
- Interdisciplinary collaboration
- Patient advisory committees

Roswell Park aims to support the whole patient by ensuring the treatment plan includes:

- Patient treatment goals
- Quality of life
- Patients' cultures
- Personal preferences

The Resource Center for Patients and Families

The Resource Center for Patients and Families offers information and support for all visitors to Roswell Park. It provides patient education materials from our clinicians as well as national cancer organizations (NCI, NCCN, etc.), access to WiFi, computers and printers, a lending library of books, DVDs and CDs, and a complimentary wig program for any cancer patient in the community.

Patient Experience/Patient Advocacy Department

The Office of Patient Experience is dedicated to working with all areas of Roswell Park to enhance the Roswell Park experience for patients and families. This department, which includes Patient Advocacy and Patient Navigation, partners with Roswell Park departments to create ongoing patient-centered care and experiences.

Patient Advocacy

Patient advocates serve as liaisons between healthcare services and patients and families.

Patient advocates:

- **Assist** patients and families to resolve issues with respect to coordination of care
- **Mediate** communication between families and caregivers
- **Improve** overall quality of service
- **Refer** patients and families to needed services and resources

Patient advocates represent patient and family interests on the Institutional Review Board, Ethics Committee, Quality Improvement Committee, Quality of Life Committee, and Workplace and Patient Safety Committee

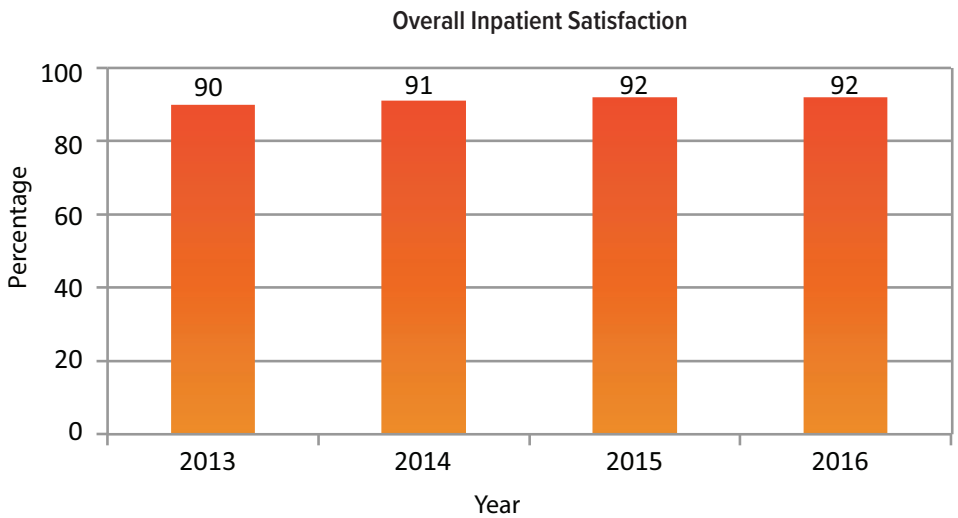
PRESS GANEY

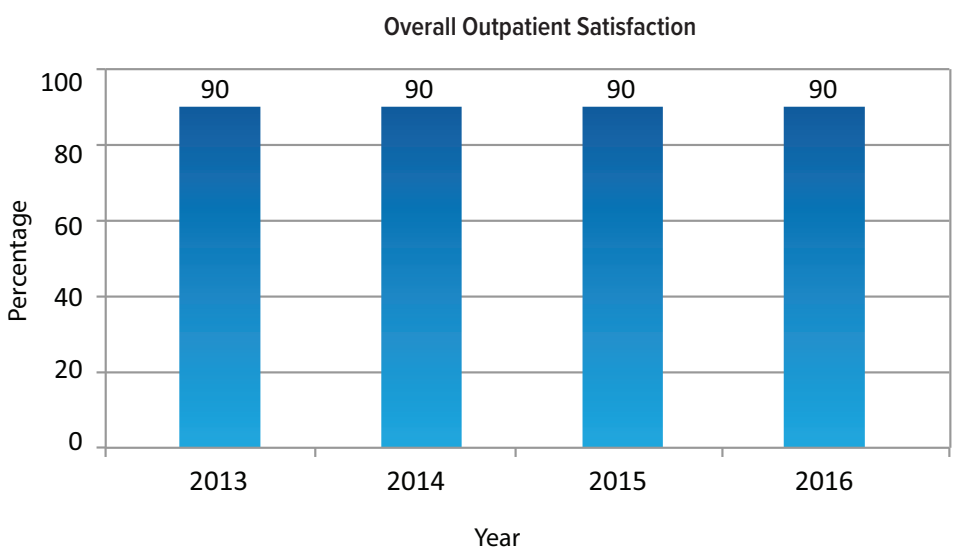
Press Ganey maintains a national database for benchmarking, patient-satisfaction measurement and improvement services. Roswell Park has been using Press Ganey for patient satisfaction benchmarking since 2002, and named Guardian of Excellence for inpatient services in 2014, 2015 and 2016.

Receiving the Guardian of Excellence Award means that Roswell Park has achieved and sustained performance in the top 5% of Press Ganey users.

[1] For the more information on the survey results please visit: www.roswellpark.org/about-us/quality-improvement/patient-satisfaction

ROSWELL PARK OVERALL PATIENT SATISFACTION





PATIENT SAFETY AND QUALITY

Roswell Park is committed to promoting a strong safety culture that reduces errors and improves patient outcomes. The Roswell Park Patient Safety and Quality programs work to ensure that clinical care and research are continuously monitored, measured and improved.

Patient Safety Committee (PSC)

At Roswell Park, the Patient Safety Committee serves as the coordinating point and information-sharing forum for patient safety issues and is comprised of a multidisciplinary team of administrators, clinicians and patient safety experts.

The responsibilities of the PSC include:

- Promotion of a culture of safety that encourages and facilitates event reporting, communication and teamwork
- Oversight of the root cause analysis process
- Coordination of patient safety activities, including recommendations for performance improvement opportunities and process change
- Ensuring that faculty and staff have knowledge of, and consider implementing, current nationally endorsed patient safety recommendations
- Medication Safety

MONITORING OUTCOMES

The **National Surgical Quality Improvement Program (NSQIP)** is a quality improvement program developed and supported by the American College of Surgeons specifically to decrease patient complications after surgery and improve outcomes for surgical patients overall. Roswell Park has been a voluntary participant in NSQIP since 2011.

The program is standardized nationally using a validated sampling methodology which provides robust risk-adjustment. The well-defined clinical outcomes are obtained by credentialed Surgical Clinical Reviewers and are more robust than traditional administrative coding. Roswell Park uses the benchmarked data to develop and monitor quality improvement strategies. Numerous studies show that NSQIP participation benefits patients and hospitals by reducing complications of care, time in the hospital, and the cost of care.

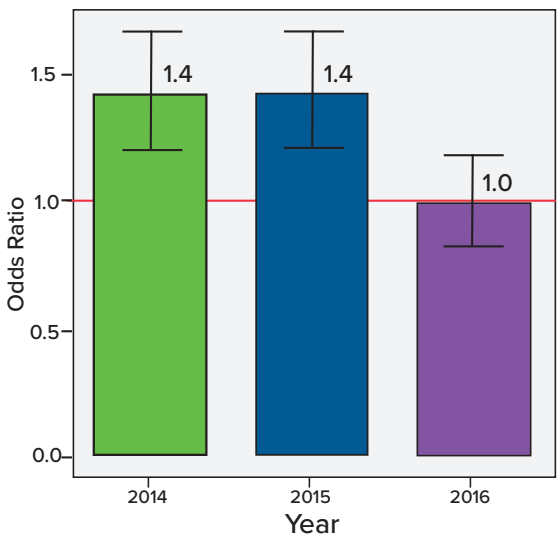
NSQIP-driven organizational improvement projects

The multidisciplinary Pneumonia Prevention Team at Roswell Park has identified and implemented strategies to prevent pneumonia by partnering with patients and implementing best practices before, during, and immediately after surgery. The data continue to show improvement as a result of this work. Specific pneumonia-prevention projects implemented include:

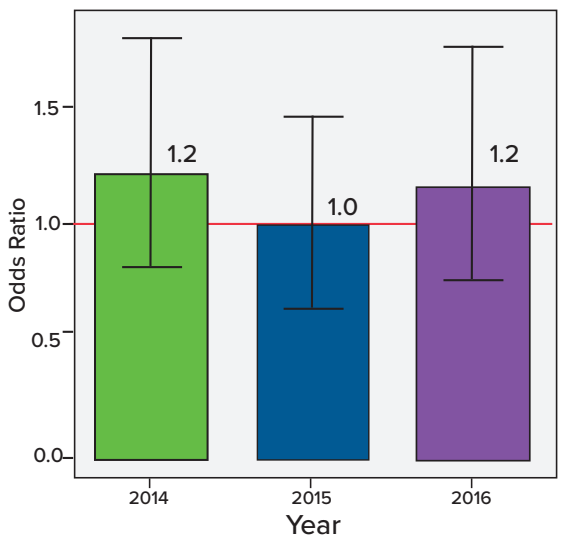
- **Preoperative** – Nurses teach patients in the preoperative clinic setting about the use of incentive spirometers; pulmonary consults are ordered, as needed; assessment is made for swallowing difficulties, a major cause of aspiration pneumonia.
- **Intraoperatively** – Adjustment in the use of certain anesthesia medications by the anesthesiologists to improve pain control while maintaining alertness.
- **Postoperatively** – Nurses help patients ambulate sooner and more frequently after surgery and help patients understand what to do at home to prevent pneumonia. The Speech Department professionals developed a comprehensive approach to assessing patients for aspiration risk in the hospital and at home.

Other departmental projects, such as **Surgical Site Infection Reduction**, show steady improvement. The following graphs demonstrate the likelihood (as indicated by the odd's ratio) of an event occurring at Roswell Park compared with the national average. The error bars represent the 95% confidence interval. If the confidence interval crosses an Odds Ratio of 1, performance is on par with the national average. Roswell Park's performance on these measures are presented on below:

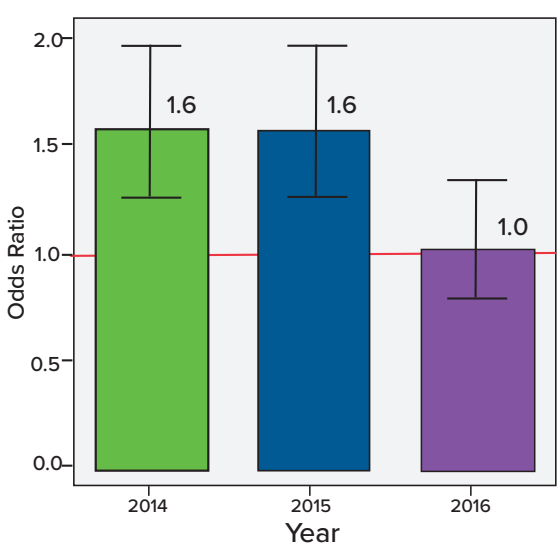
All Cases – Morbidity



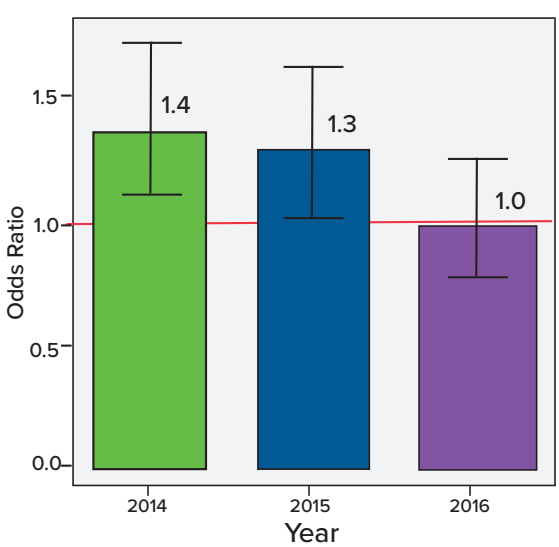
All Cases – Mortality



All Cases – Surgical Site Infections

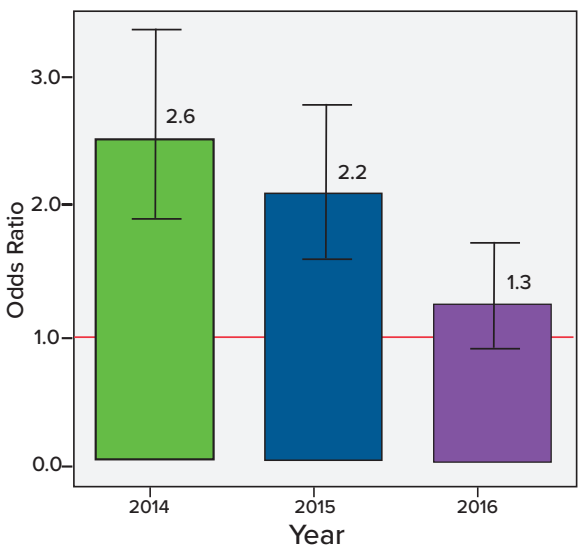


All Cases – Return to Operating Room

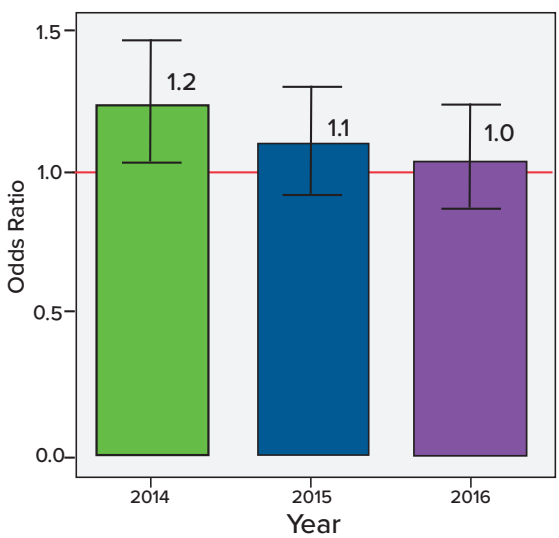


ACS NSQIP: ALL CASES

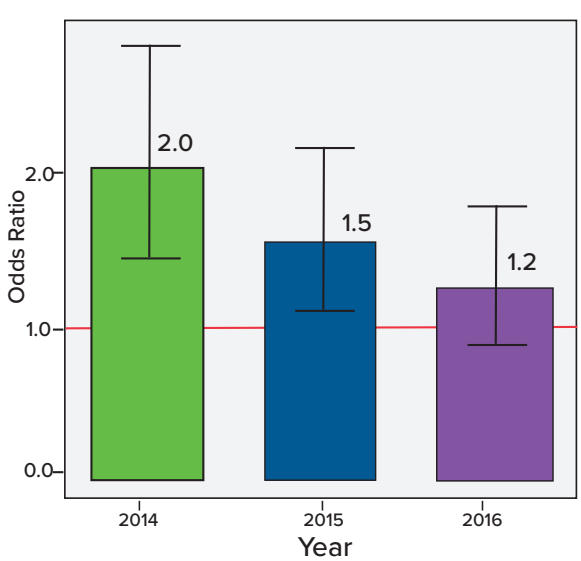
All Cases – Pneumonia



All Cases – Readmission



All Cases – Venous Thromboembolism



[1] The Odds Ratio (OR) provides a comparison of Roswell Park to all other hospitals participating in NSQIP. OR greater than 1.0: event is more likely at Roswell Park; OR less than 1.0: event is less likely at Roswell Park. Error bars show 95% confidence intervals. If the OR of 1.0 is included within the confidence interval the actual OR is not significantly different from the other hospitals"

