CANCER CARE

INAUGURAL REPORT | 2019
WELCOME

The cancer battle is serious—for many the fight of a lifetime. But cunning and ruthless as it is, cancer can be outwitted, outfought, and overcome. It can be forced to yield, allowing a body to survive, recover, even thrive. People fighting cancer want the best tools available in close, capable hands. They want excellence in all aspects of cancer care—precision, skill, experience, expert decision-making, determination, ingenuity, compassion, comfort, and the utmost in teamwork. This is what we aspire to achieve at Main Line Health.

Excellence is a work in progress. Even the best-run systems can reach higher. Essential to the pursuit of excellence is willingness to evolve and seek opportunities for growth.

In this spirit, Main Line Health has embraced change and forged a unified cancer program that incorporates the individual strengths of its multidisciplinary cancer programs at Lankenau Medical Center, Bryn Mawr Hospital, Paoli Hospital, and Riddle Hospital. Historically strong in their own right, these programs have consistently earned recognition for providing quality cancer care to the communities they serve. The goal of integration is not to dismantle these deep-rooted programs but to encourage formation of new roots connecting each to the other, thus creating a robust foundation to support further improvement and sustainability in a changing health care environment.

An important milestone in the evolution of Main Line Health’s system-wide cancer program, achieved in 2017, was Commission on Cancer accreditation as an Integrated Network Cancer Program. This inaugural report from Main Line Health Cancer Care highlights steps in our journey to integration, our progress to date, and our goals for future collaborative growth. It also serves as a reminder of our trifold mission of patient care, research, and education across the spectrum of cancer prevention, screening, diagnosis, treatment, symptom palliation, and survivorship.

Main Line Health remains true to its core values—serving the community and especially vulnerable populations, treating the whole person, and caring for people where they live. It also recognizes that patients have a choice in care providers. By merging the strengths of its more than 150 physicians with expertise in cancer, specialized cancer teams and programs, and state-of-the-art medical and surgical facilities, Main Line Health promises patients access to every advance possible in the fight against cancer and support at each step in their journey.

On behalf of my dedicated colleagues across Main Line Health, I hope that you find this report an informative introduction to Main Line Health Cancer Care and overview of our collective capabilities. It is an honor to partner with you in the care of your patients with or at high risk for cancer, and we look forward to continuing to earn your trust.

MICHAEL WALKER, MD
Medical Director, Main Line Health Cancer Care
### System Cancer Program

- **150+** Cancer care physicians
- **49** Oncology certified nurses
- **16** Oncology nurse navigators
- **4** Certified genetic counselors
- **5** Certified oncology social workers
- **9** Patient care locations
- **1** Biomedical research institute

### Clinical Care

- **3310** Analytic cancer cases<sup>a</sup>
- **1622** Cases presented at multidisciplinary tumor conferences
- **1655** Tumor genomic tests analyzed<sup>b</sup>
- **2030** Surgical procedures for treatment of cancer
- **25,908** Radiation therapy treatments
- **376** New patients accrued to cancer clinical trials and research studies
- **10** Cancer clinical trials staff members<sup>d</sup>

### Research

- **9** Resident research faculty investigating cancer
- **6.5M** Total external funding for cancer-related research<sup>c</sup>
- **67** Active cancer clinical trials and research studies across 14 tumor types<sup>d</sup>
- **1 of 74** U.S. health systems to achieve Commission on Cancer accreditation as an Integrated Network Cancer Program<sup>d</sup>

### Graduate Medical Education

- **101** Residents in specialty training emphasizing core competencies in cancer prevention, detection, diagnosis, treatment, follow-up, and survivorship<sup>op</sup>
- **21** Fellows receiving training in hematology/oncology, breast oncology, medical management of lung cancer, medical management of GI cancers, and rectal cancer management<sup>d</sup>

### Recognition

- **1 of 46** National Cancer Institute NCORP sites

### Vision

An integrated cancer program offering excellence in all aspects of cancer care at multiple sites throughout the region.

### Mission

To improve the lives of people with or at high risk for cancer through comprehensive, continuously improving, community-based services focused on cancer prevention, early diagnosis, and personalized care across the disease continuum.

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Forging a Path to Excellence in Community-Based Cancer Care

A long history of cancer care and research

Founded in 1985, Main Line Health has deep roots and a long history of caring for patients with cancer. Three Main Line Health hospitals (Lankenau Medical Center, Bryn Mawr Hospital, Paoli Hospital) have served communities in the Philadelphia region for more than a century—and a fourth (Riddle Hospital) for more than a half century. Prior to system integration of cancer services, all four acute care hospitals had their own cancer programs continuously accredited for decades by the American College of Surgeons Commission on Cancer. In addition, Lankenau shares its history with one of the nation’s earliest cancer research institutes. Lankenau Institute for Medical Research (LIMR), founded in 1927 and now part of Main Line Health, was the first biomedical research center in the United States to study cancer as a fundamental problem of cell growth. LIMR scientists continue to focus on basic cancer research while increasingly engaging clinicians at Main Line Health and beyond in collaborative cancer translational research. LIMR also serves as the administrative hub for Main Line Health’s cancer clinical trials program.

Building an integrated cancer program

Main Line Health made a strategic decision to merge cancer care expertise and services across the system to better serve regional patients and pave the way for future growth as an Integrated Network Cancer Program (INCP) built from but stronger than its component hospital-based programs. Guiding the system to better serve regional patients and pave the way for future growth as an Integrated Network Cancer Program (INCP) built from but stronger than its component hospital-based programs. Guiding the effort were the goals to:

- Enhance access to and coordination of cancer care to ensure that the full spectrum of clinical and support services are available to address the diverse needs of individual patients, close to home
- Continuously measure and improve, at the level of both hospital and system, clinical care processes and support systems for patients and families affected by cancer
- Optimize resource use, prioritizing efforts that support enhanced access and quality improvement while keeping pace with advances in cancer diagnosis and treatment

Core program infrastructure was put in place—including a network cancer committee, tumor work groups, and focused teamwork, the newly formed INCP achieved 3-year accreditation with silver commendation from the Commission on Cancer. The lifeblood of Main Line Health Cancer Care is the collective expertise of more than 150 physicians in more than 20 specialties, who collaborate in the care of individual patients with or at high risk for cancer in communities in the Philadelphia region for more than a century—and a fourth (Riddle Hospital) for more than a half century. Prior to system integration of cancer services, all four acute care hospitals had their own cancer programs continuously accredited for decades by the American College of Surgeons Commission on Cancer. In addition, Lankenau shares its history with one of the nation’s earliest cancer research institutes. Lankenau Institute for Medical Research (LIMR), founded in 1927 and now part of Main Line Health, was the first biomedical research center in the United States to study cancer as a fundamental problem of cell growth. LIMR scientists continue to focus on basic cancer research while increasingly engaging clinicians at Main Line Health and beyond in collaborative cancer translational research. LIMR also serves as the administrative hub for Main Line Health’s cancer clinical trials program.

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Multidisciplinary care teams at Main Line Health help ensure that patients throughout the region with or at high risk for cancer receive the best care that is delivered safely, efficiently, and with the goal of optimal outcomes.

Moving the Needle

Network cancer committees and tumor work groups

The network cancer committee and tumor work groups play critical roles. These multidisciplinary teams draw from across Main Line Health and in tandem to promote growth and success of the integrated cancer program.

- The network cancer committee includes representatives from radiology, pathology, surgery, medical oncology, radiation oncology, genetics, clinical research, oncology nursing, oncology social work, oncology data services, quality improvement, palliative care, pharmacy, nutrition, hospice, rehabilitation, navigation, survivorship care planning, and community outreach—among others. Chief among the committee’s roles is to identify and overcome barriers to improving 1) cancer survival and survivability, and 2) the process, outcomes, and experience of cancer care.

- The tumor work groups have representatives from surgery, medical oncology, radiation oncology, radiology, and other specialties as needed (e.g., pulmonology, gynecology, genetics, pathology, palliative care, pain management), as well as cancer research, oncology nurse navigation, and oncology social work.

Since 2015, these physician-led, tumor site–specific groups have helped to advance and, when appropriate, introduce changes in the system. In addition to providing management oversight of cancer care, these work groups have been critical partners to the network cancer committee by using their expertise at its four hospitals to ensure that the vast resources and multidisciplinary teams from each acute care hospital rotate in bringing complex or clinically challenging cases for group discussion and shared learning.

Moving forward together

To date, Main Line Health’s transition from four related but separate cancer programs to a single, integrated cancer program has led to important growth and benefits, including:

- Introducing/re-introducing physicians and clinical teams at Main Line Health’s acute care campuses
- Sharing best practices to elevate cancer care delivery throughout the system
- Identifying opportunities for improvement through review of system-wide quality data and outcomes
- Discovering how to maximize use of Commission on Cancer quality tools to benefit patients

Looking ahead, Main Line Health Cancer Care will continue to seek opportunities to improve the quality and coordinated delivery of its comprehensive cancer services while strengthening cohesiveness of its system-wide clinical cancer teams. Specific goals include:

- Ensuring multidisciplinary, proactive discussion and decision-making for all 3300+ patients served each year
- Expanding clinical cancer research and increasing clinical trial accrual
- Providing high-value services to patients and the community

Finally, as an accredited cancer program, Main Line Health Cancer Care has access to Commission on Cancer quality tools to benchmark its performance, identify quality gaps, and drive improvement efforts.

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Nearly a Century of Cancer Research

Main Line Health is distinct as a community-based cancer program in having a large research enterprise spanning basic science investigations to late-stage clinical trials. The Program in Cancer Research is anchored at Lankenau Institute for Medical Research (LIMR), a state-of-the-art biomedical research facility on the campus of Lankenau Medical Center. LIMR has been a nexus of cancer research since 1927, with integral ties to cancer care initially at Lankenau and ultimately across all of Main Line Health. Synergy between resident faculty at LIMR and affiliated physicians at Main Line Health enables rapid translation of laboratory findings into clinical investigations. LIMR is also the administrative hub for National Cancer Institute (NCI) clinical trials available through Main Line Health’s NCI-funded Community Oncology Research Program (NCORP).

The Program in Cancer Research is co-directed by George Prendergast, PhD, president and CEO of LIMR and Havens Chair for Biomedical Research, and Paul Gilman, MD, director of the Center for Clinical Cancer Research at LIMR and chief of hematology/oncology at Main Line Health.

Speeding the Path from Lab to Clinic

LIMR is unique in merging scientific, clinical, and entrepreneurial activity at the same facility—a biomedical research model Dr. Prendergast describes as acapreneural. A central element of the model is integration of a biotechnology start-up incubator side-by-side with laboratory-based scientists and clinical researchers seeking to move a scientific discovery to the clinic.

Discovery and development of new targeted cancer therapies

A dominant focus of cancer research at LIMR is the tumor microenvironment, where research teams are plowing the depths in pursuit of targets that can be exploited with novel therapies to help prevent immune overreaction to targeted therapies, improve efficacy, and overcome drug resistance.

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The ultimate goal of cancer therapy is to destroy and fully doom malignant tumors without damaging healthy tissues. While cancer immunotherapy is a significant step forward, most patients do not achieve complete response with current immunotherapies. Achieving the promise of immunotherapy may depend on combining these therapies with novel targeted agents that improve their efficacy.

Cancer Research at LIMR: History and Highlights

1927 Lankenau Hospital chief pathologist and pioneering cancer researcher Stanley Reimore founds Lankenau Hospital Research Institute (LIMR) and the first U.S. research center dedicated primarily to the study of cancer and first to study cancer as a fundamental problem of cell growth.

1937 The newly formed National Cancer Institute (NCI) identifies LIMR and Memorial Hospital (later, Memorial Sloan Kettering Cancer Center) as the most significant U.S. cancer research labs at the time.

1943 Jack Schatz, one of few geneticists working in cancer research at the time, joins LIMR and is encouraged by Reimore to study human chromosomes using clinical specimens readily available from Lankenau Hospital.

1944–1957 Growth and success of LIMR’s cancer research program lead the hospital to create the Institute for Cancer Research (ICR), a sister entity focused exclusively on cancer research. In 1948, ICR and LIMR move to a larger facility in Fox Chase and continue to conduct research jointly.

1957–1974: a time of major contributions to cancer research

Cancer research activity at LIMR and ICR is consolidated under the name ICR, and all other LIMR research programs move to the new hospital medical facility in Wynnewood under the name Lankenau Medical Research Center (LMRC). Basic cancer research begins at LMRC as major work in cancer continues at ICR:

• In 1960, ICR’s David Hungerford (a student of Schultz) codiscovers (with Penn’s Peter Nowell) the Philadelphia chromosome, launching the modern era of molecular genetics in cancer research.

• In 1962, ICR researcher Beatrice Mintz creates the first mammary construct composed of genetically different cell populations in all tissues. Her research methods enable later development of the first transgenic species, now widely used in cancer research.

• In 1967, ICR’s Barbara Blumberg discovers the hepatitis B virus, shows it can cause liver cancer, and develops a blood test to detect it. It is the first virus to be identified with a link to target that can be treated.

• In 1969, ICR researcher Burt Kramer develops the first anticancer drug, 5-fluorouracil, which is now widely used in cancer research.

1974–1985 ICR merges with American Oncologic Hospital to form Fox Chase Cancer Center. Cancer research accelerates at Lankenau Hospital and LMRC.

1985–1999 Lankenau Hospital and LMRC become part of Main Line Health, LMRC moves to a state-of-the-art laboratory facility on the hospital campus and recruits experts in cancer-related molecular biology and molecular genetics, who identify and characterize genes influencing inflammatory carcinogenesis. In 1994, Main Line Health receives its first NCI community oncology research grant (see page 17).

1999–2004 LMRC is renamed Lankenau Institute for Medical Research (LIMR) and greatly expands its research programs on aging, inflammation, and cancer.

2004 to present Cancer genetics and biology researcher George Prendergast is appointed LIMR president, launching study of disease modifier genes and incubation of biotech companies that translate that cancer discoveries into new prognostic and therapeutic tools for cancer care.
CANCER RESEARCH AND CLINICAL TRIALS

TARGET: IDO

Turning cold tumors hot. Successful cancer immunotherapy depends on blocking mechanisms tumors use to evade or subvert immune attack. LIMR scientists have been at the forefront of research showing that cancers use IDO1 (indoleamine 2,3-dioxygenase 1)—an enzyme activated in pregnancy to prevent immune attack on a growing fetus—to blunt immunosuppression. IDO1 is widely overexpressed in human cancers and predicts poor prognosis.

Dr. Prendergast and LIMR associate professor Alexander Muller, PhD, have spent more than a decade examining IDO1 and, more recently, the related tryptophan catabolic enzymes IDO2 and TDO (tryptophan 2,3-dioxygenase) with this in mind. The small molecule IDO1 inhibitors they developed spent more than a decade examining IDO1 and, more recently, the related tryptophan catabolic enzymes IDO2 and TDO (tryptophan 2,3-dioxygenase) with this in mind. The small molecule IDO1 inhibitors they developed—Ido-1-Inh-A and Idodan—are licensed to NewLink Genetics, which is developing the IDO1 inhibitor indoximod. Their patents with the goal to develop IDO-blocking agents. The scientists pioneered the discovery and use of small-molecule inhibitors of IDO. Their patents are licensed to NewLink Genetics, which is developing the IDO1 inhibitor indoximod. Their patents with the goal to develop IDO-blocking agents. The scientists pioneered the discovery and use of small-molecule inhibitors of IDO. Their patents are licensed to NewLink Genetics, which is developing the IDO1 inhibitor indoximod.

In combination with drugs that preferentially kill proliferating tumor cells, IDO1 inhibitors—IDO inhibitors—

TARGET: THIOL

Destroying tumor back-up fuel. Glucose-starved tumors are notorious for giving rise to drug-resistant, polyamine-overexpressing cells. By targeting thiols—small, thiol-containing agents—LIMR research lab associate James Dufayell was the first to speak to the possibility that drugs that sensitize glucose-deprived cancer cells to destruction may be useful alone or as an adjuvant therapy.

In the glucose-deprived microenvironment of solid tumors, maintaining thiol homeostasis is critical for cancer cell survival. Disrupting energy transport

TARGET: POLYAMINES

Starving and exposing tumors to their survival needs. Polyamine synthesis is a hallmark of tumorigenesis. All cells need polyamines to proliferate, but tumor cells need high amounts of polyamines to meet their metabolic needs. Wanting to take advantage of this, Dr. Prendergast and Muller discovered that IDO1 (indoleamine 2,3-dioxygenase 1)—an enzyme activated in pregnancy to prevent immune attack on a growing fetus—to blunt immunosuppression. IDO1 is widely overexpressed in human cancers and predicts poor prognosis.

Dr. Prendergast designed a study in animal models of melanoma and breast, ovarian, colorectal, and pancreatic cancers. The discovery, poised to enter clinical trials, offers general utility in cancer treatment, including in combination with standard chemotherapy or immunotherapy to further increase patient survival.

The protein HuR (human antigen R) is found in high amounts in cancer cells and regulates hundreds of genes that function in critical pathways for tumor cell survival. HuR kicks in during times of stress, as in the face of chemotherapy, to enable the most aggressive cancer cells to survive. Destroying cancer survival kits

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Increasing energy transport

Disrupting energy transport

Polyamine uptake is highly increased in melanoma tumor cells, which are brimming with oncogenic mutations and thus have a high demand for polyamines to meet their metabolic needs. Wanting to take advantage of this, Dr. Gilmour designed a study in animal models of BRAF mutant melanoma to test the effect of targeting the polyamine transport system with a polyamine-conjugated cytostatic drug synthesized by Dr. Phanelli. The experimental treatment significantly increased cell death in BRAF-mutant melanoma cells compared to wild-type cells and restored BRAF inhibitor sensitivity in melanoma tumor cultures, showing potential as an adjunct therapy to overcome drug resistance in mutant BRAF melanoma.

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Translational Cancer Research

LIMH’s unique dynamic fosters collaborative translational research, ease of access and a fluid environment allow LIMH scientists and Main Line Health clinicians to interact and ponder research questions together, creating fertile ground for studies in which scientist and clinician work hand-in-hand.

Oral zinc to prevent malignant progression of Barrett’s esophagus

Patients with Barrett’s esophagus (BE) have a significantly increased lifetime risk of esophageal cancer, with no options for chemoprevention. Following up on research showing that oral zinc prevented squamous cell carcinoma in the esophagus of lab animals, James Mullin, PhD, LIMR professor and director of research in the division of gastroenterology at Lankenau Medical Center, and on human risk factors associated with BE progression, Mullin and gastroenterology fellows at Lankenau began a study to test the potential chemopreventive action of oral zinc in patients with BE.

The team’s first, in patients with BE undergoing endoscopic surveillance for cancer development, showed positive results of oral zinc on squamous marker of BE progression. These results, presented at the 2018 annual meeting of the American College of Gastroenterology, led to a follow-up study in eligible patients randomized to 14 days of oral zinc or placebo after radiographic ablation of Barrett’s tissue and subsequent scheduled endoscopic follow-up. The team is looking to see whether zinc renders neosquamous epithelium less leaky to acid and induces molecular changes indicative of a chemopreventive action.

The study opened in July 2018 and is enrolling patients.

Blood test to predict acute nausea with platinum-based chemotherapy

Chemotherapy-induced nausea and vomiting is a debilitating side effect experienced by some but not all patients treated with platinum-based agents, with no predictive biomarker currently available to identify those at risk. Recognizing the potential benefits of a reliable predictive test (i.e., improved patient quality of life during cancer treatment, reduced hospitalizations for treatment of acute chemotherapy-induced vomiting, reduced potential for treatment dropout, and justification for the use of powerful antiemetics in patients at risk with reduced use in patients not at risk), Dr. Gilman consulted LIMR assistant professor U. Margaretha Wallon, PhD, a cancer biologist with an interest in cancer biomarkers.

Dr. Gilman and Wallon subsequently developed a blood-based assay that exploits a natural variation in patients at risk with reduced use in patients not at risk), Dr. Gilman consulted LIMR assistant professor U. Margaretha Wallon, PhD, a cancer biologist with an interest in cancer biomarkers. Drs. Gilman and Wallon subsequently developed a blood-based assay that exploits a natural variation in patients at risk with reduced use in patients not at risk), Dr. Gilman consulted LIMR assistant professor U. Margaretha Wallon, PhD, a cancer biologist with an interest in cancer biomarkers. Drs. Gilman and Wallon subsequently developed a blood-based assay that exploits a natural variation in red blood cell thiol redox capacity in humans, which Dr. Wallon discovered using a novel assay for measuring thiol redox stress in cells. An initial study in 64 patients with lung or colorectal cancer treated with platinum-based therapy at Lankenau Medical Center showed that the test correctly classified patients’ sensitivity in 89% of cases.