vizient™

Vizient is the nation's largest member-owned health care services company. Roswell Park's voluntary membership gives us the ability to leverage our clinical data for quality improvement initiatives through dynamic reporting and benchmarking. Roswell Park participates in Vizient's Performance Improvement Program which provides opportunity to collaborate with other health care organizations to test and develop data-driven processes and programs to maximize efficiency and improve quality of care. Roswell Park is a charter member of Vizient's Cancer Center Network. This collaborative effort allows us, and other NCI-designated cancer centers, to develop programs and strategies to better meet the challenges of holistic cancer care.

Physician Quality Officers

In 2015, Roswell Park received a grant to support six **Physician Quality Officers (PQOs).** This group of diverse physicians, led by the Chief Medical Officer, are charged with developing and implementing quality improvement projects that fall within their scope of influence. The goal of the program is to further engage those who provide clinical care in the performance improvement process as well as provide leadership for medical-staff-focused performance improvement initiatives.

Physician Quality Officer projects include:

- Developing an improved way to communicate the **Goals of Care** to all collaborating clinicians within 24 hours of hospital admission for medical oncology patients
- Developing and implementing **Enhanced Recovery After Surgery** program
- Improving communication about, and management of **Present on Admission** conditions
- Reduce unnecessary blood tests in the ICU
- Lower pneumonia and surgical site infections among surgery patients.

C4QI Comprehensive Cancer Center Consortium for Quality Improvement

COMPREHENSIVE CANCER CENTER CONSORTIUM FOR QUALITY IMPROVEMENT

This group of cancer centers has a mission that "seeks to improve the quality of care for all cancer patients by identifying and promoting best practices that provide optimal clinical outcomes and patient satisfaction." Roswell Park is an active and founding member of C4QI and participates in monthly conference calls and semi-annual meetings, focused studies and clinical comparisons. Membership in the group provides Roswell Park with the ability to collaborate with peer cancer centers on quality improvement initiatives specific to cancer care.

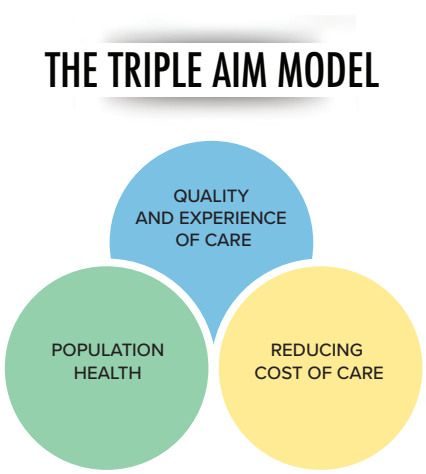
PROJECTS TO IMPROVE PATIENT SAFETY AND QUALITY

Patient Safety Leadership Rounds

Since their inception in March 2016k, these rounds are an opportunity for executive leaders to talk with bedside staff about patient safety related concerns and/or obstacles they face and that may prevent them from providing the safest patient care. All suggestions and concerns are discussed in a non-punitive and confidential forum. These issues can include anything, but often focus on staffing, training, facilities and technology. These issues are discussed with managers and leaders, prioritized, and acted upon when necessary.

Clinical Pathways

Pathways are a unifying approach toward the identification, treatment and improvement of the quality of cancer care at Roswell Park. Our clinical pathways address the full spectrum of cancer care from diagnostic evaluation to surgical, pharmacological and radiation treatments, imaging and laboratory testing including personalized medicine, palliative care, patient education, and survivorship. These pathways help guide physicians and other providers in selecting a treatment recommended for specific circumstances. However, they are only a guide and provide no substitute for the medical professional's clinical judgment, or the patient's individual needs and preferences. Roswell Park's clinical pathways address all aspects of the Triple Aim Model, a framework that describes an approach to optimizing health system performance.



Clinical Pathways support the best possible outcomes with consistent standards of care based on evidence and consensus, up-to-date clinical trial information, toxicity and cost information.

COMPELLING REASONS TO IMPLEMENT PATHWAYS				
Quality	**Patients**	**Clinical Trials**	**Payers**	**Affiliates**
Document Quality of Care	**Serves as Cornerstone for Education and Treatment Planning**	**Present Clinical Trials at Point of Care for all Patients**	**Communicate Quality with Payers**	**Use Pathway Program at all Affiliates (in WNY and beyond)**
• Assess variation and reasons • Provider and institution feedback	• Inform use of pathways • If ON pathway, inform why • If OFF pathway, inform why • Provide written documenation with diagnosis, treatment plan, side effects, etc.	• Assure awareness of providers • Rapid messaging to CRS staff • Improve assessment of eligibility	• Provide information on care provided • Benchmarks • Pre-authorization documents • Improve efficiency of communication	• Document care for all patients • Understand and manage utilization • Assure we can manage and improve care

Pathways further support the Triple Aim by providing guidance and improving shared decision making that lead to treatments reflective of the patient's health goals. With the pathway information, patients can see how their recommended treatment compares with the pathway treatment, and are more involved with decisions regarding their care.

THE HISTORY OF CLINICAL PATHWAYS AT ROSWELL PARK

In 2015, Roswell Park began its first Clinical Pathways initiative as collaboration with the established pathway program at Moffitt Cancer Center in Tampa, Florida. Using Moffit's pathways as a foundation, our multidisciplinary disease teams made modifications based on local standards and changes in supporting new treatments. Our pathways are updated quarterly, at the time of concordance review, to ensure they reflect the most current evidence-based treatment.

The actual treatment administered to patients was compared with the Pathway's recommendation. Pathway recommended treatment is termed "Pathway Concordant." It is not expected the patient's treatment will always be Pathway Concordant for a variety of reasons, including the patient's medical or other personal status. However, it is expected that the reason for the non-pathway treatment is documented.

Pathway concordance was evaluated through retrospective chart review and the use of Tumor Registry data. Each pathway had a corresponding quarterly Concordance Report, which provided information regarding the percentage of eligible patients with pathway concordant care or "On Pathway." Since the publication of the first clinical pathway in December 2015, all pathways have had concordance rates of 80% or greater. For individual cases that were not pathway concordant, there was excellent documentation of the rationale for the actual treatment administered.

Below is an example of a review of care at Roswell Park for pancreas cancer with the pathway concordance report.

PANCREAS PATHWAY CONCORDANCE
Patients Receiving First Course Treatment at Roswell Park (January-March 2016)

	Classification	Regimen	N= Patients	On Pathway
Borderline Resectable	ECOG 0-1	Clinical Trial PH 277015		
		Gemcitabine 1000 mg/m2 IV	1	1
		FOLFIRINOX (leucovorin, fluorouracil, irinotecan and oxaliplatin	1	1
		NAB PACLitaxel 125 mg/m2 IV + Gemcitabine 1000 mg/m2	5	5
Adjuvant		RTOG-974: Gemcitabine 1000 mg/m2 IV + 5FU 225gm+50.4 Gy x5wks		
		Gemcitabine 1000 mg/m2 IV		
First Line Metastatic	ECOG 2-4	Gemcitabine 1000 mg/m2 IV	1	1
		NAB PACLitaxel 125 mg/m2 IV + Gemcitabine 1000 mg/m2	1	1
		Palliative and Supportive Care	3	3
	ECOG 0-1	Clinical Trial PH 240613		
		Clinical Trial I 265214		
		Clinical Trial PH 276815		
		Clinical Trial PH 269615		
		FOLFIRINOX (leucovorin,fluorouracil, irinotecan and oxaliplatin	3	3
	BRACA or BRACA2	Cisplatin 50mg+Gemcitabine 1000 mg		
		NAB PACLitaxel 125 mg/m2 IV + Gemcitabine 1000 mg/m2		
Locally Advanced Unresectable		Clinical Trial PH 277015		
	ECOG 2-4	Gemcitabine 1000 mg/m2 IV		
	ECOG 0-1	FOLFIRINOX (leucovorin, fluorouracil, irinotecan and oxaliplatin)		
		NAB PACLitaxel 125 mg/m2 IV + Gemcitabine 1000 mg/m2	1	1
		Clinical Trial PH 277015		
Off Pathway-No Pathway Treatment	Chemorad	RTOG-974: Gemcitabine 500 mg/m2 IV + 5FU 225gm+50.4 Gy x5wks	1	
Off Pathway-No Pathway Treatment	BR, UR	Patient Choice - Palliative and Supportive Care - Patient Choice	1	
		89% CONCORDANCE	**18**	**16** ✓

This initial approach to clinical pathways was well-received at Roswell Park. One central value was increased multidisciplinary collaboration to establish and review the pathways. However, in this form the pathways could only be used for retrospective review and not as a decision support tool at the point of care.

THE FUTURE STATE OF CLINICAL PATHWAYS AT ROSWELL PARK

To enhance the role and value of pathways, Roswell Park has reoriented the pathway program around a software solution that will be integrated into the electronic health record. This will be used at the time of treatment with documentation of the choice of treatment, and of the rationale for any treatment that is not "on pathway." After a careful review of available systems, we selected the software system provided by Via Oncology (www.viaoncology.com). These pathways are modified as necessary based on evidence and the expertise at Roswell Park to create the "Roswell Park Pathways Powered by Via Oncology".

Clinical pathways support our patients in decision making and are the cornerstone of care coordination in our Oncology Medical Home model. Importantly, this tool presents the clinician with a list of clinical trials for which the patient may be eligible based the cancer status. If the clinical trial is selected, the system initiates immediate contact with the clinical research team to begin the prescreening and assessment process. This will further improve the quality of clinical care by assuring that all patients eligible for clinical trials have the opportunity to consider participation.

Moving forward, a key focus will be on improving provider workflow by integrating with the Electronic Health Record (EHR). This integration will also allow us to leverage robust analytics that will add value to the Pathways Initiative. In addition, EHR integration will promote a better understanding of the nature of survival and cost variability, measure the impact of toxicity-related complications, and evaluate outcomes relative to cost.

Another advantage is that it will be implemented in the Roswell Park community affiliate practices. This will allow better coordination and evaluation of care provided throughout the Roswell Park network and assure that all people treated in our system receive the best possible care.

The Roswell Park Pathways Powered by Via Oncology will be implemented the second quarter of 2018. Implementation at the Roswell Park affiliate practices will begin in the 3rd quarter of 2018

REFERENCES

[1] Berwick DM, Nolan TW, Whittington J. The triple aim: care, health, and cost. Health Aff (Millwood). 27(3):759-769, 2008
[2] Carlson B: Controlling the cost of care through clinical pathways. Biotechnol Healthc 6:23-26, 2009
[3] Page RD: Refining the standard of care: How oncology treatment pathways can make a difference. J Oncol Pract 12:143-144, 2016
[4] Stefanacci,R, Schieder, T. Developing balanced clinical pathways through individualized care. Journal of Clinical Pathways. 3(2):29-31, 2017

THE FUTURE
Clinical Pathways Model at Roswell Park

STEP 1
Patient presents to Roswell Park physician.

STEP 2
Patient specific information is entered into pathway system.

STEP 3
Patient specific, evidence based treatment recommendation is presented to physician.

STEP 4
Any clinically appropriate Roswell Park clinical trials are presented as the first treatment option for the physician.

The physician chooses to pre-screen the patient for the trial or enters a reason for not screening.

If not pre-screening for a trial, then the standard of care treatment option is presented to the physician.

STEP 5
Physician selects suggested treatment plan and enters orders into the EHR.

STEP 6
The patient education packet including the treatment plan is reviewed with and given to the patient.

or

STEP 5
If the physician determines the pathway-suggested treatment is not in the best interest of the patient or the patient declines the recommended treatment, the physician can choose to go off pathway and enter off pathway orders into the EHR.

"Roswell Park is leading the nation in using pathways to inform patients about their care and to serve as the cornerstone for education about the purpose, nature, and side effects of treatment."