A test in a second group of 97 patients confirmed the accuracy of the predictive test, with a 2% false-negative rate and 98% true-positive rate, measuring thiol redox capacity in red blood cells.

The researchers continue to seek eligible patients for the study, including those with breast or ovarian cancer.

Clinical Cancer Research

The Center for Clinical Cancer Research at LIMH, led by Dr. Gilman, oversees all cancer-related clinical research activity at Main Line Health, which encompasses NCI-sponsored cooperative group clinical trials, industry-sponsored trials, investigator-initiated studies, and patient registries. Clinical cancer research at Main Line Health is broad based, with a common focus on cancers of the breast, gastrointestinal tract, lung, prostate, and ovary.

NCI-sponsored clinical trials

In 1983, recognizing that most people receive cancer-related care outside of academic medical centers, the NCI launched the Community Clinical Oncology Program (CCOP) to bring cancer research to a larger population of patients being treated in real-world community settings. Since 1994, Main Line Health has been continuously funded for participation in this program—first as a CCOP (1994 to 2014) and then as one of 46 NCORP community sites (2014 to present). Main Line Health’s NCORP principal investigator is Albert DeNittis, MD, radiation oncologist at Lankenau Medical Center.

Being part of the NCORP network allows Main Line Health physicians to enroll patients in multisite NCI-sponsored cancer trials and research studies spanning the areas of cancer control, prevention, screening, treatment, post-treatment surveillance, supportive care, and symptom management as well as cancer care delivery and health-related quality of life for patients undergoing treatment for cancer.

NCORP Clinical Trials

As of December 2018, 49 NCORP clinical trials currently enrolling patients. 63 NCORP clinical trials active but closed to enrollment as of December 2018.

A hospital or health system cancer research program must hit target accrual rates each year to be approved for an NCI grant to participate in community oncology research. This is one reason Main Line Health’s clinical cancer research program has been continuously funded since 1994. Our trial accrual rates are always among the highest in the country.

Main Line Health Cancer clinical trials coordinators.

Clinical Cancer Research 13 MAIN LINE HEALTH CANCER CARE INAUGURAL REPORT 2019 CLINICAL RESEARCH AT MAIN LINE HEALTH Main Line Health maintains a robust infrastructure to support clinical research. The Office of Research Protection facilitates review of human subject research by the Main Line Health Institutional Review Board (IRB) and is a resource for navigating regulatory compliance and fostering ethical conduct of human subject research. Main Line Health’s Human Research Protection Program is fully accredited by the Association for the Accreditation of Human Research Protection Programs.

Clinical Cancer Research CAREER Clinical Cancer Research

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Cancer genetics is a rapidly changing field. Guidelines for hereditary cancer syndromes are continually evolving, making it impossible for most physicians to keep up. We encourage physicians to rely on us to update them with what's new and what they need to do.

Cancer Risk Assessment and Genetics Program
The Main Line Health Cancer Risk Assessment and Genetics Program provides evaluation and genetic counseling, including coordination of genetic testing when appropriate, for patients who are at risk for hereditary cancer or who seek to better understand their cancer risks based on their personal or family history of cancer. Individualized, evidence-based recommendations and psychosocial support are provided for optimal cancer risk management.

A key mission of the program is to increase awareness among providers and patients of hereditary cancer risks and the impact risk assessment can have on improved care.

Program history
The Cancer Risk Assessment and Genetics Program was established in 1997 under the leadership of medical oncologist Paul Gilman, MD, following the discovery of the BRCA1 and BRCA2 genes. Dr. Gilman was inspired by an opportunity to prevent breast and ovarian cancers by identifying individuals at risk and personalizing their medical management.

Uncertainty regarding genetic testing was an early barrier to uptake, as patients feared potential insurance or legal discrimination, testing techniques and interpretation of results were limited, and management options were largely unproven. Further, associated costs were high and not covered by insurance.

Over the past 2 decades, advancements in science, law, and medicine have lowered costs, increased knowledge, provided legal protection, and improved access to genetic testing services. Today, patients can be self- or provider-referred for genetic evaluation and tested for multiple genes concurrently at little to no cost; laws are in place to reduce the chance of potential discrimination based on genetic predisposition; and published guidelines for screening, prevention, and treatment are available to assist providers in caring for patients at risk.

Program goals and services
Identify at-risk individuals who are candidates for genetic evaluation and a consideration of genetic testing

Provide comprehensive risk assessment including genetic evaluation and counseling

Assist in genetic testing, interpret test results, and provide post-test genetic counseling

Discuss and provide risk-reducing options and risk-appropriate screening recommendations, including opportunities for research participation

Provide resources and referrals for follow-up and support internal and external patient needs and networks

Assess cancer risk and provide counseling, and advice about making lifestyle changes, for patients with breast cancer

Benefits and Complexities of Genetic Testing
Genetic testing is increasingly used to improve and personalize cancer treatment and inform strategies to reduce cancer-related morbidity and mortality. Genetic mutations—both acquired within a tumor and inherited within the genome—can have important implications. Some patients with specific mutations should or should not receive certain treatments, making genetic testing critical for managing specific tumors. Because some inherited mutations can associate with more than one type of cancer, genetic testing also is important for managing individual patients and their risks, rather than tumors.

The education and support genetic counselors provide are essential in helping our patients understand and adapt to the medical, psychological, and familial implications of the genetic component of cancer risk.

Michael Dabrow, DO
Medical oncologist, Paoli Hospital
Co-Medical Director, Cancer Risk Assessment and Genetics Program, Main Line Health

Certified genetic counselors

<table>
<thead>
<tr>
<th>Program at a glance</th>
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<tbody>
<tr>
<td><strong>Patient visits</strong></td>
</tr>
<tr>
<td>1325</td>
</tr>
<tr>
<td><strong>New patient visits</strong></td>
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<tr>
<td>90%</td>
</tr>
<tr>
<td><strong>Percentage of patients seen for genetic counseling who elected to have genetic testing</strong></td>
</tr>
<tr>
<td>20%</td>
</tr>
<tr>
<td><strong>Care centers served</strong></td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td><strong>Certified genetic counselors</strong></td>
</tr>
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<td>4</td>
</tr>
</tbody>
</table>
Main Line Health’s cancer genetics program provides genetic testing for many familial cancer susceptibility syndromes. Generally, these syndromes involve an increased risk for breast, ovarian, uterus, colorectal, pancreatic, gastric, prostate, renal, endocrine/neuroendocrine, and/or skin cancers. Some benign findings, such as colorectal polyps, uterine fibroids, and thyroid nodules, may also suggest an inherited risk.

Helping patients navigate in the era of direct-to-consumer genetic tests

With direct-to-consumer (DTC) tests for cancer-related genes now available, many patients may consider at-home testing for genetic cancer. Patients should be advised of the complexities of genetic testing and the limitations of DTC tests. Current DTC tests may not include or fully analyze cancer-associated genes, so a negative result may be falsely reassuring in a patient with a strong family history of cancer. Conversely, any positive test should be confirmed with another testing method, as inaccurate results have been reported. Main Line Health's cancer genetics program offers a wealth of experience navigating the evolving genetic testing landscape and is designed to meet the needs of patients seeking information about cancer risks. The program promotes genetic testing when accompanied by pre- and post-test counseling, so patients can choose the best test for them with a clear understanding of its pros, cons, and limitations as well as how their test results may impact their care or the care of their family members.

RACHAEL BRANDT, PhD, MS, LCGC
Manager, Cancer Risk Assessment and Genetics Program, Main Line Health

Main Line Health certified genetic counselor.

Main Line’s pathology and cancer genetics teams regularly review testing for MMR deficiency in colorectal and endometrial cancers to identify patients at risk for Lynch syndrome. Another reason to identify MMR-deficient cancers is the observation that MMR deficiency predicts benefit from PD-1 (immune checkpoint) blockade in select patients. Lynch syndrome. Another reason to identify MMR-deficient cancers is the observation that MMR deficiency predicts benefit from PD-1 (immune checkpoint) blockade in select patients. Lymphoma, another type of cancer that can result from genetic changes, is also considered a potential risk factor for developing cancer. The genetics team at Main Line Health works closely with other medical professionals, such as oncologists and surgeons, to provide comprehensive care for patients with Lynch syndrome.

Support across the cancer continuum

From the earliest indication of cancer, patients have the support of an oncology nurse navigator. On staff at each acute care cancer center, nurse navigators serve as a continuous point of contact throughout a patient’s course of care as well as a conduit for connecting patients to support services offered through Main Line Health Cancer Care (see page 42).

Guiding Principles

Clinical services offered through Main Line Health Cancer Care are guided by five principles:

- Prevention, early detection, and eradication of cancer wherever possible
- Individualized, multidisciplinary care using all available and appropriate diagnostic and treatment options, including novel and emerging therapies
- Minimally invasive, tissue-sparing treatment whenever possible
- Adherence to current evidence-based, standard of care practices
- Patient-centered longitudinal care from cancer diagnosis through survivorship

Multidisciplinary care

In 2017, 338 multidisciplinary tumor conferences were conducted across Main Line Health’s four acute care cancer campuses, with 332 cases presented for comprehensive team discussion. At campus tumor conferences, all cases are reviewed in the framework of national guidelines, emerging best practices, and the latest advances in molecular-based targeted treatment and immunotherapy. To ensure all relevant aspects of a patient’s case are considered, surgeons, medical and radiation oncologists, radiologists, pathologists, and pertinent medical specialists provide input, along with representatives from cancer genetics, oncology nursing, oncology social work, nutrition, and cancer clinical research.

In addition to campus tumor conferences, Main Line Health holds system-wide tumor-specific conferences that bring teams from each campus together to share best practices and learn from each other. These breast, lung, gastrointestinal, and gynecological tumor conferences are held two to four times per year and focus on rare or clinically complex cases.