Stephen Edge, MD, FACS, FASCO
Vice President, Healthcare Outcomes and Policy
Roswell Park Comprehensive Cancer Center

Glycemic Control

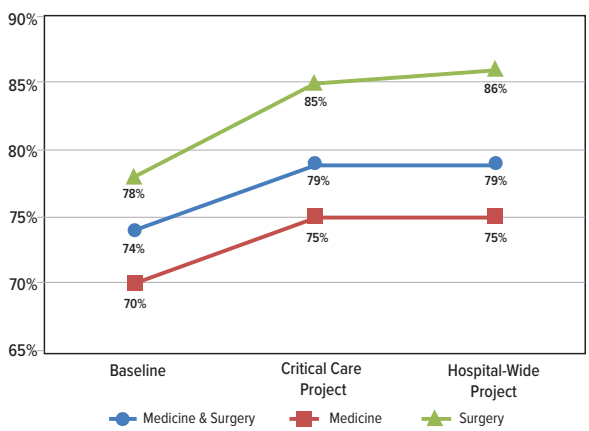
Both hyperglycemia and hypoglycemia can adversely affect patient outcomes. Controlling glucose levels safely is frequently very challenging for hospitalized patients. A pilot project to improve glucose control was initiated in the ICU and another unit. A second, hospital-wide project, was later deployed.

The pilot used Lean Six Sigma methodology and rapid cycle process changes to manage insulin levels. Close monitoring over a year showed improvements in both hyperglycemia and hypoglycemia for Surgery and Medicine services. Subsequently, decreased glucose volatility was identified and clinical improvements sustained over the longer-term. The success of this project resulted in the Critical Care team receiving an International Award for Quality and Safety from the Society of Critical Care Medicine.

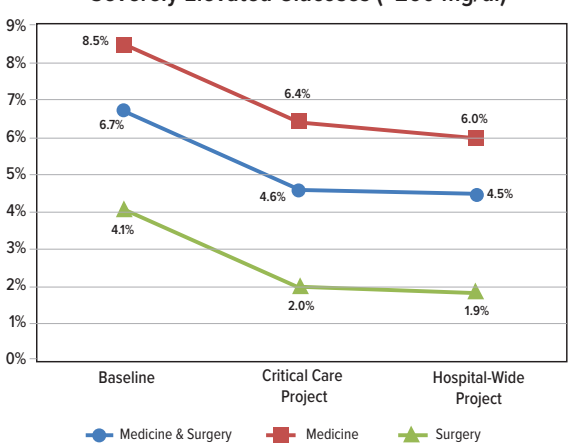
GLYCEMIC CONTROL PROJECT
Summary Report
(Generated on July 26, 2016)

Hospital-Wide Project: 8/1/2015 – 6/30/2016
Critical Care Project: 4/1/2013 – 7/31/2015
Baseline: 10/12012 – 3/31/2013

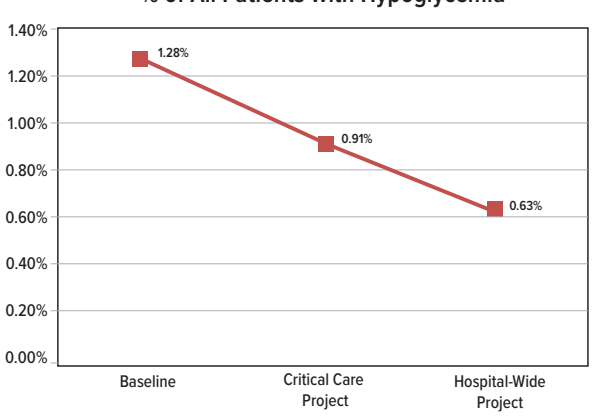
% Glucoses in Goal Range (80-180 mg/dl)



Severely Elevated Glucoses (>260 mg/dl)



% of All Patients with Hypoglycemia



ENHANCED RECOVERY AFTER SURGERY (ERAS)

Enhanced Recovery After Surgery (ERAS) is a program designed to improve patients' recovery from surgery, with fewer complications and earlier discharge to home. ERAS protocols include a number of interventions which minimize the body's response to surgical stress and improve post-operative pain control. Prompt recovery is accomplished via good patient education before surgery; encouraging early, frequent ambulation and mobility; allowing a regular diet; and reducing narcotic usage.

Steven Nurkin, MD spearheaded Roswell Park's ERAS program, implementing it initially with colorectal surgical patients, and then to GYN patients. Rollout to other surgical services was completed by the end of 2016.

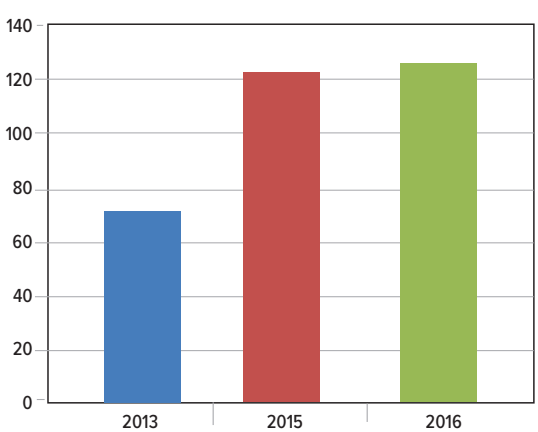
Masimo/Patient Safety Net

Patient Safety Net is a bedside monitoring and clinician notification system. The system was purchased and initially implemented on four surgical units in October 2013. Since that time, the system has been expanded to five additional units.

The system provides continuous pulse oximetry, pulse rate, and respiratory rate monitoring of select patients. It includes pager notification to nursing staff to warn of potentially critical patient events. The premise of the system is that early intervention equates to improved patient outcomes.

Patient Safety Net was purchased to provide continuous monitoring to a larger number of patients. The intent is to improve recognition and response to changes in a patient's condition that could lead to patient deterioration. Appropriate patients are placed on Patient Safety Net monitor and the nurse carries a pager with an alarm that will sound when decreasing oxygenation or critical respiratory or pulse rate are identified.

Number of Beds with Patient Safety Net



NEW YORK STATE PARTNERSHIP FOR PATIENTS (NYSPFP)

Roswell Park is a proud participant with the NYSPFP, a joint initiative of the Healthcare Association of New York State (HANYS) and the Greater New York Hospital Association (GNYHA). HANYS and GNYHA have the Centers for Medicare & Medicaid Services (CMS)-contracted New York State's Hospital Engagement Network.

The focus of this partnership has been improvement in the following areas:

- **Adverse drug events including anticoagulants, insulin, and opioids**
- **Injuries from falls and immobility**
- **Pressure ulcers**
- **Catheter associated urinary tract infections**
- **Central line associated blood stream infections**
- **Clostridium difficile**
- **Sepsis**
- **Surgical site infections**
- **Readmissions**
- **Culture and Leadership**

GUIDING PRINCIPLES

OF THE NYS PARTNERSHIP FOR PATIENTS

CULTURE OF SAFETY

- Building capacity
- Being flexible to change
- Creating highly reliable organizations
- Ensuring a just culture, with all disciplines accountable for patient safety
- Continually striving for excellence

INNOVATE

Continually test/pilot strategies for value.

Capture strategies from all sources (internal, external, clinical, non-clinical)

Align efficiency and reduction of cost/waste with strategies for preventing harm.

ENGAGE

Target total stakeholder engagement

- Leadership
- Physicians
- Patients/Families
- Frontline Clinician and Support Staff
- Community-Based Providers

HARDWARE

Exhaust all strategies for hard-wiring evidence based practices. Measure and track to ensure compliance.

- Tools
- Communication protocols
- Bundles
- Checklists
- EHR

INTEGRATE

Integrate care practices into the delivery system by focusing on:

- Interdisciplinary team development
- Patient safety practices
- Prevention protocols (no harm across the board)

INFECTION PREVENTION AND CONTROL

The Infection Prevention and Control (IPC) department works closely with the Infectious Disease department to reduce the risk of epidemic, endemic, and hospital-acquired infections for Roswell Park's patient population and healthcare workers. Infection Prevention and Control must work closely with all Roswell Park's departments to identify risks and ensure infection prevention while providing quality care. The department engages in surveillance of hospital-acquired infections, which are then reported to internal and external organizations.

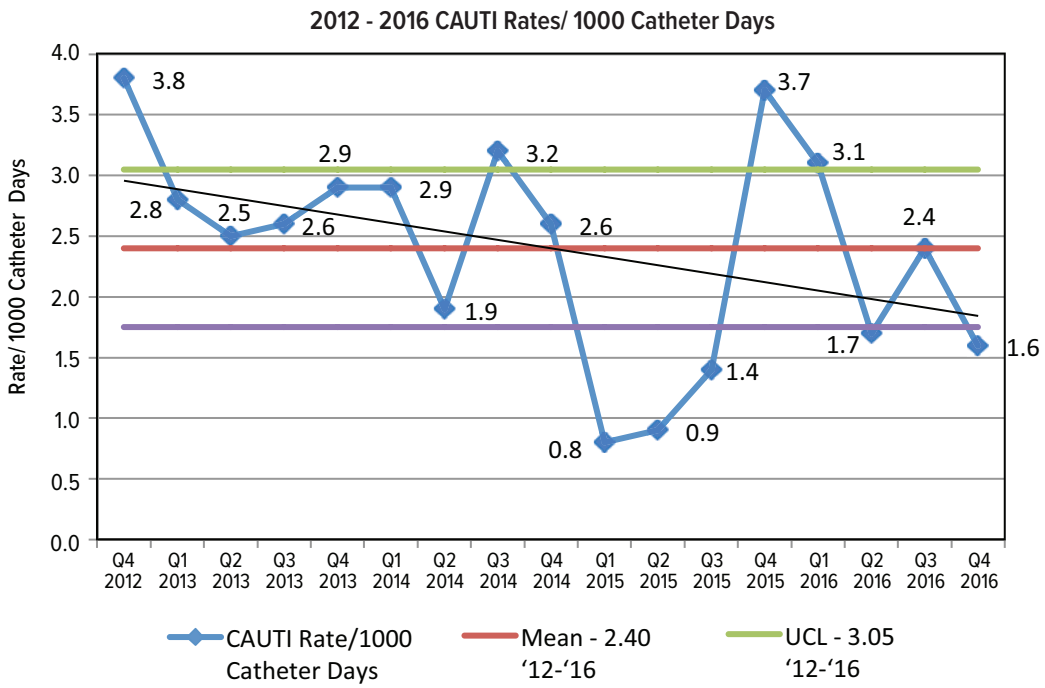
Catheter-Associated Urinary tract Infection (CAUTI)

In April 2013, Roswell Park introduced a program to reduce urinary catheter use, decrease the rate of catheter-associated urinary tract infections (CAUTI) and improve patient safety. Built on evidence-based practices, the plan of action is called the CAUTI bundle.

Infection Prevention and Control created and led the multidisciplinary group that developed the plan. In addition to Wound, Ostomy, Continence nurses and Magnet Coordinators, members included physicians, nurses and other staff from various departments, such as Urology, Medicine, Information Technology, Nursing Quality, Nursing Education, Nursing Administration, Perioperative, Cytoscopy, and Purchasing and Receiving, plus representatives from medical equipment vendors.

The bundle included:

- Development of a prompt in the Electronic Medical Record to alert physicians to the presence of Foley catheters and to determine and document the clinical need for the catheter.
- Redesign of nursing flow sheets to capture accurate data on catheter use.
- Creation and implementation of an algorithm to determine what a nurse should do after a urinary catheter is discontinued.
- Team review of any identified CAUTI cases.
- Standardization of catheter brand.
- Introduction of updated policies.
- An educational blitz to ensure that nurses were informed about the CAUTI bundle, including the algorithm and bladder scanner use.
- Launching of a website for CAUTI prevention, with links to pages about all aspects of the CAUTI bundle.
- Purchase of bladder scanners.
- Changes to catheter inventory on all units.
- In January 2016, after a slight increase of CAUTIs over the 3rd and 4th quarters of 2015 was identified, a privileging fair was held and raised concerns for a lack of standardized insertion process. Infection Prevention and Control worked with Nursing to bring in a foley insertion kit that included a checklist for proper insertion technique. IPC also began a process for sending preliminary urine cultures to Nursing Administrators. In March 2016, a "super users" class was held for CAUTI Champions on each unit.



Central Line-Associated Blood Stream Infection (CLABSI)

Healthcare-associated CLABSI is a leading cause of preventable illness and death and is often a result of colonizing bacteria that has overcome body defenses. CLABSI can be detrimental to patients, requiring a lengthy hospital stay with poor outcomes. Our patients face higher risk for infections as a result of their cancer treatment.

CLABSI have been required reporting to NHSN in New York State since 2007, and required reporting to CMS for PPS-exempt hospitals beginning in 2013. Reporting helps reduce infection rates by providing accurate data tracking, comparisons with other hospitals, and baselines that are used by CMS and insurance payers to reimburse hospitals. Below are some interventions that Roswell Park undertook to reduce the incidence of CLABSI since 2012.

Electronic Insertion Checklists

Roswell Park requires the use of checklists for both physicians and nurses when a central line is inserted. In 2012, electronic checklists were fully implemented to ensure compliance with appropriate central-line insertion bundles

Central Line Removal Prompt

The best way to prevent CLABSI is to avoid use of a central line unless medically necessary. IPC worked with IT and physicians to roll out a removal prompt in the 3rd quarter of 2012, with full implementation in January 2013. This tracks every inpatient with a temporary central line, and asks providers to indicate whether it's medically necessary and why. If the line is not medically necessary, clinicians are prompted to place an order for the line's removal.