Prevention and Early Detection

Main Line Health offers many tumor-specific and specialized programs for cancer prevention and early detection, including:

- Routine and high-risk screening for breast, lung, colorectal, cervical, prostate, and skin cancers
- Cancer risk assessment and genetic testing for inherited and familial cancers
- Surveillance and management of patients with high-risk or premalignant lesions
- Cancer risk reduction and prophylactic interventions for appropriate high-risk patients

Cancer prevention is a major focus at Main Line Health, with everything from cancer risk assessment and genetic testing to specialized cancer screening, patient registries and surveillance programs, and physician specializing in pre- and early cancer eradication. We are all trying to find patients at high risk and help them change their story.

ADVANCING QUALITY: Ensuring genetic referrals for mismatch repair deficiency

The National Comprehensive Cancer Network (NCCN) recommends testing for mismatch repair protein (MMR) deficiency in colorectal and endometrial cancers to identify patients at risk for Lynch syndrome. Another reason to identify MMR-deficient cancers is the observation that MMR deficiency predicts benefit from PD-1 (immune checkpoint) blockade in select patients. Main Line Health’s pathology and cancer genetics teams regularly review testing for MMR deficiency in colorectal and endometrial cancers and, in 2017, found a small gap in immunohistochemical testing when indicated. This study prompted a formalized, collaborative effort across the health system to ensure the test is performed in all appropriate cases and that all MMR-deficient cancers are reported to the genetics team and the physician of record so appropriate patients can be referred to the cancer genetics team for further evaluation.

ROBIN CICCO, DO
Breast surgeon, Lankenau Medical Center
Minimally invasive surgery.
Main Line Health surgeons specialize in minimally invasive approaches to cancer management, including laparoscopic and robotic-assisted abdominal surgery, thoracoscopic and robotic-assisted thoracic surgery, endoluminal surgery, and natural orifice transluminal endoscopic surgery (NOTES).

Surgeons and interventional specialists also have expertise in a variety of surgical alternatives, such as cryoablation, radiofrequency ablation, laser surgery, and photodynamic therapy.

Medical therapy
Although chemotherapy and hormone therapy remain the most common medical therapies used to treat cancer, they are no longer the only options. As new targeted and immunotherapeutic agents become available, Main Line Health cancer teams are harnessing every emerging therapeutic strategy possible to improve medical treatment of cancer. Among the advanced medical therapies being used are oncolytic viral therapy for melanoma and hyperthermic intraperitoneal chemotherapy for ovarian cancer.

Radiation therapy
Radiation oncologists use sophisticated linear accelerator–based systems for safe, effective delivery of highly targeted external beam radiation therapy, including intensity-modulated radiation therapy (IMRT), image-guided IMRT (IG-IMRT), and stereotactic body radiotherapy (SBRT) and stereotactic radiosurgery (SRS); SBRT and SRS treatments are delivered with submillimeter accuracy. Cardiac protection strategies and respiratory gating are used at all locations where radiation therapy is offered.

Brachytherapy (internal/low radiation therapy), which can be delivered at a low or high dose rate, plays a key role in the treatment of certain gynecologic malignancies and is used in select patients with clinically localized prostate cancer. High-dose-rate brachytherapy also is used in appropriate patients with nonmelanoma skin cancer; less frequently, it is used as palliative therapy for the treatment of airway involvement in lung cancer.
Subspecialty Services
Main Line Health offers advanced interventional radiology services to support cancer diagnosis and treatment as well as comprehensive programs in interventional pulmonology and interventional gastroenterology for the care of patients with lung cancer (see page 25) and gastrointestinal malignancies (see page 57), respectively. In addition, a specialized cardio-oncology team takes steps to prevent and manage cancer treatment–related cardio toxicity.

Cardio-Oncology Program
Cardiotoxicity is a significant risk with many cancer therapies. Cardiovascular (CV) complications may develop during, soon after, or years following use of cardiological therapies, the severity of which depends on the therapy dose and mode of administration, the presence of pre-existing CV disease, and other factors.

An early quality effort of Main Line Health Cancer Care was to form a cardio-oncology program and establish protocols to protect heart health during and after cancer treatment. Collaboration among medical and radiation oncologists and CV specialists from across the health system has led to development and dissemination of algorithms to guide the care of patients needing radiation therapy or systemic therapies that put them at risk for developing CV complications. More than 100 patients have been referred to the Cardio-Oncology program since 2015.

INTERVENTIONAL RADIOLOGIC SERVICES
- Percutaneous transarterial chemoembolization (TACE) for liver metastases
- Transarterial chemoembolization, transarterial arterial embolization, cryoablation, and microwave thermal ablation
- Radiofrequency ablation
- Percutaneous biopsy (all body sites); transjugular liver biopsy

INTERVENTIONAL PULMONOLOGY SERVICES
- Preoperative portal vein embolization
- Hepatic artery and renal artery embolization
- Transarterial chemoembolization using drug-eluting beads
- Selective internal radiation therapy (radioembolization using yttrium-90)
- Percutaneous radiofrequency ablation, cryoablation, and microwave thermal ablation
- Interventional pulmonology for lung and liver tumors
- Bronchoscopic ultrasound-guided transbronchial needle aspiration
- Flexible bronchoscopy

We have established stringent criteria for protecting the heart during radiation treatments. In breast cancer, we limit the radiation dose to the heart by employing a deep inspiration breath-hold technique that maximally separates the breast from the heart without compromising breast cancer treatment, and we strive to achieve a lower heart dose than what is accepted nationally.

LINNA LI, MD
Chief, Division of Radiation Oncology, Lankenau Medical Center

A personalized plan for any follow-up care.

Additional options for breast imaging, and discussion about breast density and genetic evaluation, referral to a genetics counselor, risk assessment using the appropriate risk model, and what if anything they should do. We offer many services, including a personalized risk assessment using the appropriate risk model, referral to a genetics counselor, discussion about breast density and additional options for breast imaging, and a personalized plan for any follow-up care.

Our team is passionate about helping women who are interested about developing breast cancer better understand their risk and what if anything they should do. We offer many services, including a personalized risk assessment using the appropriate risk model, referral to a genetics counselor, discussion about breast density and additional options for breast imaging, and a personalized plan for any follow-up care.

BREAST CANCER PROGRAM
Breast cancer is the most common malignancy in women and the most frequent cancer diagnosed and treated at Main Line Health. Fortunately, breast cancer mortality is decreasing as a result of advances in prevention, early detection, and treatment. In addition, the ability to stratify targeted tumors with adjuvant drugs and radiation makes it possible to offer breast-conserving therapy to more patients, while refinements in oncologic and reconstructive surgery help patients avoid disfigurement from breast cancer treatment.

Main Line Health is proud to be at the forefront of breast cancer care and to offer patients in the community the benefit of advances that are improving survival and quality of life. Four breast centers serve this large patient population, providing access to comprehensive, highly coordinated clinical and supportive services—from state-of-the-art screening and risk assessment through prompt biopsy, precise diagnosis and staging, personalized treatment, and survivorship care.

Collaboration for optimal patient care
At each breast center, we have the focused attention of a team of physicians and other care providers. Breast tumor conferences are held regularly and allow breast teams to prospectively review each newly diagnosed case from every angle in order to optimize initial treatment and then reassess at each step in the patient’s care. These conferences ensure that patients benefit from all services appropriate for them; such as genetic evaluation, fertility intervention, treatment with new targeted medications or immunotherapies, clinical trial enrollment, and management of any complications impacting cancer treatment. There is also collaboration to advance the overall quality of breast cancer care. Locally, each breast center team works on annual improvement projects required to maintain accreditation by the National Accreditation Program for Breast Centers (NAPBC). At the system level, regular meetings of the breast tumor workgroup bring all breast teams together to discuss new study findings or guidelines, emerging treatments or technologies, and opportunities for improvement or standardization of care processes.
ADVANCING QUALITY: Breast tumor work group

The breast tumor work group is a highly engaged, system-wide team led by breast surgeon W. Bradford Carter, MD, and medical oncologist Paul Gilman, MD. The following are examples of quality initiatives spearheaded by the workgroup since its formation in 2015.

Sentinel node biopsy for axillary staging. In 2016, an NAPBC survey prompted the group to review system cancer registry data for compliance with guideline recommendations for sentinel node biopsy in patients undergoing lumpectomy or mastectomy for early-stage clinically node-negative breast cancer. After identifying compliance of ≤95% of cases reviewed, the group conducted a system-wide educational program addressing current NCCN and National Comprehensive Cancer Network (NCCN) guidelines and then monitored for compliance as a quality metric for breast cancer care.

Appropriate Oncotype DX® testing. In 2016, the group also embarked on an initiative to standardize Oncotype DX® testing across the health system. The goals were twofold: 1) reduce variability in care by increasing compliance with NCCN and American Society of Clinical Oncology (ASCO) guideline recommendations for appropriate tumor genomic test ordering and 2) reduce time from breast cancer diagnosis to treatment decision and chemotherapy initiation in appropriate patients. A follow-up study in 2017 showed that in 97% of cases qualifying for Oncotype DX® testing, the test was successfully integrated into the treatment plan.

Patient access

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Average time from referral to surgery</th>
<th>Average time from referral to first available appointment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast MRI</td>
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<td>7 days</td>
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</tbody>
</table>

BREAST CANCER SERVICES

Prevention and early detection

- Breast cancer risk assessment: genetic counseling/breast imaging in patients identified as being at risk for breast cancer
- Comprehensive breast imaging procedural, digital breast tomosynthesis, and computer-aided detection
- Chemoprevention and prophylactic surgery in appropriate high-risk patients

Diagnosis and treatment

- Core needle, MRI-/ultrasound-guided, stereotactic, and surgical biopsy of suspicious breast cancer
- Sentinel lymph node biopsy
- Tumor marker/breast analyte and staging: Oncotype DX® testing in appropriate patients
- Breast-conserving and accreted local surgical breast resection and skin-sparing mastectomy: comprehensive options for breast reconstruction
- Comprehensive chemotherapies, targeted therapy, and chemotherapy options; clinical trials of investigational agents and combination regimens
- Targeted radiation therapy (RT), including drug-targeted breast RT and accelerated partial breast irradiation in appropriate patients
- RT protocols and techniques for cardioprotection

Support and survivorship care

- Lymphedema monitoring and management
- Cardiovascular oncology cardiological involvement in patients treated with cardioprotective chemotherapies
- Oncology nurse navigators, psychosocial support, and patient-oriented survivorship care planning

HISTORICAL SPOTLIGHT

Main Line Health physicians have contributed to several advances in the treatment of breast cancer.