Electronic Line Counting

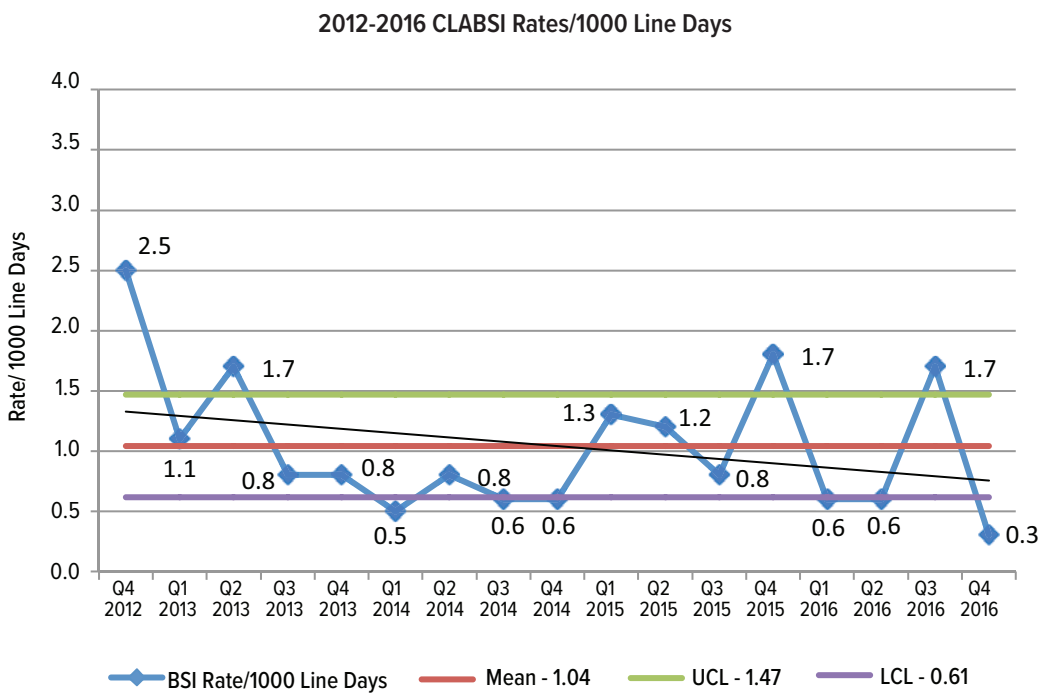
IPC is able to collect central line days using the electronic health record, which provides accurate data with which to drive interventions.

CUROS Caps

CUROS caps are alcohol-impregnated caps placed on all IV access points and were rolled out in late 2013. The caps aim to decrease central line infection rates by providing continuous protection and cleansing of the caps. CUROS caps are one step in a multidisciplinary process to prevent CLABSI. Our goal was to increase compliance with the usage of CUROS caps among all the inpatient units to decrease CLABSI. We have been successful in this endeavor.

CHG Bathing Cloths

Another step toward reducing CLABSI began in the 3rd quarter of 2013 with the use of bathing cloths impregnated with chlorhexidine gluconate (CHG) on several inpatient units. Research shows that patients in bone marrow transplantation and intensive care units had reduced infection rates when using this product. A re-evaluation of usage is underway to increase compliance. The following graph shows the CLABSI Rate from 2012-2016. Overall, the rate of bloodstream infections is declining.



Electronic Hand Hygiene

In 2018, IPC plans to implement an electronic hand hygiene monitoring system to track hand hygiene compliance throughout the hospital. While the system itself will not reduce healthcare associated infections, it will provide accurate data that IPC can use to drive appropriate hand hygiene interventions in the units that need it.

NURSING

In 1945, Nursing Administrator Ethel Chandler formally organized the Department of Nursing at Roswell Park with 61 nurses under her direction. Today, the Department of Nursing boasts a dynamic and engaged staff of over 600 administrators, nurse practitioners, registered nurses, licensed practical nurses, hospital clinical assistants and clinical support assistants.

The Department of Nursing

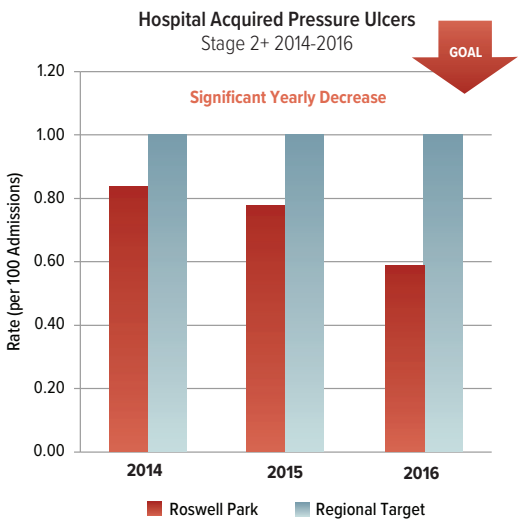
- Promotes an environment whereby each patient's dignity and rights are recognized and respected.
- Collaborates in the planning and delivery of healthcare that is specific to each individual's needs.
- Develops an individualized approach involving the family/significant others in a care plan intended to maximize each patient's health potential and quality of life.
- Provides staff development and oncology nursing education programs.
- Continuously evaluates and improves nursing care.
- Participates in the implementation of clinical research protocols.
- Shares information and findings with the nursing community at large through educational programs and publications of research findings.
- Provides support for ongoing educational degrees and certifications.

Pressure Ulcer Prevention

As we continue to improve the quality of nursing care and nursing-sensitive indicator outcomes, Roswell Park has been selected as one of eleven hospitals in the nation to participate in the Agency for Healthcare Research and Quality (AHRQ) Pressure Ulcer Prevention Project. By utilizing the toolkit provided by AHRQ, effective pressure ulcer prevention practices have been implemented. The toolkit's content draws on published best practices in pressure ulcer prevention and includes both validated and newly developed tools. Pressure ulcer rates have dropped since entering into the AHRQ Pressure Ulcer Prevention Project. Other accomplishments from this project include two national poster presentations and initiation of a research project.

Implemented Interventions

- New turn and position system & seated positioning system
- New products for sacrum and other areas
- Quarterly pressure ulcer surveys
- Use of appropriate skin care equipment, products, supplies
- Pressure ulcer case reviews
- Use of bed algorithm and other specialty beds
- Continuing education for nurses

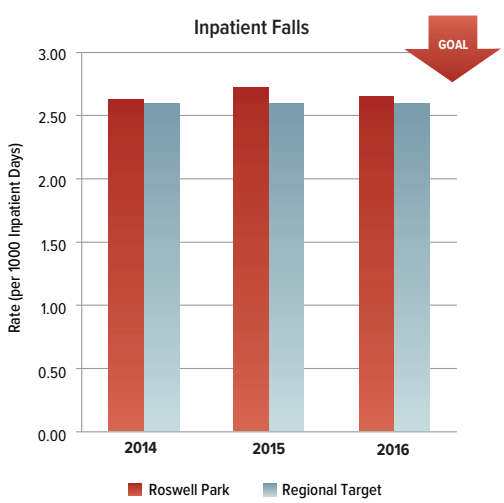


Patient Falls

Our patients have cancer and their disease and treatment side effects mean that many of them are weak, debilitated and prone to falls. Roswell Park made fall prevention a priority by creating a culture of safety based on a universal understanding that fall prevention is everyone's job. Our fall prevention program developed and implemented several interventions to reduce the fall rate.

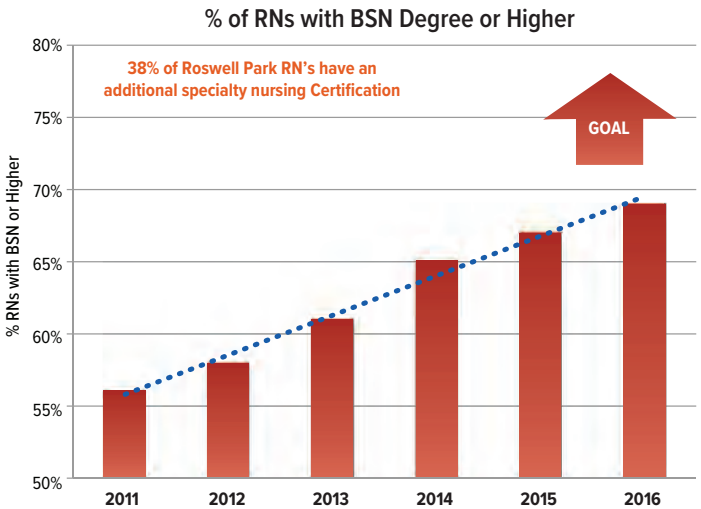
Implemented Interventions

- Multidisciplinary falls taskforce
- Fall risk assessment scale in EHR
- Yellow socks, blankets and magnets to identify patients at risk for falling
- Awareness of high risk meds
- Hourly rounding & targeted toileting
- Clear path to bathroom
- Bed and chair alarms
- Commodes in bathroom when not in use
- Continuous patient & family education
- Appropriate sink/shower chair



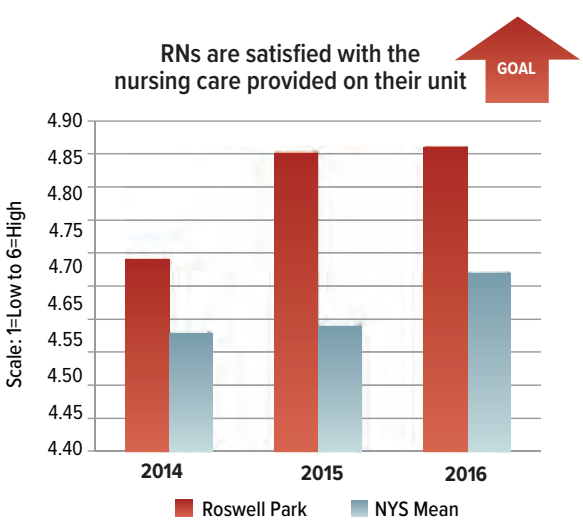
Nursing Certifications

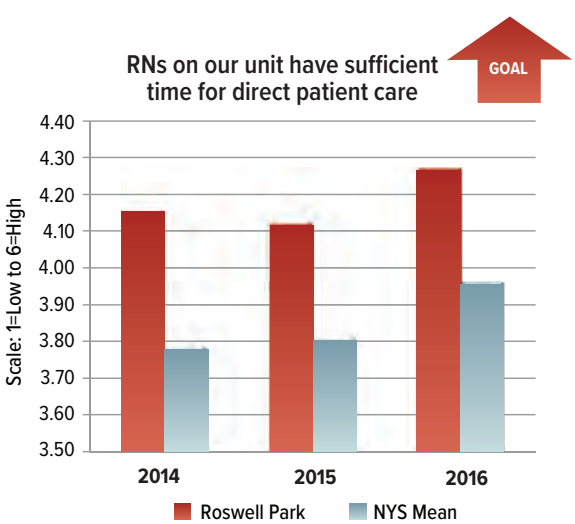
- Oncology Certified Nurse
- Certified Nurse Practitioner
- Certified Clinical Research Professional
- Certified Pediatric Hematology Oncology Nurse
- Certified Clinical Research Coordinator
- Certified Nurse Operating Room
- Critical Care Registered Nurse
- Blood & Marrow Transplantation Certified Nurse
- Certified Pediatric Nurse Practitioner
- Certified Medical-Surgical Registered Nurse
- Certified Professional in Healthcare Quality
- Certified in Executive Nursing Practice
- Certified Dialysis Nurse
- Certified Radiology Nurse
- Certified Gastroenterology Registered Nurse
- Board-Certified Case Manager
- Hematopoietic Transplant Coordinator Certification
- Advanced Oncology Certified Nurse Practitioner
- Certification by Board of Infection Control and Epidemiology
- Certified Wound, Ostomy and Continence Nurse



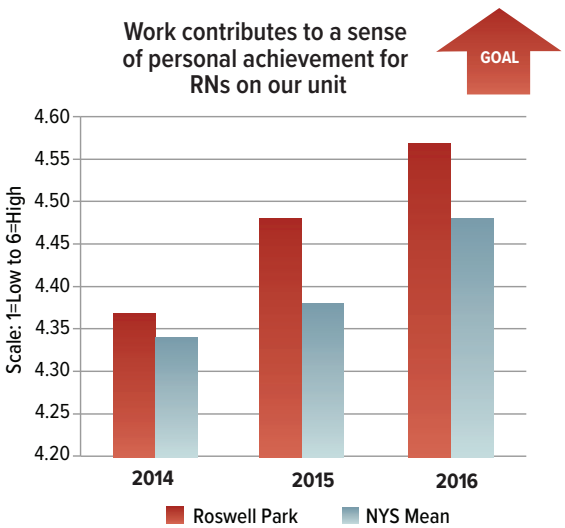
The Institute of Medicine (IOM) report calls for increasing the proportion of baccalaureate-educated (BSN) nurses in the workforce to 80% by 2020. Evidence supporting the IOM recommendation of a BSN nursing degree are improved patient outcomes.

RN SATISFACTION 2014-2016

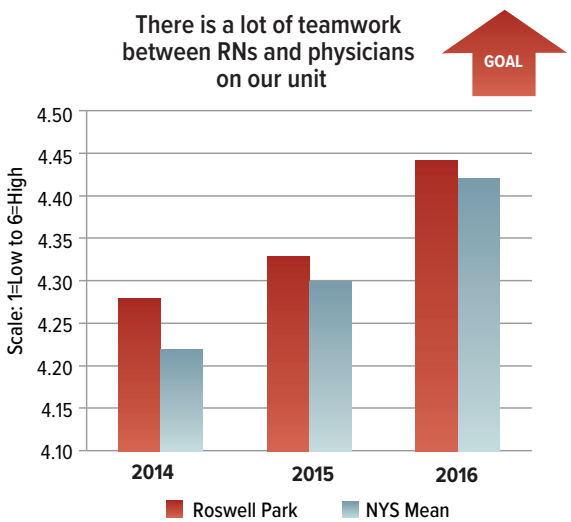




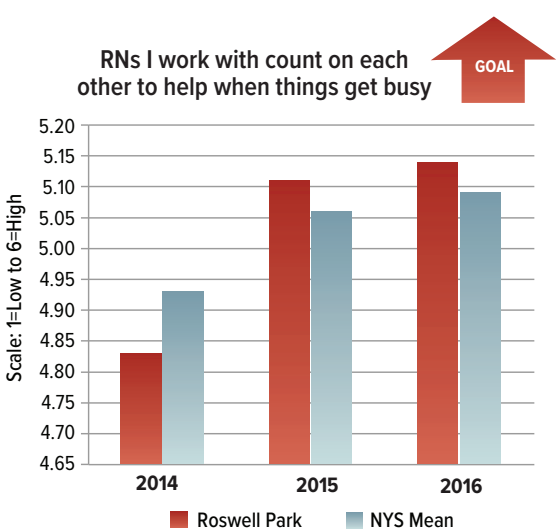
Work contributes to a sense of personal achievement for RNs on our unit



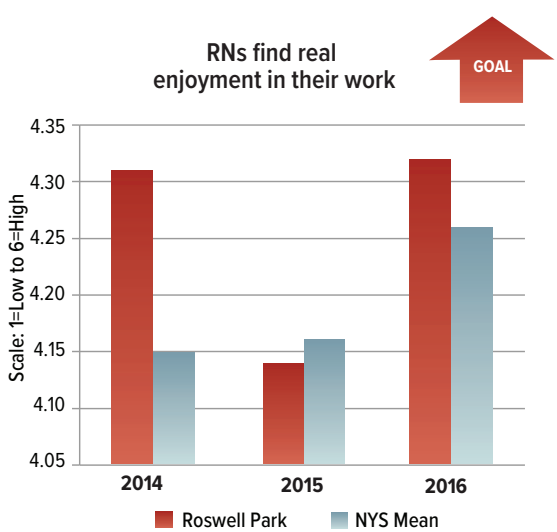
There is a lot of teamwork between RNs and physicians on our unit



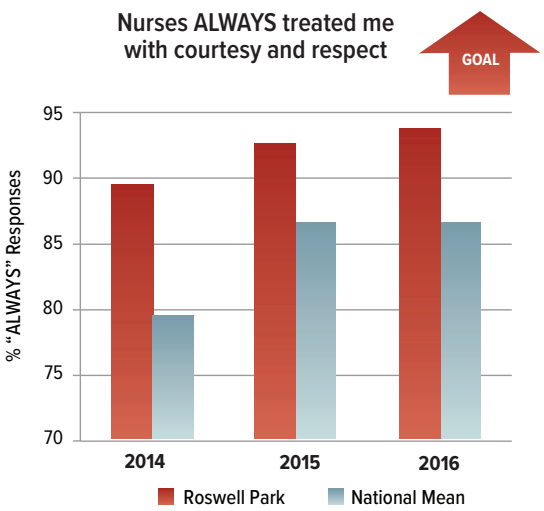
RNs I work with count on each other to help when things get busy

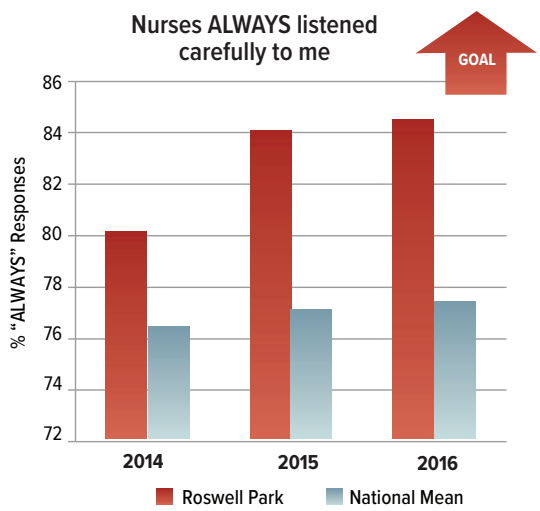


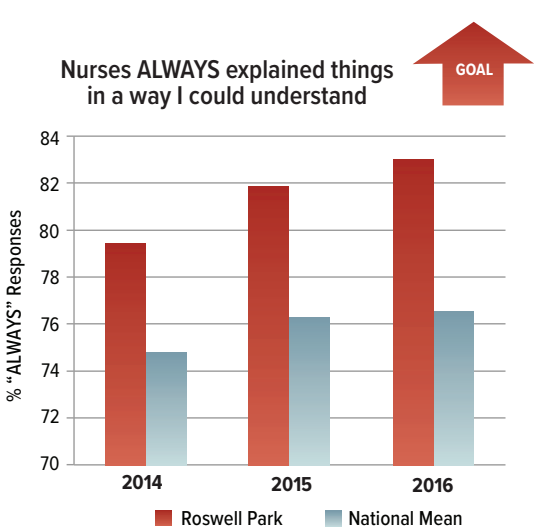
RNs find real enjoyment in their work

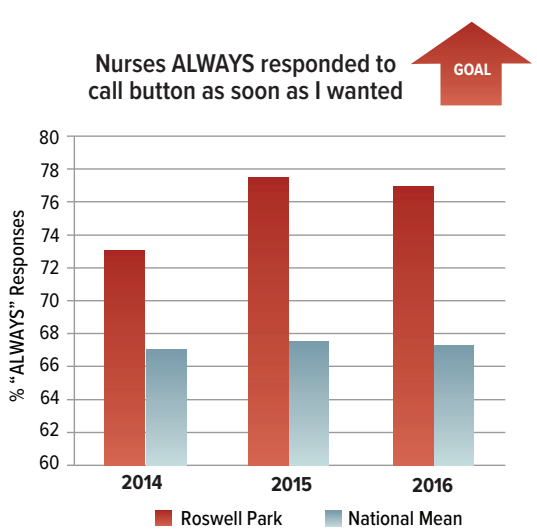


PATIENT SATISFACTION WITH NURSING CARE HCAHPS SURVEY 2014-2016

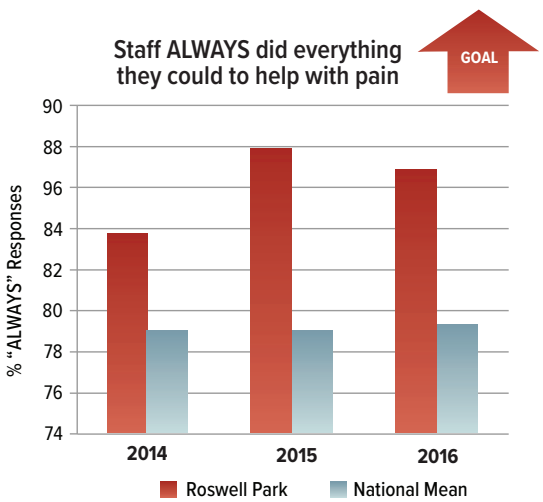


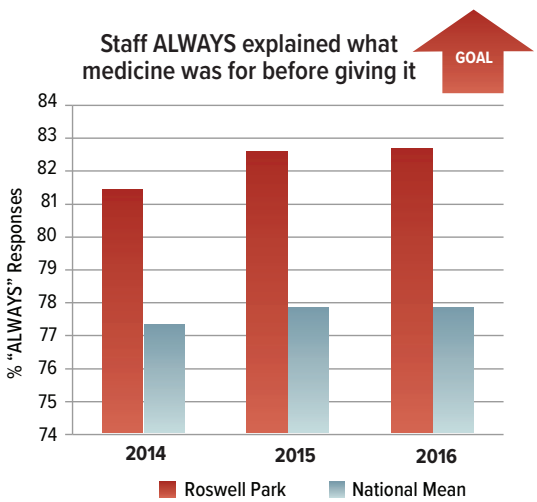






PATIENT SATISFACTION WITH NURSING CARE HCAHPS SURVEY 2014-2016





NOTEWORTHY FACTS

- The department has approved ACGME fellowship programs in Oncologic Surgical Pathology and Cytopathology
- A cytotechnology school leading to a MS degree opened in 2015 in collaboration with Daemen College.
- The department supports clinical affiliations with several regional Clinical Laboratory Technologist, Clinical Laboratory Technician, and Phlebotomy programs.
- Roswell Park's phlebotomy service ranks in the 99% percentile of C4QI skill level rankings of the how well the blood was taken.

PATHOLOGY AND LABORATORY MEDICINE

The mission of Pathology and Laboratory Medicine is to provide results that matter for comprehensive clinical testing, research, and diagnostic expertise in a manner that aligns with our specific focus areas and sub-specialty disease site delivery model. Our efforts focus on providing services that match our patients' specific needs, improving communication and integration of laboratory services within clinical care delivery and providing area expertise to support the research and education activities of Roswell Park.

Our services are divided into the traditional disciplines of Anatomic Pathology inclusive of Surgical Pathology, Cytopathology, Hematopathology, and Medical Pathology (Autopsy), Laboratory Medicine (Chemistry, Hematology, Immunology, Microbiology, and Transfusion Services), and specialized areas of Clinical Cytogenetics and Flow Cytometry. Board-certified specialists lead all these areas, and many have advanced fellowship training within their fields. The department performs 1.5 million tests annually.

Surgical Pathology

Surgical Pathology is structured as a modified sub-specialty model with specific expertise in Breast, Gynecology, Genitourinary, Dermatopathology, Thoracic, Gastrointestinal, Soft Tissue Sarcoma, Head and Neck, and Neuropathology. The entire Anatomic Pathology staff has completed at least one post-residency fellowship, many have completed two subspecialty fellowship and most have sub-specialty board certifications. This highly specialized model integrates with the sub-specialized disease site clinical care delivery model and provides for a merging of the clinical and research missions of Roswell Park. A seamless transfer of tissue samples from Anatomic Pathology to OmniSeq for genomic and biomarker molecular profiling of a patient's tumor assures patient access to the most advanced, personalized therapy available for their cancer.

Cytopathology

The Cytopathology section is staffed by fellowship-trained, board-certified cytopathologists. A cytopathologist-performed fine needle aspiration service provides rapid diagnosis for patients with superficial palpable masses. Cytology support to Diagnostic Imaging for rapid on-site assessment of sample adequacy for image-guided tissue acquisition provides unique support to clinicians and ensures that patients don't need a second procedure to obtain a diagnosis.

Hematopathology

The Hematopathology section is staffed by fellowship-trained, board-certified hematopathologists. A hematopathologist diagnoses disorders of the white blood cells in lymph nodes, blood and bone marrow and provides unique support to patients undergoing bone marrow transplant and post-transplant surveillance.

Flow Cytometry

Flow Cytometry is a state-of-the-art facility offering simultaneous eight-color analysis for clinical hematologic samples in support of the Leukemia, Lymphoma, and Bone Marrow Transplant services. Clinical results are available within 4 hours, enabling immediate therapy to be initiated for critically ill patients.

Clinical Cytogenetics

Clinical Cytogenetics offers conventional karyotyping as well as a full array of advanced molecular testing for precise classification of hematologic disease. The tests identify the specific molecular abnormalities that distinguish one type of hematologic disorder from closely-related diseases. The Clinical Cytogenetics laboratory is one of 106 worldwide reference testing sites for the Children's Oncology Group (COG) and one of 33 US reference sites for the Alliance for Clinical Trials in Oncology (formerly the CALGB), underscoring the expertise and quality of our service.

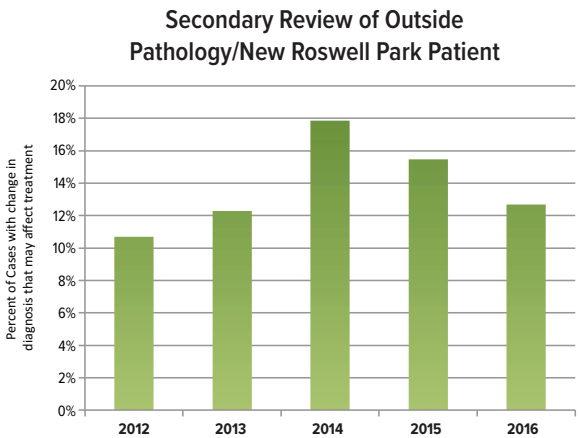
Laboratory Medicine

Laboratory Medicine provides traditional core laboratory services 24/7, in addition to operating satellite laboratories in Amherst, NY and in the Chemotherapy & Infusion Center. The department houses the only hospital-based Blood Donor facility in the region. The Therapeutic Apheresis and Stem Cell Processing Laboratory directly supports the BMT program with the collection and processing of hematopoietic progenitor cells for transplantation.

PATHOLOGY SECONDARY REVIEW OF CASES

Secondary Review of Outside Pathology/New Roswell Park Patient

As a routine component of the new patient evaluation, all external pathology cases are reviewed by the Roswell Park pathology team that has sub-specialty disease site expertise and training. This routine secondary review of all new patients' previous diagnosis identifies that 11%-18% of cases have a change in diagnosis (major/minor) that may affect treatment decisions.



Secondary Review of Outside Pathology /New Roswell Park Patient					
	2012	2013	2014	2015	2016
# of Cases Reviewed	7849	7736	7364	8953	8994
# of Change in Diagnosis that may affect treatment	839	951	1314	1385	1141
% of cases with Change in Diagnosis that may affect treatment	11%	12%	18%	15%	13%

Pathology Cases Referred for Multidisciplinary Review

At Roswell Park, the multidisciplinary team approach with surgery, medical oncology, radiology, includes presentation of patient pathology cases for discussion. These cases are frequently presented to the tumor board by a review pathologist, not the original pathologist for presentation to the tumor board. The average discordant rate between Roswell Park's primary pathology diagnosis and multidisciplinary pathology review is 1% of cases presented.

Pathology Cases Referred for Multidisciplinary Review					
	2012	2013	2014	2015	2016
# of Multidisciplinary Review Cases	1886	1851	1609	1477	1484
# of Cases Discordant between initial and review diagnosis	14	13	21	20	8
% Discordant	0.7%	0.7%	1.3%	1.4%	0.5%

Fine Needle Aspiration Evaluation

The Fine Needle Aspirate technique (FNA) is utilized to obtain cellular material for diagnosis from superficial nodules or abnormal masses seen by radiology. These FNA samples undergo rapid evaluation for diagnostic adequacy by the cytology staff. These aspirates are evaluated within the clinic or endoscopy units while the patient is undergoing the procedure. The Roswell Park fine needle aspirates are adequate in rendering a final diagnosis 96% of the time, thus preventing the need for a more invasive procedure or larger excision for diagnosis.