In the 1970s, former Lankenau surgeon Hunter Neal, MD, and cytopathologist Trudy Sisko Kline, MD, pioneered the use of fine-needle breast biopsy, reporting the first case series showing the method’s accuracy for rapid cancer detection in palpable breast masses.

In the 1980s, R. Barrett Noone, MD, former chief of plastic surgery at Bryn Mawr Hospital and Lankenau, forged ahead with dramatic new concepts and techniques for breast reconstruction at the time of mastectomy.

More recently, Thomas Frazier, MD, retired breast surgeon at Bryn Mawr Hospital, and Ned Carp, MD, surgical oncologist at Lankenau Medical Center, became the third team to contribute to the NAPBC B-32 study establishing sentinel lymph node dissection as a standard of care.

The development of an integrated breast oncology program allows us to pursue best-practice clinical pathways that place patients at the center of our care delivery. By leveraging individual expertise, we provide the highest quality of care, delivered with compassion and using the most advanced technology. Coupled with access to national and investigator-initiated clinical trials, we are becoming a destination program for patients with breast cancer.

We have a personal relationship with each patient who comes here and we design plans of care with play into her choices and decisions. We prefer the time-honored way, where patients are not numbers in the system. And patients like it because they get state-of-the-art treatment close to home, where they know their doctors. The proof is in the vast majority who stay with us through their breast cancer and return for years afterwards.
Main Line Health participates in national clinical trials investigating a wide spectrum of issues in breast cancer. Select examples include active but closed studies assessing the local recurrence rate after breast-conserving therapy in patients with multiple ipsilateral breast cancers (ACOSOG Z1072) and the value of MRI and a genomic profiling assay in the treatment of patients with ductal carcinoma in situ (ECOG-4503), as well as the following enrolling randomized phase III trial treatment in triple-negative breast cancer.

- N3SPB B35 (Olympia). This trial is assessing the effect of adding the oral/polyADP-ribose polymerase (PARP) inhibitor olaparib as adjunctive treatment in patients with germline BRCA-mutated triple-negative or high-risk HER2-negative non-metastatic breast cancer following definitive local treatment and chemotherapy. It is theorized that olaparib may enhance the DNA-damaging effects of chemotherapy as well as block enzymes tumor cells need for the maintenance of DNA repair.

S1418. This trial is evaluating whether the immune checkpoint inhibitor pembrolizumab is an effective and safe treatment option in patients with early-stage breast cancer who have undergone surgery and a 10-month adjuvant treatment. The study is ongoing at Main Line Health and Lankenau Medical Center. The study is now eligible for recruitment of women 50 years of age and older with unifocal invasive breast cancer.

Academic centers participating in the study are Lankenau Institute for Medical Research, Fox Chase Cancer Center, Dana-Farber Cancer Institute, and Memorial Sloan Kettering Cancer Center. The study uses a minimally invasive surgical approach to biopsy treatments in patients with early-stage breast cancer following surgery and neoadjuvant chemotherapy.

Lung Cancer Program
Lung cancer mortality is now declining with efforts to decrease tobacco use, detect more lung cancers at an early stage, and develop treatments based on a better understanding of the molecular heterogeneity and drivers of lung cancer.

Main Line Health is strongly motivated by the opportunity to improve the outlook for people with or at risk for lung cancer. This drive has fueled the development of a comprehensive lung cancer program focused on:

• Finding and optimally treating more lung cancers at an early stage.

• Improving survival and quality of life for patients with lung cancer.

• Decreasing tobacco use and dependence.

Main Line Health’s lung cancer program is at the leading edge in all evolving facets of lung cancer detection, diagnosis, treatment, and symptom palliation. Multidisciplinary lung teams are experienced in treating both non-small-cell lung cancer (NSCLC) and small cell lung cancer (SCLC).

Two Paths to Early Detection
Although most lung cancers are an at an advanced stage when discovered, an increasing number are identified through follow-up of pulmonary nodules or through targeted screening.

Main Line Health is taking both paths to find more lung cancers at an early stage, with the goal to increase the cure rate and allow more limited lung resection to achieve cure. These separate but complementary programs offer coordinated management of patients with incidental lung nodules and patients with positive findings on low-dose CT (LDCT) screening for lung cancer.
Lung Nodule Program

Between 2006 and 2022, an estimated 1.57 million adults in the United States had a lung nodule identified on an unrelated chest CT examination, including 65,000 patients who received a lung cancer diagnosis within 2 years (4.0%). Data collected at Main Line Health reflect a similar picture, with 3.88% of patients diagnosed with lung cancer during follow-up for an incidental nodule.

At Main Line Health, interest in standardizing management of incidental lung nodules led to the development of a lung nodule program based on Fleisher Society criteria, which rolled out to all acute care campuses in January 2015. Patient referrals have steadily increased since the program launched, with 416 referrals in 2017.

The Lung Nodule Program is managed by Main Line Health pulmonary specialists with support from a dedicated nurse navigators and team of radiologists. Referrals lead to prompt evaluation, nodule diagnosis, reminders to both patients and physicians to ensure compliance with recommended follow-up reminders.

The Lung Nodule Program’s goal is to expedite care and provide clear communication to primary care doctors and for the patient—to ensure that patients and providers connect with the support of the Lung Nodule Program, they’re referred to an oncology nurse navigators, who are dedicated nurse navigator and team of radiologists. Referrals lead to prompt evaluation, nodule diagnosis, and recommendations for next steps in care. The team then tracks both patients and providers to both patients and physicians to ensure compliance with recommended follow-up reminders.

By CY15–CY17 data.

Primary care physicians often tell us that without the support of the Lung Nodule Program, they’re not sure that all reports of incidental nodules, particularly when patients go to the ED. The nurse navigators serve as a bridge between radiology and appropriate specialists—for the primary care doctor and for the patient—to expedite care and provide clear communication.

Main Line Health’s multidisciplinary lung cancer team includes dedicated thoracic surgeons, medical oncologists specializing in thoracic malignancies, and radiation oncologists, as well as interventional pulmonologists and radiologists, pathologists, and supportive clinical staff. Patients with suspected lung cancer receive expedited evaluation according to current evidence-based practices for tumor diagnosis and staging. Severe biopsy methods are used, including endobronchial ultrasonography (EBUS)- guided biopsy. Emphasis is placed on adequate tumor sampling for histologic examination and assessment for the presence of driver mutations and for expression of programmed death ligand-1 (PD-L1).

Lung Cancer Screening Program

In October 2015, Main Line Health also launched a system-wide lung cancer screening program. Use of LDCT for lung cancer screening is widely endorsed by medical societies based on the initial National Lung Screening Trial report linking LDCT screening in high-risk individuals with a 20% risk reduction in lung cancer mortality. Guidelines have evolved since this report and stress the importance of weighing potential benefits against harms and taking steps to decrease false-positive results.

At Main Line Health, LDCT lung screening is integrated into multidisciplinary lung cancer care to ensure careful risk assessment prior to screening, proper test performance and interpretation, and appropriate follow-up of abnormal findings (pulmonary and non-pulmonary). Referring physicians receive results within 24–48 hours after LDCT screens, with standardized management recommendations for all clinically relevant findings.

In 2017, a total of 1,219 LDCT screens were performed and identified 27 primary lung cancers (cancer detection rate = 1.6%). 229 other findings (e.g., lung nodule, pneumothorax, coronary calcification, thyroid nodule, pancreatic cyst, renal cyst) also were reported, with evaluation and/or referral as appropriate.

Local Care at the Leading Edge of Lung Cancer Treatment

Main Line Health’s multidisciplinary lung cancer team includes dedicated thoracic surgeons, medical oncologists specializing in thoracic malignancies, and radiation oncologists, as well as interventional pulmonologists and radiologists, pathologists, and supportive clinical staff. Patients with suspected lung cancer receive expedited evaluation according to current evidence-based practices for tumor diagnosis and staging. Severe biopsy methods are used, including endobronchial ultrasonography (EBUS)- guided biopsy. Emphasis is placed on adequate tumor sampling for histologic examination and assessment for the presence of driver mutations and for expression of programmed death ligand-1 (PD-L1).
Our lung cancer program provides academic level care by highly trained specialists who choose to work in the community. Patients have access to all of the specialized and supportive care they may need as well as clinical trials.

Each patient’s treatment is tailored in accordance with evolving guidelines and best practices and with consideration of all patient- and tumor-specific factors that may impact outcomes. Lung cancer specialists offer every available option for multimodality treatment of NSCLC and SCLC, including clinical trials of investigational agents and emerging therapeutic strategies for managing disease that progresses on standard medical treatment.

For patients who present with or progress to advanced disease, the goal is to prolong survival and quality of life for as long as possible, with treatment directed toward specific sites of metastasis and symptom control.

**Surgery**

Complete surgical resection remains the gold standard approach to treatment of early-stage NSCLC. Main Line Health offers comprehensive options for lung-sparing surgery and significant experience with video-assisted thoracoscopic (VATS) and robotic-assisted techniques. In 2017, 64% of lung cancer resections were performed via a minimally invasive approach. SBRT

SRT now has a well-defined role in the management of early-stage node-negative NSCLC in patients who are not surgical candidates or do not want surgery. The proven effectiveness of SBRT for definitive management of stage I disease has led to increasing use of SBRT in appropriate patients treated at Main Line Health.

**Postoperative mortality, NSCLC resections**

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<tr>
<td>90-day mortality</td>
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**Radiation therapy**

In NSCLC, thoracic radiation therapy is used alone to treat positive resection margins in early-stage disease and in combination with chemotherapy to treat more extensive disease confined to the chest. In SCLC, thoracic radiation therapy is mainly used in combination with chemotherapy for the treatment of limited-stage disease; prophylactic cranial (whole-brain) radiation may also be used to prevent brain metastases.

**Systemic therapy**

Despite progress in early detection and treatment of lung cancer, the disease often is diagnosed at an advanced stage or progresses after initial definitive treatment. Fortunately, options for initial and sequential systemic therapies (chemotherapy, targeted therapy, and immunotherapy) continue to expand and improve and can significantly prolong overall survival and help to maintain quality of life.