Fine Needle Aspirate Cases with Unsatisfactory Final Diagnosis				
	2013	2014	2015	2016
Total # of Fine Needle Aspirate Cases (FNA)	1726	1873	2163	2593
Total # of FNA Cases Unsatisfactory for Final Diagnosis	62	67	88	106
Total # of FNA Cases Satisfactory for Final Diagnosis.	1664	1806	2075	2487
% of FNA Cases Unsatisfactory for Final Diagnosis	4%	4%	4%	4%
% of FNA Cases Satisfactory for Final Diagnosis	96%	96%	96%	96%

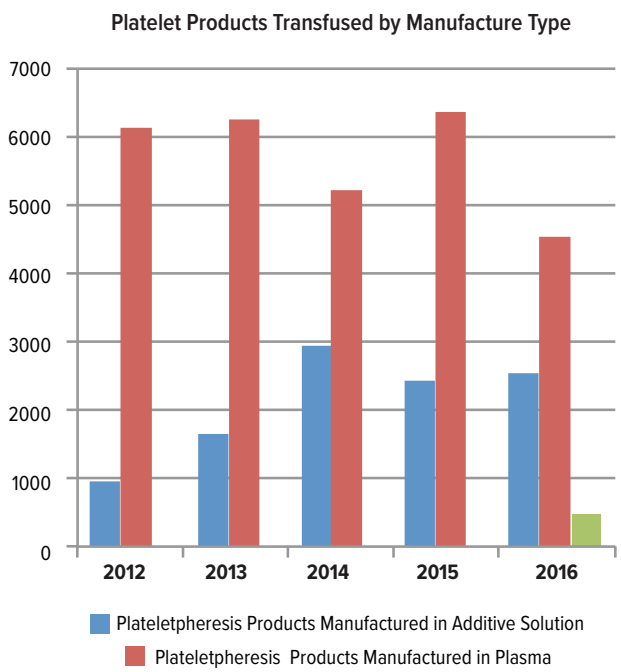
PLATELETPHERESIS PRODUCTS MANUFACTURED IN PLATELET ADDITIVE

Platelet Additive (PAS) Manufacture

The Roswell Park Donor Center was an early adopter to manufacture plateletpheresis products collected in additive solution (PAS) replacing donor plasma. The collection procedure is the same, however the final donor volume of plasma is replaced with an additive solution. A benefit of the additive solution includes the reduced isohemagglutinin (ABO) titers that are present in donor plasma based on blood type. This allows for safe transfusion of the products across blood types eliminating the need for additional processing. The Roswell Park Donor Center began manufacturing platelet products collected in PAS in 2012. As of January 2016, 100% of products collected on site at Roswell Park were collected in additive solution. In 2016, we were one of the first ten blood collection centers in the United States to implement the pathogen reduction treatment of plateletpheresis products collected in platelet additive solution. This processing treatment exposes the platelet product to a psoralin compound that is exposed to ultraviolet light. The UV/psoralin complex cross links the DNA or RNA of bacteria, viruses or parasites, effectively preventing further replication and contaminated products. This procedure is also equivalent to the gamma irradiation treatment of products used to prevent graft vs. host disease.

Transfusion Reactions by Platelet Manufacture Type				
	Platelets Manufactured in Platelet Additive Solution		Platelets Manufactured in Plasma	
YR	# of Transfusion Reactions	Rxn/Unit x100	# of Transfusion Reactions	Rxn/Unit x100
2012	8	0.838	117	1.907
2013	11	0.663	80	1.208
2014	16	0.544	71	1.361
2015	11	0.453	56	0.879
2016	14	0.464	54	1.190

Plateletpheresis Products Transfused at Roswell Park by Manufacuture Type					
	2012	2013	2014	2015	2016
Plateletpheresis Products Manufactured in Additive Solution	955	1646	2942	2427	2540
Plateletpheresis Products Manufactured in Plasma	6134	6251	5217	6369	4536
Plateletpheresis Manufactured in Additive Pathogen Reduced					478



Platelet Transfusion Reaction Rates (Additive vs Plasma)

A transfusion reaction is a known risk to the use of blood products as a therapeutic agent. The Roswell Park implementation of platelets manufactured in additive (PAS) has demonstrated a decreased transfusion reaction rate when compared to platelet products manufactured in donor plasma. The transfusion reaction rate of products collected in additive solution is currently half the rate of products collected in donor plasma, thus supporting the transition to products collected solely in additive. This transition also allowed us to implement pathogen reduction of platelet products via the FDA approved pathogen reduction system.

The Role of Pathology in Precision Medicine/Targeted Therapy

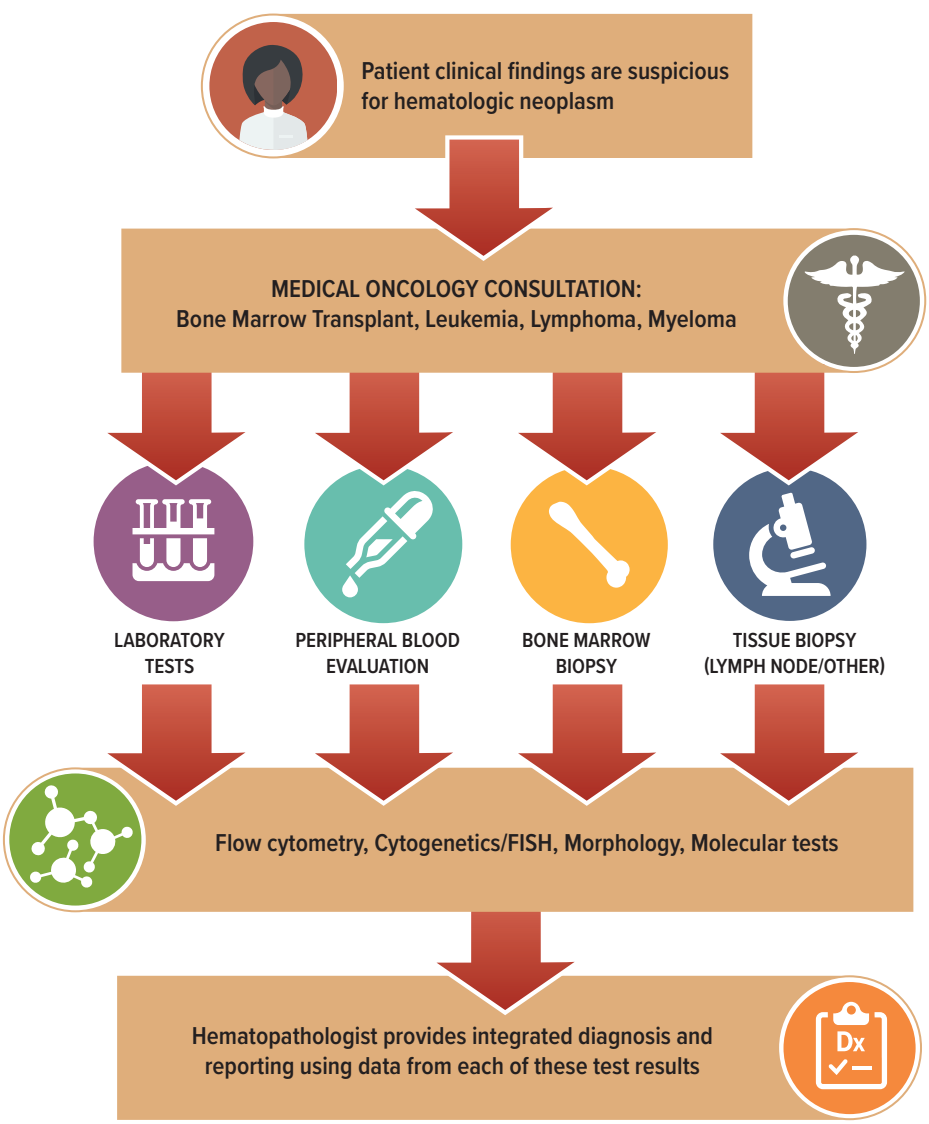
Roswell Park's Pathology Immunohistochemistry (IHC) Laboratory was one of the early stage laboratories to offer FDA approved PD-L1 IHC testing for the use of targeted drug therapies for non-small cell lung cancer patients. It is absolutely fundamental to carefully select those patients who, based on clinical and tumor features, are the best candidates for targeted therapies, so these patients receive the maximum benefit of the treatment and minimize potential side effects. Give the right drug to the right patient at the right time with the right dose!

PD-L1 (IHC) Non-Small Cell Lung Cancer	
# of patients screened for PD-L1	2016
22c3 (Keytruda)	483
28-8 (Opdivo)	213

DIAGNOSTIC HEMATOLOGY

Roswell Park's Division of Diagnostic Hematology provides comprehensive and integrated reporting of diagnostic and prognostic information on hematologic malignancies. The division includes the bone marrow laboratory, lymph node pathology, flow cytometry, cytogenetics and FISH laboratories. Clinical molecular diagnostic services for hematologic malignancies are provided in collaboration with OmniSeq laboratory.

SPECIMEN DIAGNOSTIC WORKFLOW: OUR PROCESS



DIAGNOSIS PARAMETERS: BONE MARROW LABORATORY

Bone marrow specimen diagnostic evaluation: Service supports clinical trials and routine diagnostic evaluation of bone marrow specimens. Roswell Park's expedited diagnoses on leukemia specimens shortens time to treatment.

TOTAL NUMBER OF PROCEDURES FOR 2016:

Bone Marrow Biopsies **1768**

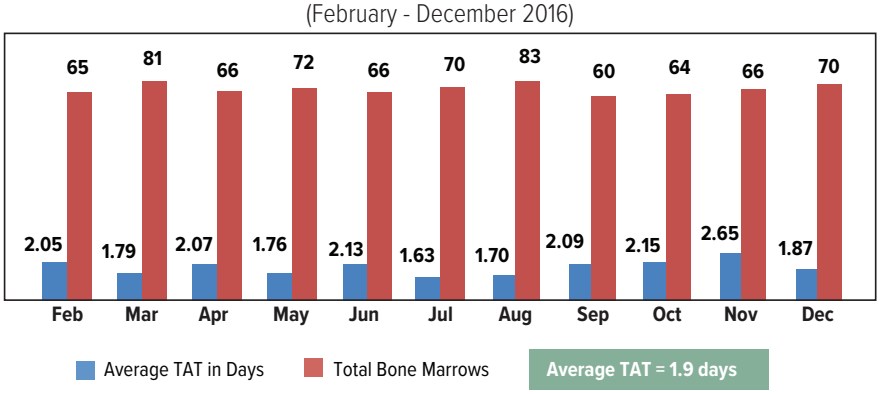
Leukemia Bone Marrows **763**

Average time from biopsy procedure to diagnosis:

1.9 working days.

Leukemia Bone Marrow Biopsy Totals and Average Turnaround Times

(February - December 2016)



- Same day preliminary diagnostic evaluation performed on 100% acute leukemia specimens at first diagnosis (24/7 year-round service).
- Q4 2016 (September to December) 25% of all leukemia specimens (all the specimens at first diagnosis and specimens from follow up) received same day diagnosis.

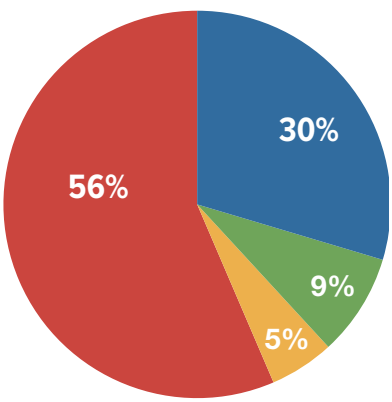
DIAGNOSIS PARAMETERS: FLOW CYTOMETRY LABORATORY

Flow Cytometry is a laser or impedance technology used in cell counting, cell sorting, and biomarker detection by suspending cells in a stream of fluid and passing them by an electronic detection apparatus. This lab supports clinical trials and routine diagnostic evaluation of bone marrow, body fluid and tissue specimens.

TOTAL NUMBER OF SPECIMENS processed and diagnosed in 2016:

5915

Leukemia Specimens	=	1752
Lymphoma	=	505
Myeloma	=	319
Other/body fluids	=	3339



SPECIAL SERVICES

Minimal Residual Disease:

- **Acute Lymphoblastic Leukemia**
- **Acute Myeloid Leukemia**
- **Plasma cell Myeloma**
- **Mantle cell Lymphoma.**

Diagnostic Phenotype provided same day (within 4 hours of specimen receipt) = 20% of all cases (24/7 year-round service).

DIAGNOSIS PARAMETERS: CYTOGENETICS / FISH

The Clinical Cytogenetics laboratory provides cytogenetic and molecular cytogenetic/ fluorescence in situ hybridization (FISH) analyses of bone marrow, peripheral blood, body fluid and solid tumor specimens. FISH tests performed include bone marrow, peripheral blood and other body fluid specimens, touch imprints, separated enriched cells and paraffin embedded tissue sections. The lab supports routine diagnostic evaluation and clinical trials. The Clinical Cytogenetics laboratory is one of 107 worldwide reference testing sites for the Children's Oncology Group (COG) and one of 33 US reference sites for the Alliance for Clinical Trials in Oncology (formerly the Cancer and Leukemia Group B), underscoring the laboratory's expertise and quality.

- Preliminary reports on newly diagnosed acute leukemia patients are issued within 24 hours
- Stat FISH analysis is provided within 4 to 24 hours after specimen is received
- Routine FISH analysis is provided 24-48 hours after specimen is received
- Total number of FISH tests performed in 2016: over 6,000
- Total number of specimens processed in 2016: 2577
- Chromosome analysis performed on 701 specimens, July to December 2016

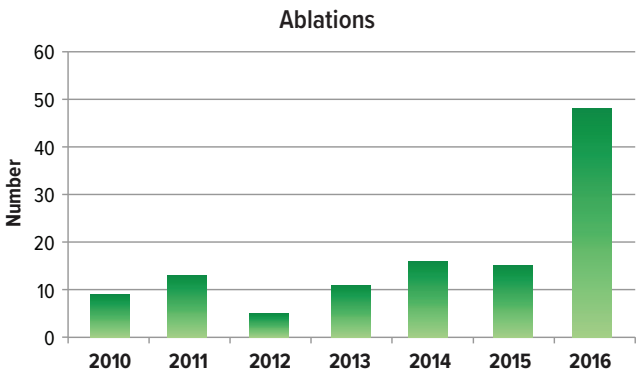
RADIOLOGY

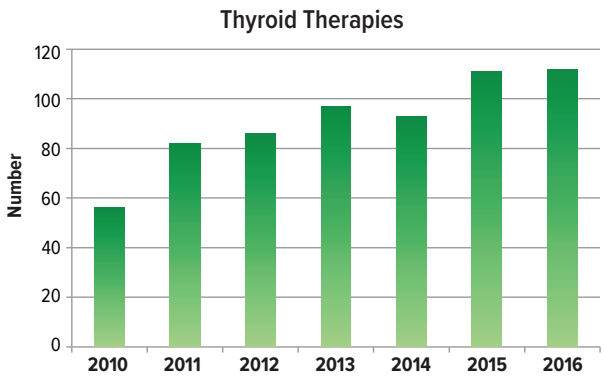
While our equipment is state-of-the-art and our staff are predominantly fellowship-trained, the quality added by Diagnostic Imaging at Roswell Park stands in a series of operational features that are unusual even in top cancer centers and university hospitals, and unique to the Buffalo area.

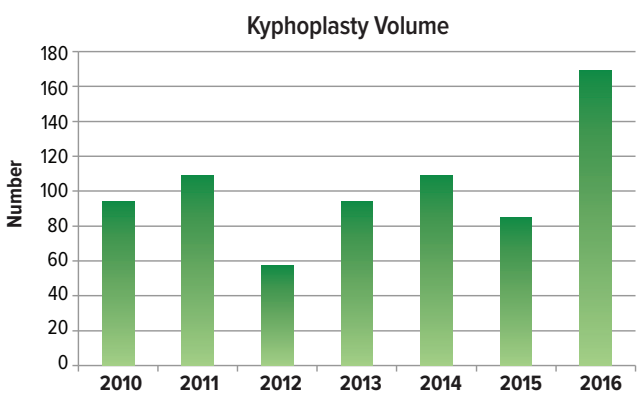
INTERVENTIONAL

1. Roswell Park's Radiology Department is aggressively interventional. The majority of cancer diagnoses are made in Radiology using minimally invasive image-guided biopsy techniques. We perform biopsies of virtually all tissues and patients recover in our own outpatient recovery suite. Although many hospital radiology departments perform lung, liver and thyroid biopsies, we emphasize larger-volume core biopsies to obtain adequate diagnostic samples required for molecular testing and today's newer personalized treatment regimens. Moreover, nearly all samples are examined at the time of removal by an on-site cytopathologist to ensure that adequate tissue is obtained. Thus, our callback rate for a repeat biopsy is under 2%.

2. The Radiology Department is also aggressively interventional in terms of therapy, and we perform radiofrequency tumor ablation, microwave ablation and cryoablation, depending upon tumor site and type. The department provides critical support for our surgical services, facilitating their ability to manage complex cases. In the Nuclear Medicine Department, we have by far, the largest thyroid cancer therapy group in Western New York.







3. Roswell Park neuroradiologists perform interventional therapeutic procedures such as kyphoplasty and vertebroplasty. For patients with a cancer diagnosis, we have one of the largest series statewide.

4. We actively support the limb perfusion therapy service, and are key to the microembolization and radioembolization of hepatic metastases, which are performed in our department, in collaboration with Nuclear Medicine and Interventional Radiology.

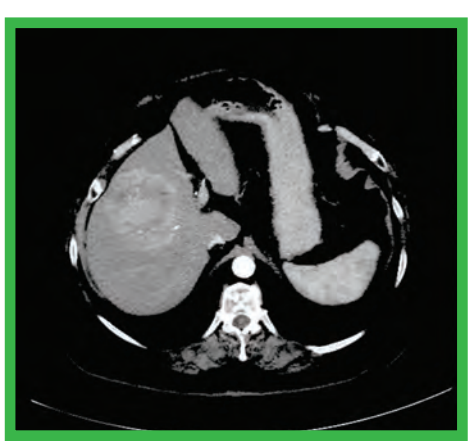
DIAGNOSTIC

1. American College of Radiology standards recommend reporting of all cases, whenever possible, within 24 hours. We comply, and usually exceed this standard by reporting cases within the same "daylight cycle." For example, cases performed between midnight and 4 p.m. on any given day are reported by the end of that workday. Because we employ instant voice-recognition software, there is no delay for human transcription.

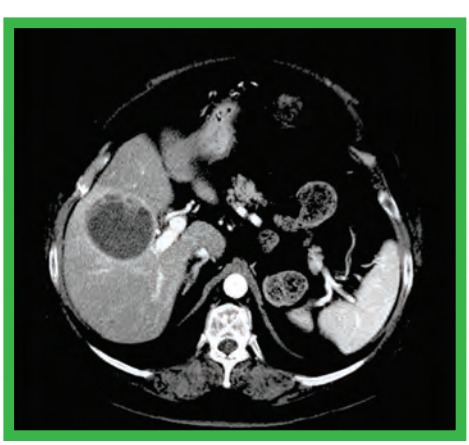
2. Once a patient arrives in our department, the typical wait time before a procedure begins is less than 30 minutes.

INTERVENTIONAL RADIOLOGY HIGHLIGHTS

- 94% of patients who underwent microwave ablation of a liver mass demonstrated a partial or complete response
- 86% of patients who underwent cryoablation of a renal mass demonstrated a partial or complete response
- 73% of all patients who underwent transarterial liver directed therapy for either primary or metastatic disease demonstrated tumor response or stable disease
- All biopsies are performed with a pathologist on site yielding a non-diagnostic rate of only 2%
- Only 3% of patients undergoing percutaneous lung biopsy require post procedure chest tube placement, significantly less than the national average
- We offer a dedicated Interventional Radiology clinic to provide patients with an opportunity to meet their interventional radiologist before the procedure, allowing the radiologist to make a final face-to-face evaluation of whether the patient is indeed appropriate for the procedure.
- 1 of 25 sites selected nationally to participate in the SIR-spheres research registry, which evaluates outcomes of radioembolization of primary and metastatic liver tumors
- Fellowship-trained and subspecialty board-certified interventional radiologists



Pre-procedure CT scan demonstrating a solitary hypervascular mass in the right hepatic lobe measuring 7 x 6.8 cm, consistent with hepatocellular carcinoma.



Post-procedure CT scan after a selective radioembolization (Y-90) treatment, demonstrating no residual enhancement consistent with a complete tumor response.

PASTORAL CARE

Roswell Park's Pastoral Care plays a key role in our holistic approach to cancer treatment, which recognizes the need to integrate the spiritual, emotional and physical care of the patient. We provide interfaith services and resources to meet the needs of our patients and their families.

Our Pastoral Care mission is to:

- **ENCOURAGE** a holistic interdisciplinary approach to cancer treatment
- **PROVIDE** spiritual support with respect for each person's faith tradition and spiritual perspective
- **ENHANCE** the spiritual, psychological and physical wellbeing of patients and families
- **RESPECT** the various religious beliefs and cultures of our patients and staff

Pastoral Care offers spiritual care to all persons regardless of religious affiliation. Our chaplains are familiar with, and sensitive to, the issues that accompany illness, and will respect the individual beliefs and preferences of our patients and families. Anyone may request a chaplain; you do not have to belong to a faith congregation or consider yourself religious.

We can provide information and support for a variety of religious and cultural backgrounds with the help of 35 area clergy and leaders of faith communities. Some of these faith traditions are: Baptist, Buddhist, Hindu, Jehovah's Witness, Islam, Pentecostal, Native American, Jewish and Orthodox Christianity.

Pastoral Care coordinates a number of worship services in our interfaith chapel throughout the year, and specific holy days of various traditions are celebrated along with communion services and weekly Masses. Staff chaplains have also celebrated baptisms and weddings for our patients.

Pastoral Care Services Include:	2014	2015	2016
Anointing of the Sick	393	437	411
Eucharistic Visits	4,940	4,769	4,242
Pastoral Care Visits – Patients	10,385	9,279	7,969
Pastoral Care Visits – Families	3,792	3,347	2631
New Admission Assessments	3,135	3,907	4,544

END-OF-LIFE/BEREAVEMENT SUPPORT SERVICES

With sensitivity, compassion and respect, Pastoral Care offers end-of-life support for patients and families in collaboration with the Palliative Care team. We also coordinate support to nursing staff and other employees of Roswell Park. Our services include:

- **Monthly grief education sessions**
- **Patient remembrance services**
- **Visitation and phone support**
- **Grief support groups**
- **Pediatric remembrance services**

End of Life/Bereavement Support Requests

2014	1,437
2015	1,489
2016	1,479

Palliative Care Referrals to Pastoral Care

2014	78
2015	58*
2016	136†

*Decrease due to no Department Chair | †New Chair

PROGRAM HIGHLIGHTS

Nurture Your Hope, a patient and caregiver retreat, is an ecumenical weekend of renewal, prayer, inspiration and personal reflection, designed especially for people facing the challenges of cancer. The weekend features speakers with personal and professional experience with cancer, provides information on the healing process and identifies resources for assistance.

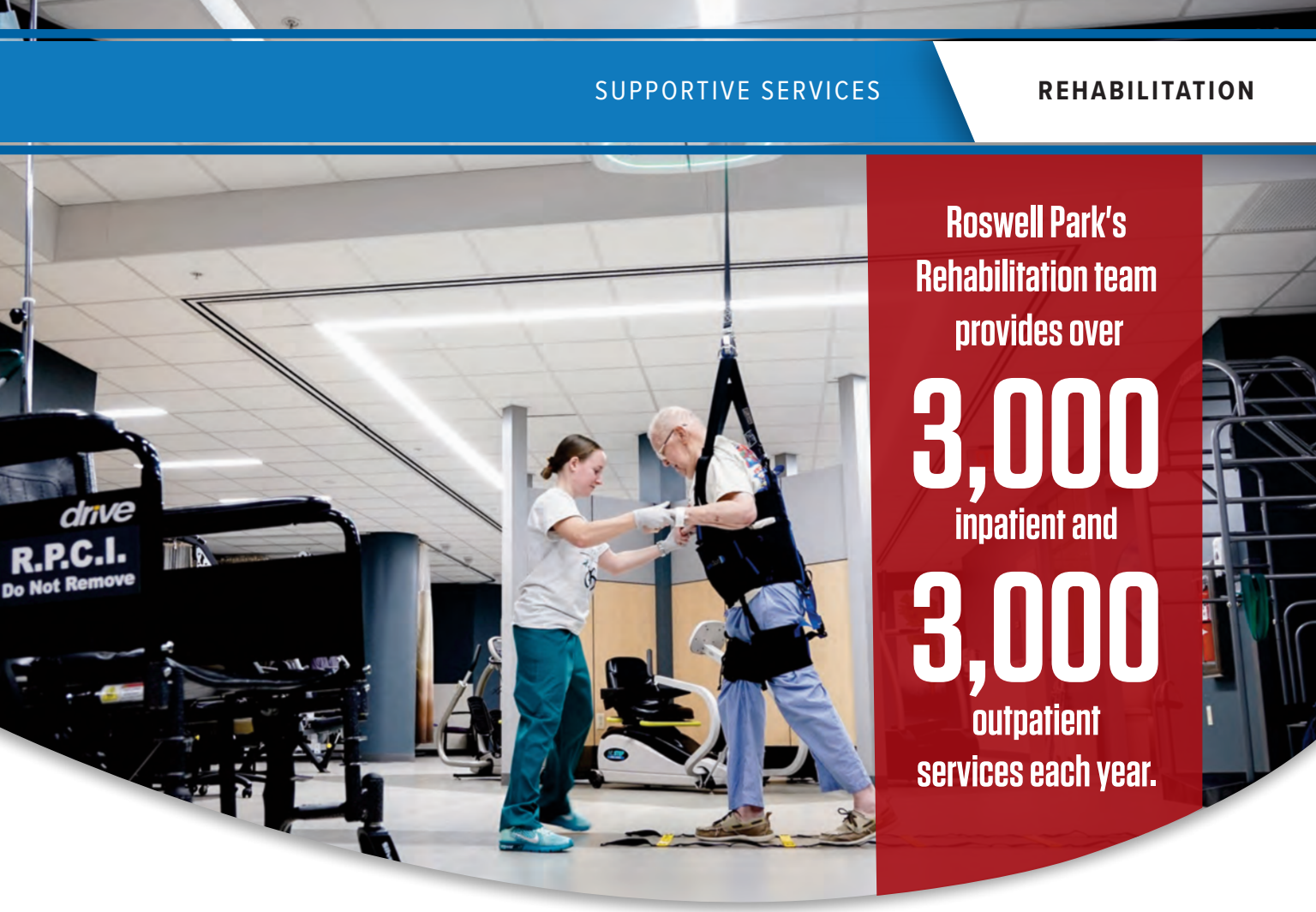
LIFE RECORDED®

Life Recorded celebrates the fact that everyone has a story to share. This program offers everyone at Roswell Park, including patients, families, staff and volunteers, the opportunity to share, record and treasure memories, thoughts, advice and insights. Our stories link us to one another and bring us hope. This program honors the uniqueness of every individual and brings recognition to the extraordinary within us all.