For patients with advanced NSCLC, the choice of initial and subsequent systemic therapy is guided by specific findings on tumor molecular analysis. Patients with identified, treatable driver mutations are matched to appropriate therapies; patients without treatable mutations are considered for immunotherapy.

Adjunct chemotherapy is used in the treatment of patients with very early SCLC who are candidates for surgical resection. Combination chemotherapy is the mainstay of treatment for patients with limited SCLC who are not candidates for surgery and for patients with extensive SCLC.

For a complete list of enrolling cancer clinical trials, go to mainlinehealth.org/cancertrials.

<table>
<thead>
<tr>
<th>Tumor type/stage</th>
<th>Trial title/description</th>
<th>Phase</th>
<th>Trial ID</th>
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<tr>
<td>Stage I–III NSCLC</td>
<td>Maintenance chemotherapy with or without SBRT in untreated patients with stage I–IIIA NSCLC (Lung-MAP substudy)</td>
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<td>S1400K</td>
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<td>Stage IV squamous cell lung cancer</td>
<td>Durvalumab plus tremelimumab in treating patients with advanced stage IV squamous cell lung cancer (Lung-MAP portfolio)</td>
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<td>AVGR03</td>
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<td>Atezolizumab plus bevacizumab in treating patients with advanced stage IV squamous cell lung cancer (Lung-MAP portfolio)</td>
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**Postoperative survival**

Successful resection of lung cancer hinges on skill and precision at each step, from preoperative staging and surgical planning through postoperative care. It is highly gratifying to offer an increasing number of patients the option of lung-sparing surgery using the most advanced, minimally invasive techniques available to see those patients do very well.

Michael Walker, MD
Chief, Division of Thoracic Surgery, Main Line Health

There’s a lot of nihilism around lung cancer that isn’t appropriate any more. We now have treatments that can lead to durable responses, and patients can lead high-quality lives living with lung cancer. We also have the ability to care more patients than ever before with chemotherapy and immunotherapy in conjunction with surgery and radiation. A lung cancer diagnosis should be a strong call to action.

Tracey Evans, MD
Medical oncologist, Lankenau Medical Center
Co-Medical Director, Thoracic Oncology Program, Main Line Health

John Devlin, MD
Medical oncologist, Bryn Mawr Hospital
NCORP associate principal investigator, Main Line Health

Our lung cancer program provides academic level care by highly trained specialists who choose to work in the community. Patients have access to all of the specialized and supportive care they may need as well as clinical trials.

Each patient’s treatment is tailored in accordance with evolving guidelines and best practices and with consideration of all patient- and tumor-specific factors that may impact outcomes. Lung cancer specialists offer every available option for multimodality treatment of NSCLC and SCLC, including clinical trials of investigational agents and emerging therapeutic strategies for managing disease that progresses on standard medical treatment.

For patients who present with or progress to advanced disease, the goal is to prolong survival and quality of life for as long as possible, with treatment directed toward specific sites of metastasis and symptom control.

**Surgery**

Complete surgical resection remains the gold standard approach to treatment of early-stage NSCLC. Main Line Health offers comprehensive options for lung-sparing surgery and significant experience with video-assisted thoracoscopic (VATS) and robotic-assisted techniques. In 2017, 64% of lung cancer resections were performed via a minimally invasive approach. SBRT

SRT now has a well-defined role in the management of early-stage node-negative NSCLC in patients who are not surgical candidates or do not want surgery. The proven effectiveness of SBRT for definitive management of stage I disease has led to increasing use of SBRT in appropriate patients treated at Main Line Health.

**Postoperative mortality, NSCLC resections**

<table>
<thead>
<tr>
<th>Time &amp; Unadjusted Mortality</th>
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<tr>
<td>30-day mortality</td>
<td>0.6%</td>
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<td>2.8%</td>
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Tracey Evans, MD
Medical oncologist, Lankenau Medical Center
Co-Medical Director, Thoracic Oncology Program, Main Line Health
GI cancers often are challenging, but advances in treatment are helping us tackle difficult cases. Our system-wide GI tumor work group provides a forum for us to discuss complex cases with colleagues and share our knowledge and experience in an ever-changing world of treatment options for patients with GI cancers.

Gastrointestinal Cancer Program

Gastrointestinal (GI) cancers significantly impact patient survival and quality of life when identified at an early stage. Fortunately, technological advancements are allowing improved detection, diagnosis, and treatment of many GI cancers, while research is helping define therapeutic strategies to achieve better survival.

Main Line Health cancer care teams are highly focused on GI cancers and use the latest tools and breakthrough therapies to manage patients with or at risk for these malignancies. Areas of expertise include:

- GI cancer risk assessment and management of patients at increased risk due to personal medical history, family history, or genetic factors
- Endoscopic, organ-sparing treatment of premalignant lesions and early cancers of the colon, rectum, and esophagus
- Minimally invasive surgical treatment of cancers of the colon, rectum, esophagus, and pancreas
- Targeted high-dose radiation therapy and systemic therapy tailored to tumor molecular and biologic characteristics

All patients diagnosed with GI cancers are under the care of a comprehensive clinical team and receive individualized treatment in accordance with current guidelines, best practices, and emerging evidence. Seamless access to specialized services available at other Main Line Health campuses ensures prompt care and individualized treatment in accordance with current guidelines, best practices, and emerging evidence.

Colorectal Cancer

Colorectal cancer is the third most common cancer and third leading cause of cancer deaths in men and women in the United States. At Main Line Health, there is a multidisciplinary effort to decrease this disease burden, a major threat of which is appropriate screening and surveillance in asymptomatic individuals and careful evaluation of patients with symptoms that raise concern about a lower GI malignancy.

If cancer is present, patients benefit from the combined expertise of highly skilled surgeons, interventional gastroenterologists, medical and radiation oncologists, radiologists, and pathologists. Standard-of-care treatment is individualized based on tumor location, stage, and other factors, with the goal of optimizing both oncologic and patient-centered outcomes. Surgery plays a central role in the treatment of most colorectal cancers. Main Line Health surgeons have vast experience with minimally invasive surgical treatment of complex colorectal cancer as well as expertise in sphincter-sparing surgery for rectal cancer.

TECHNOLOGY SPOTLIGHT: Evolving role of endoscopy in GI cancer care

Advanced diagnostic and therapeutic endoscopy techniques are revolutionizing the management of many GI cancers and are available at Main Line Health. These sophisticated procedures allow earlier detection and improved diagnosis of many tumor types as well as organ-sparing treatment for certain early cancers that would otherwise require open or laparoscopic surgery. Optimal use of advanced endoscopy also assists with personalizing treatment.

At Main Line Health, interventional gastroenterologists are integral members of the GI cancer team and participate closely with surgeons, medical and radiation oncologists, radiologists, and pathologists. GI endoscopy teams perform more than 1000 advanced procedures each year and specialize in endoscopic approaches to tumor diagnosis and staging, curative treatment, and symptom palliation for several GI cancers as well as detection and eradication of precancerous lesions.

INTERVENTIONAL GASTROENTEROLOGY TECHNIQUES

- High-definition endoscopy, chromoendoscopy, and patient-based colon screening for colorectal cancer
- Endoscopic ultrasound (EUS) and EUS-guided fine-needle aspiration, cytologic, and histologic sampling
- Endoscopic retrograde cholangiopancreatography, including stent-in-stent procedures
- Endoscopic mucosal resection, submucosal dissection, and laser endomicroscopy
- Manometry and barium swallow
- Laser and diathermy endoscopy

Main Line Health’s GI tumor work group includes gastroenterologists, surgeons, and radiation oncologists who collaborate closely with each other and with surgeons, medical and radiation oncologists, radiologists, and pathologists. GI endoscopy teams perform more than 1000 advanced procedures each year and specialize in endoscopic approaches to tumor diagnosis and staging, curative treatment, and symptom palliation for several GI cancers as well as detection and eradication of precancerous lesions.
Quality Indicator: Adenoma Detection Rate

Effective endoscopic screening for colorectal cancer depends on adequate detection and removal of potentially precancerous adenomas. The primary colonoscopy quality indicator is adenoma detection rate (ADR), which is defined as the percentage of patients 50 years of age and older undergoing first-time screening colonoscopy who have one or more adenomas detected and removed. The current (2015) ADR benchmark is 30% for men and 20% for women. 4

In 2016, Main Line Health’s network cancer committee undertook a quality study to assess system-wide ADR. A review of 5418 first-time screening colonoscopies performed in 2015 showed:

- 1033 adenomas were detected in 2509 screenings in men, for an ADR of 41%
- 842 adenomas were detected in 2909 screenings in women, for an ADR of 29%

Dr. Marks and his Lankenau colleagues have experience using taTME to facilitate sphincter-preserving resection of rectal cancer in the distal rectum and, in 2017, published outcomes for 373 consecutive patients followed for a mean of 5.5 years; perioperative morbidity and mortality rates were 13.4% and 0.3%, respectively, and overall local recurrence and 5-year survival rates were 7.4% and 90%, respectively.

As of December 2018, six Lankenau patients were enrolled in the U.S. study of taTME. A separate, investigator-initiated study by Dr. Marks and colleagues in patients undergoing taTME for treatment of rectal cancer in the distal rectum will assess patient-reported QoL. Findings from both studies will be used to define new pathways for improved outcomes in the elite group of international rectal cancer specialists currently working to develop new palliative and curative treatments for patients with rectal cancer. Combined with chemoradiation, complete TME with negative resection margins is associated with sustained control even in patients with locally advanced disease—ultimately, at the risk of functional deficits and reduced quality of life (QoL).

Laparoscopically assisted TME via a transanal endoscopic approach (taTME) is a new technique being advanced in an effort to improve patient outcomes of TME. Published registry data and single-center results showing procedural and oncologic safety of taTME for resectable rectal cancer have led to two multicenter studies underway in the United States and in Europe.

Lankenau is one of 10 sites selected for the 5-year, phase II U.S. study, which will evaluate the safety and efficacy of taTME with laparoscopy, or robotic assistance relative to standard low anterior resection. Colorectal surgeon John Marks, MD, is principal investigator. Dr. Marks and his Lankenau colleagues have experience using taTME for facilitating sphincter-preserving resection of rectal cancer in the distal rectum and, in 2017, published outcomes for 373 consecutive patients followed for a mean of 5.5 years; perioperative morbidity and mortality rates were 13.4% and 0.3%, respectively, and overall local recurrence and 5-year survival rates were 7.4% and 90%, respectively.