NUMBER OF RECORDINGS	
2014	49
2015	70
2016	53

Holiday Program, an endeavor to provide meals and gifts to patients and families who would benefit from additional support during the December holidays. Roswell Park departments—clinical, research and administrative—participate by "adopting" a family and providing the holiday food and gifts.

HOLIDAY PROGRAM STATS	2014	2015	2016
Families Served	87	90	67
Individuals Served	339	348	272
Including Pediatric Families	16	10	5



Roswell Park's Rehabilitation team provides over **3,000** inpatient and **3,000** outpatient services each year.

REHABILITATION

Mission

Our mission is to maximize the patient's physical abilities and comfort level throughout their entire experience at Roswell Park. We provide a range of inpatient and outpatient services, from pre-treatment physical and functional assessments to addressing side effects to ensure the most effective recovery.

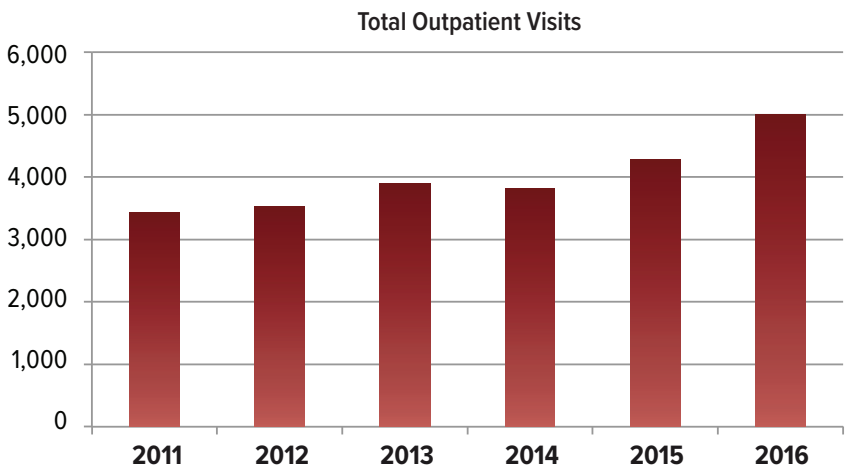
Oncology Specialty Trained Clinicians

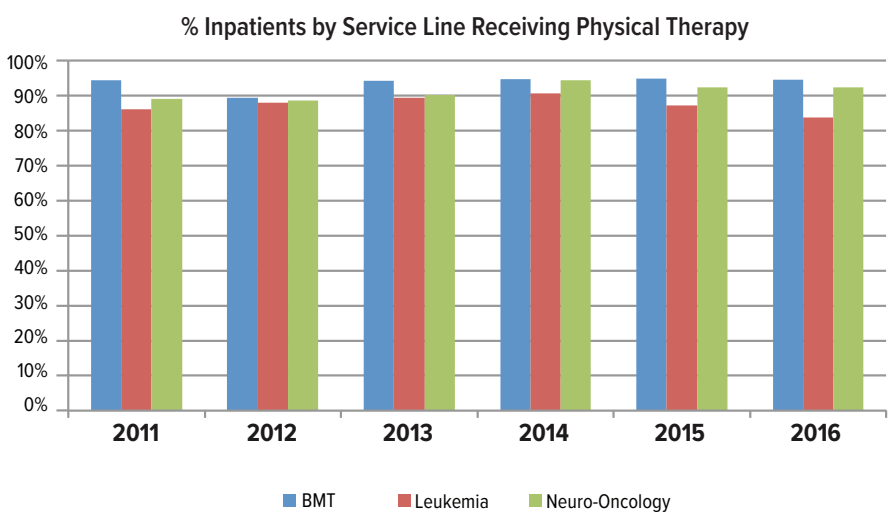
Patients with cancer often have unique and complicated rehabilitation needs. Roswell Park's physical and occupational therapists are specially qualified in addressing issues specific to the oncology population, and underwent training through the STAR Program®, a nationally recognized institution that focuses on the most current, evidence-based oncology rehabilitation.

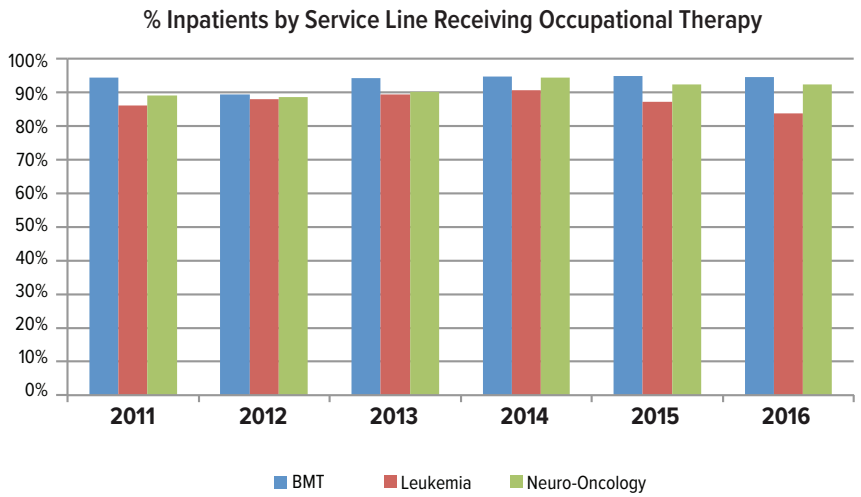
Occupational and Physical Therapists address the needs of patients in a variety of capacities:

- Evaluating physical and functional status to develop an appropriate care plan
- Providing treatments focused on reducing pain and restoring function
- Implementing interventions to improve mobility and independence
- Making recommendations for assistive equipment to maximize patient safety
- Coordinating with multidisciplinary team to plan for a safe and appropriate discharge

PROGRAM STATISTICS







OUR SPECIALIZED REHABILITATION TREATMENTS

- Lymphedema evaluation and treatment
- Pelvic floor rehabilitation, pre and post-surgery
- Pre-transplant evaluation for all patients receiving blood & marrow transplant
- Prehabilitation
- Home safety evaluations

Lymphedema

Lymphedema is an abnormal retention of fluid that occurs in tissues of the body when the lymphatic system is compromised. Cancer treatments, including surgery and radiation, can often affect lymph nodes resulting in swelling, discomfort and restricted motion.

Our Certified Lymphedema Therapists provide specialized treatments that include:

- **Manual lymphatic drainage**
- **Fitting of compression garments**
- **Symptom specific exercises**
- **Meticulous skin and nail care**
- **Comprehensive patient education**

Pre-treatment Evaluation & Prehabilitation

Cancer and the associated treatments can be physically demanding. Physical screening of patients prior to treatment can be an important first step to better prepare them for the process and to potentially improve prognosis. At Roswell Park, all patients who require blood & marrow transplantation (BMT) are evaluated by a physical therapist to determine a baseline physical status prior to admission. Patients who require additional strength and stamina are referred to outpatient physical therapy for prehabilitation. Over 90% of patients who undergo prehabilitation proceed on to transplant. Coordination between the outpatient and inpatient teams ensure continued treatment to promote patient independence and to prepare for discharge.

Amy Allen Case, MD, FAAHPM

Supportive and Palliative Care Program

Coping with advanced illness is stressful – not only for the patient but also for those who love and care for them. Palliative Care is a medical specialty devoted to caring for individuals with progressive illness. The goal is to maintain an optimal quality of life for patients and caregivers.

Palliative care means to "make feel better" and we take a team-based approach to medical care focusing on quality of life. Some of the services offered by our team include:

- Coordination with expertly trained physicians, nurse practitioners and nurses who evaluate and treat physical symptoms such as pain, shortness of breath, constipation or nausea
- Psychosocial support including social work assessment and patient and family counseling to help cope with stressors related to having cancer
- Spiritual support from a chaplain
- Healthcare planning

PALLIATIVE CARE ACCOMPLISHMENTS IN 2016

- Doubled the number of palliative care visits
- Maintained Joint Commission Advanced Certification in Palliative Care
- Increased staff to support our patients

How we help patients with cancer

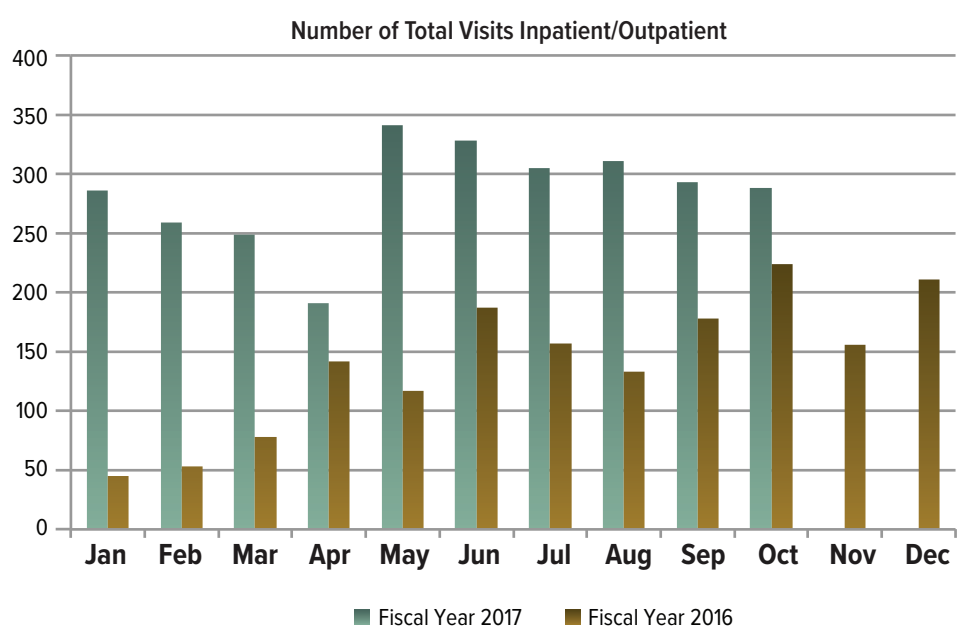
The palliative care team works with the patient and their family to develop a care plan focused on their needs and goals. We take the time to listen, explain things, answer questions and help patients cope with having cancer and undergoing treatments.

Numerous studies show that patients who receive palliative care have improved quality of life, greater satisfaction, better pain control and less depression.

In addition, patients who receive palliative care alongside oncology treatment earlier in the course of their disease had a significant survival benefit, according to randomized, controlled trials.

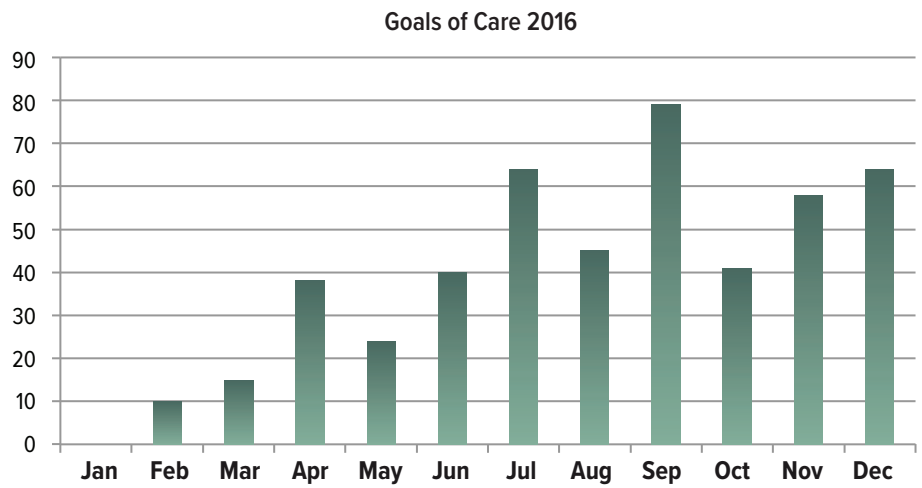
Quality Measures

Roswell Park's palliative care team increased volumes for both inpatient and outpatient visits over the past year.



Treatment Preferences and Goals of Care

Seriously ill patients who are given the opportunity to discuss their treatment preferences, including whether or not they desire to receive life-sustaining treatments, are more likely to have their disease managed in a way that is consistent with their values. These conversations with the care team support both the patient and family and result in improved satisfaction with treatment. Roswell Park aims to increase the number of Goals of Care and Treatment Preference notes completed by the palliative care team.



INNOVATION & RESEARCH

Key areas of research involving Palliative Care at Roswell Park include:

- **Early intervention for patients with advanced glioma and glioblastoma**. Because patients with these diagnoses often experience rapid disease progression, early palliative care to improve the quality of life for patients and families is important. Our team has begun a research study in collaboration with our Neuro-Oncology team to explore this.

- **Review of "triple therapy" for small bowel obstruction**. Non-operable malignant small bowel obstruction can pose significant risks for patients nearing end of life and typically indicates disease progression. The goal of a palliative approach is to minimize the symptoms to improve the quality of life. Triple therapy, a little-studied technique that uses octreotide, metoclopramide and dexamethasone, shows promise for symptom relief. Our researchers are working on an IRB-approved retrospective review of triple therapy for reversal of non-operable malignant small bowel obstruction.

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MISSION

To eliminate cancer's grip on humanity by unlocking its secrets through personalized approaches and unleashing the healing power of hope.

VISION

To free our world from the fear, pain and loss due to cancer — one act of compassion, one breakthrough discovery, one life-changing therapy at a time — until cancer is gone.

VALUES

Core values reflect what is most true and important to us as an organization.

These are values that have shaped us and will continue to – they do not change given circumstances or time but rather are consistent throughout our mission areas. Roswell Park is a special place to work and the staff and faculty who live these values have made it so. These values will guide and power our personal and collective actions and enable future successes on behalf of individuals and the world.

INNOVATION **INTEGRITY** **TEAMWORK**

COMMITMENT **COMPASSION AND RESPECT**

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