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**Pancreaticobiliary Cancer**

Pancreatic cancer remains a formidable challenge. Cure depends on the cancer being confined to the pancreas and resectable. Unfortunately, most pancreatic cancers are detected at an advanced stage when resection is not possible. Main Line Health offers expertise in several areas important for detection, diagnosis, and treatment of pancreatic cancer as well as care of patients with advanced disease.

- **International Endoscopy**
  - Main Line Health international gastroenterologists use endoscopic ultrasound (EUS) in several ways for suspected or confirmed pancreatic cancer. EUS is valuable in evaluating a pancreatic mass to confirm a primary adenocarcinoma and provides important information for staging the tumor and assessing resectability. EUS is also used for radiation therapy and for therapeutic interventions, including targeted delivery of antitumor agents and celiac plexus neurectomy. Surgery. The surgical approach to pancreatic cancer varies depending on tumor location in the pancreas and extent of involvement. Main Line Health surgical oncologists perform several procedures for resection of pancreatic cancer, including pancreatoduodenectomy (Whipple procedure). Surgery also is performed in appropriate patients to confirm a primary adenocarcinoma and provides important information for staging the tumor and assessing resectability. EUS also is used for fiducial placement prior to radiation therapy and for therapeutic interventions, including targeted delivery of antitumor agents and celiac plexus neurectomy. EUS also is used for radiation therapy and for therapeutic interventions, including targeted delivery of antitumor agents and celiac plexus neurectomy. Surgical oncologists also are involved in care for patients with locally advanced rectal cancer. In patients with stage II–IIIB anal cancer, the surgical approach to treatment may include neoadjuvant therapy (TNT) with laparoscopic assistance for excision (taTME) with Transanal total mesorectal excision (TaTME) or neoadjuvant chemoradiotherapy. Surgery also is performed in appropriate patients to confirm a primary adenocarcinoma and provides important information for staging the tumor and assessing resectability. EUS also is used for fiducial placement prior to radiation therapy and for therapeutic interventions, including targeted delivery of antitumor agents and celiac plexus neurectomy.

- **Interventional Endoscopy**
  - Main Line Health interventional gastroenterologists use endoscopic ultrasound (EUS) Interventional endoscopy.
  - Main Line Health interventional gastroenterologists have evaluated and treated hundreds of patients with Barrett’s esophagus and are highly familiar with the appearance of early Barrett’s neoplasia and adept at assessing risk for Barrett’s Esophagus and Esophageal Cancer. Main Line Health interventional gastroenterologists have evaluated and treated hundreds of patients with Barrett’s esophagus and are highly familiar with the appearance of early Barrett’s neoplasia and adept at assessing risk for Barrett’s Esophagus and Esophageal Cancer.

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- **Surgical Management of Genitourinary Cancer**
  - The surgical management of GU cancers has evolved significantly in recent decades, paving the way for a more tailored, patient-centered approach. Advances in image guidance and robotic-assisted reconstruction have made it possible to offer patients equivalent oncologic control with less surgical morbidity compared to open surgery, while new diagnostic and prognostic tools are increasingly available to assist with patient selection and surgical planning. Other advances include the use of robotic-assisted laparoscopic techniques, including laparoscopic radical cystectomy and laparoscopic prostatectomy. Other advances include the use of robotic-assisted laparoscopic techniques, including laparoscopic radical cystectomy and laparoscopic prostatectomy. Other advances include the use of robotic-assisted laparoscopic techniques, including laparoscopic radical cystectomy and laparoscopic prostatectomy.

- **Genitourinary Cancer**
  - Main Line Health’s multidisciplinary tumor boards meet regularly to review and plan next steps in the care of patients with suspected or diagnosed hepatopancreaticobiliary tumors. The best care is achieved through collaborative, clinical decision-making approaches that include screening, biopsy, and other, when, and how to treat prostate cancer. Along the way, we should use state-of-the-art testing and the most effective, least harmful approaches to surgery, radiation, and systemic therapy. The best care is achieved through collaborative, clinical decision-making approaches that include screening, biopsy, and other, when, and how to treat prostate cancer. Along the way, we should use state-of-the-art testing and the most effective, least harmful approaches to surgery, radiation, and systemic therapy.

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**SERVICE SPOTLIGHT: Prostate multiparametric MRI program**

Multiparametric MRI of the prostate gland is an advanced imaging technique for assessing prostate tissue anatomy, volume, and vascularity. The test requires highly specialized equipment and expertise in interpretation using a standardized reporting system for characterizing prostate nodules and summarizing level of suspicion for cancer.

Main Line Health offers a state-of-the-art prostate mpMRI program to support the care of men with suspected or known prostate cancer. nachum Stollman, MD, began expanding to other health system locations in 2018. implemented at Bryn Mawr Hospital in 2014, with 404 studies performed in 2017. The program, led by radiologist Nachum Stollman, MD, began expanding to other health system locations in 2018. A growing body of evidence supports the use of mpMRI in several aspects of prostate cancer care, both before and after diagnosis. In men with suspicion of prostate cancer, two recent large prospective studies provide level 1 evidence of the ability of mpMRI to: 1) detect clinically significant disease, making it a useful triage test to improve patient selection for prostate biopsy, and 2) facilitate targeted biopsy with significantly higher detection of high-risk disease and lower detection of low-risk disease compared to standard transrectal ultrasound-guided biopsy.14

With support of this new evidence, reflected in the latest National Comprehensive Cancer Network (NCCN) guidelines, Main Line Health urologists have begun doing prostate mpMRI studies to guide biopsies in order to improve patient selection, lower the risk of sampling error, and increase the likelihood of detecting clinically significant prostate cancer.15

Multiparametric MRI (mpMRI) is used to improve biopsy and treatment decisions. These tests are being incorporated into prostate cancer care across Main Line Health.

**Tools to inform biopsy.** In patients with elevated PSA levels, several factors weigh into decisions about prostate biopsy to provide biopsy, including the PSA level and how quickly it is rising, patient age and general health, and the presence of signs or symptoms of prostate cancer. The 2018 NCCN guidelines for early detection of prostate cancer note the value of prostate mpMRI to further inform a biopsy decision and help identify suspicious regions to target if biopsy is pursued. Per NCCN guidance, biomarker assays are additional tools to help stratify risk and avoid unnecessary biopsies.

**Tools to inform treatment.** After diagnosis of prostate cancer, prostate mpMRI has further value for cancer localization and staging prior to definitive treatment and for lesion characterization in men being managed with active surveillance. Several tissue-based biomarker tests also are available and may be used to help avoid undertreating a cancer that appears histologically low grade on pathology but has an aggressive phenotype or avoid overtreating with advanced radiation therapy a patient who has a low risk for recurrence after prostatectomy.

**The Shifting Landscape of Prostate Cancer Care**

Prostate cancer is the second leading cause of cancer death in men but is more common than it is lethal. Detection of aggressive prostate cancer that requires treatment is key. Major trials of prostate-specific antigen (PSA) screening show that lowering prostate cancer mortality comes at the risk of diagnosing more low-risk cancers, the treatment of which does not extend survival. Concerns about overdiagnosis have led to fluctuating screening recommendations and uncertainty about how to identify men needing treatment for prostate cancer while sparing others the harms of unnecessary biopsy and treatment.

Minimizing harm is a strategy being used to prevent overdiagnosis from leading to overtreatment. Research in underway worldwide to identify additional strategies that can be fewer prostate cancer deaths with less harm to men who will die of other causes. Emerging evidence suggests that several new clinical tools, notably multiparametric MRI (mpMRI), may be used to improve biopsy and treatment decisions. These tests are being incorporated into prostate cancer care across Main Line Health.

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**Minimizing harm**

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Gynecologic Oncology Program

The gynecologic oncology program at Main Line Health is regionally recognized for its expertise in the diagnosis and leading-edge treatment of gynecologic cancers. The program’s experienced gynecologic oncologists and other specialists care for several hundred women each year and manage all types and stages of gynecologic malignancies as well as premalignant and high-risk conditions.

In 2017, Main Line Health’s gynecologic oncology team saw 170 new patients for evaluation or management and diagnosed or treated 181 new gynecologic cancers.

CONDITIONS EVALUATED AND TREATED

Gynecologic cancers
- Cervical cancer, endometrial cancer, ovarian cancer, fallopian tube cancer, primary peritoneal cancer, ovarian cancer, renal cell carcinoma, gastrointestinal stromal tumor, prostate cancer, and breast cancer

Premenopausal/light-risk gynecologic conditions
- Cervical intraepithelial neoplasia, endometrial intraepithelial neoplasia, cervical adenocarcinoma, endometrial adenocarcinoma, endometrial cancer, and Lynch syndrome

Patient-Centered, Technically Advanced Care

The gynecologic oncology program is committed to providing compassionate care of women using every breath-through available for the management of gynecologic malignancies. The program is led by highly-skilled gynecologic oncologists dedicated to evidence-based surgical and medical practices, with access to cutting-edge technology and subspecialty expertise needed to address complex or difficult cases.

Gynecologic oncologists work closely with all specialists in medical and radiation oncology, gynecologic oncology, radiation oncology, and other disciplines to individualize treatment, incorporating genetic and genomic testing, advanced forms of chemotherapy, and the latest surgical techniques as appropriate to optimize oncologic outcomes and quality of life.

Each patient’s care—from diagnosis, through all phases of treatment, to life-long follow-up—is directed by one of the program’s gynecologic oncologists. Oncology nurses and physician assistants experienced with gynecologic cancer management provide coordination of care and patient support at each step.

Comprehensive surgical approaches to gynecologic cancers

Surgery plays a crucial role in the management of gynecologic cancers, contributing to diagnosis, staging, and treatment. In 2017, Main Line Health gynecologic oncologists performed 167 major surgical procedures for the treatment of gynecologic cancer.

Open and minimally invasive procedures

For women who are candidates for surgical treatment, gynecologic oncologists offer extensive experience with all approaches to complex gynecologic oncology, including the latest laparoscopic and robotic-assisted techniques. Minimally invasive procedures are used whenever appropriate for the patient and in accordance with current best practice or emerging evidence that challenges current practice or defines new standards of care. In 2017, 76% of hysterectomies for the treatment of endometrial cancer were performed via a minimally invasive approach. In late 2018, based on compelling new evidence, Main Line Health gynecologic oncologists agreed to no longer offer robotic radical hysterectomy for the treatment of most invasive cervical cancers (stage IB1 tumors) > 2 cm and stage IIIB tumors.

Radical cytoreductive surgery

For women with advanced gynecologic cancers and partner with colleagues in colorectal surgery, surgical oncology, and/or urology as needed to achieve the goal of no visible residual tumor.

Sentinel node biopsy

Wherever possible, gynecologic oncologists take a tissue-sparing approach to surgical treatment of gynecologic cancers. Sentinel lymph node mapping and biopsy is a recent advance being applied in appropriate patients. Sentinel lymph node biopsy has been validated as a safe and effective alternative to systematic pelvic and para-aortic lymphadenectomy for accurate staging in early endometrial, cervical, and vulvar cancers. The tissue-sparing approach significantly lowers the risk of bleeding and lymphedema, without increasing the risk of missing cancer that has spread to local lymph nodes.

Patient access

Women needing evaluation for a possible gynecologic malignancy are seen within 48 hours of contacting the gynecologic oncology program.
HIPEC is available at Main Line Health through the peritoneal surface malignancy program at Lankenau Medical Center. Since 2012, surgical oncologists at Lankenau have used HIPEC to treat advanced colorectal cancer, appendiceal cancer, and select other malignancies in patients with limited peri-tumoral disease amenable to cytoreductive surgery. Lankenau surgical oncologist Ned Caryl, MD, assisted gynecologic oncologist David Holtz, MD, in the first ovarian case.

**Surgical Oncology Services**

- Diagnosis and treatment
  - Colorectal cancer, rectal cancer, liver cancer (transplantation), and IBD (inflammatory bowel disease) endoscopic procedure for suspected colorectal cancer
  - Gynecologic biopsy and ablation and treatment for suspected endometrial cancer
  - Theoretical colorectal, tumor marker (CA-19-9) testing, and surgical evaluation and palliation for suspected ovarian cancer
  - Medical management of peritoneal metastatic colorectal cancer
  - Radical cytoreductive surgery (curative) for adenocarcinomas malignancies
  - Laparoscopic and robotic-assisted surgery for cancer diagnosis and staging in the treatment of ovarian cancer
  - Systemic therapy, molecular and staging of endometrial, colorectal, and ovarian cancers
  - Fertility-sparing ovarian carcinoma and ovarian carcinoma
  - Role-reducing surgery in women with bowel obstruction for suspected ovarian cancer
  - Surgical monitoring, intraperitoneal chemotherapy, and surgical re-evaluation for ovarian chemotherapy
  - Comprehensive options for systemic therapy chemotherapy (chemotherapy, hormone therapy, targeted therapy), clinical trials of investigational agents
  - Oncology nurse navigation, psychosocial support, and personalized survivorship care planning

**Support and survivorship care**

- Counseling and treatment of women with sexual dysfunction during or after gynecologic cancer treatment
- Oncology nurse navigation, psychosocial support, and personalized survivorship care planning

**Leading-edge medical and radiation therapies**

At Main Line Health, the use of medical and radiation therapies in the treatment of gynecologic cancers is guided by current guideline evidence, with comprehensive options available, including:

- Hypofermic, intraperitoneal chemotherapy (HIPEC)
- Targeted therapies, including vascular endothelial growth factor (VEGF) inhibitors, poly(ADP-ribose) polymerase (PARP) inhibitors, and programmed cell death protein 1 (PD-1) inhibitors
- High-dose-rate brachytherapy and intensity-modulated radiation therapy (IMRT)
- Tumor histologic examination, immunohistochemical testing, and molecular profiling/next-generation sequencing
- Risk-reducing surgery in women with inherited risk for ovarian and/or endometrial cancer
- Fertility-sparing hormonal therapy and surgery, including trachelectomy for early-stage cervical cancer
- Sentinel lymph node mapping and staging of endometrial, cervical, and vulvar cancers
- Laparoscopic and robotic-assisted surgery for tumor diagnosis and staging and for treatment when appropriate
- Radical cytoreductive surgery (tumor debulking) for advanced gynecologic malignancies
- Medical management of preinvasive endometrial and vulvar cancers
- Transvaginal ultrasound, tumor marker (CA-125) testing, and surgical evaluation and biopsy for suspected ovarian cancer
- Endometrial biopsy and dilation and curettage for suspected endometrial cancer

**Enrolling Gynecologic Cancer Clinical Trials**

<table>
<thead>
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<th>Trial</th>
<th>Trial ID</th>
<th>Cancer Type</th>
<th>Trial Title/Description</th>
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<tbody>
<tr>
<td>I/II</td>
<td>MOS-0101</td>
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<td>II</td>
<td>MOS-0105</td>
<td>Endometrial</td>
<td>Bevacizumab plus paclitaxel in treating patients with recurrent, persistent, or refractory endometrial cancer</td>
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<tr>
<td>II</td>
<td>MOS-0106</td>
<td>Ovarian</td>
<td>triplet plus cisplatin in treating patients with recurrent, persistent, or refractory ovarian cancer</td>
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<td>II</td>
<td>MOS-0107</td>
<td>Endometrial</td>
<td>Olaparib plus cediranib versus cediranib alone and olaparib for treating patients with recurrent ovarian, fallopian tube, or primary peritoneal cancer</td>
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<tr>
<td>II</td>
<td>MOS-0108</td>
<td>Endometrial</td>
<td>Pegylated liposomal doxorubicin with atezolizumab in treating patients with recurrent, persistent, or refractory endometrial cancer</td>
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<tr>
<td>II</td>
<td>MOS-0109</td>
<td>All cancers</td>
<td>pembrolizumab plus placebo vs. pembrolizumab plus eribulin in treating patients with recurrent breast cancer</td>
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</tbody>
</table>

A distinguishing feature of Main Line Health’s gynecologic cancer program is involvement of gynecologic oncologists throughout all phases of treatment. Gynecologic oncologists plan and, in many cases, administer medical therapies, consulting colleagues in medical oncology to ensure optimal, evidence-based care for each patient.

**Inherited Gynecologic Cancers**

Prevention of inherited gynecologic cancer is a major focus at Main Line Health. Gynecologic oncologists work in partnership with Main Line Health’s cancer genetics team to identify women at high risk for ovarian or endometrial cancer as a result of inherited mutations associated with hereditary breast and ovarian cancer (HBOC), Lynch, and other genetic syndromes. The process is a two-way street.

- All women diagnosed with endometrial, ovarian, fallopian tube, or primary peritoneal cancer are referred for genetic counseling and, if appropriate, genetic testing. Women carrying a genetic mutation are counseled regarding other cancer risks they face, and their family members are informed about their potential increased risk for inherited cancers.
- The reverse is also true. When the cancer genetics team identifies a woman with one or more genetic syndrome mutations, the patient is referred to the gynecologic oncology program for individualized cancer risk management, which may include screening for ovarian and/or endometrial cancer, chemoprevention, and/or risk-reducing gynecologic surgery.

Since 2017, all women diagnosed with endometrial cancer at Main Line Health undergo evaluation for Lynch syndrome and patients with tumor studies or a family history suggestive of Lynch syndrome are referred for genetic counseling and, if appropriate, testing.

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Since 2017, all women diagnosed with endometrial cancer at Main Line Health undergo evaluation for Lynch syndrome and patients with tumor studies or a family history suggestive of Lynch syndrome are referred for genetic counseling and, if appropriate, testing.
RESEARCH SPOTLIGHT: Breast oncology nurse navigators

As health care evolves, treatment options for patients with cancer expand and payment models change, adding layers of complexity to the role and function of oncology nurse navigators. As the most frequently diagnosed malignancy, breast cancer is a predominant focus of oncology nurse navigation services at Main Line Health. A study within Main Line Health Cancer Care’s oncology nurse navigation services is underway to define the scope of work being done by breast oncology nurse navigators, with the goal to ensure that patients across the health system are effectively served and continue to receive high-quality breast cancer care into the future. The study, begun in late 2018, is being conducted by researchers in the Center for Population Health Research (CPHR) at Lankenau Institute for Medical Research. The researchers are examining the navigation process to identify potential care gaps or barriers to be addressed.

RESEARCH SPOTLIGHT: Patient-reported quality of life

In other cancer-related research, CPHR investigators are using national data from the Medical Expenditure Panel Survey to explore quality of life of patients with cancer. This research question relates to the idea of cancer and how patients perceive their life satisfaction after controlling for the effect of gender, age, and income and other resources.

Main Line Health oncology nurse navigators.

Supporting Patients Across the Continuum of Cancer Care

A cancer diagnosis can overwhelm a person and family or caregiver. Work and home responsibilities, daily stresses, and any existing health issues do not disappear to make room for cancer and its often-intense treatment. Life before cancer becomes life with cancer. Main Line Health is dedicated to supporting patients, families, and caregivers in all facets of life that may be affected by a cancer diagnosis. Comprehensive support services available to patients across the health system include:

- Oncology nurse navigation and psychosocial support
- Nutrition consultation and individualized support; nutrition referral protocol for patients with head and neck cancer
- Physical and occupational rehabilitation and lymphedema management
- Palliative care
- General and disease-specific cancer support groups
- Integrative therapies
- Cancer-related educational programs and resources

A study within Main Line Health Cancer Care’s oncology nurse navigation services at Main Line Health is dedicated to supporting patients, families, and caregivers in all facets of life that may be affected by a cancer diagnosis. Comprehensive support services available to patients across the health system include:

- Researcher-conducted by researchers in the Center for Population Health Research (CPHR) at Lankenau Institute for Medical Research. The researchers are examining the navigation process to identify potential care gaps or barriers to be addressed.

In 2018, nurse navigators supported an estimated:

- 7192 patients in active treatment or survivorship care
- 5144 patients in Main Line Health’s Lung Cancer Screening Program, Lung Nodule Program, and lung cancer registries

Nurse navigators are on staff at each acute care campus, participate in multidisciplinary tumor conferences, and serve as a continuous point of contact throughout a patient’s course of care. Core functions include:

- Coordinating care across multiple settings and providers
- Ensuring patients receive appropriate care at the right time
- Monitoring and addressing barriers that prevent patients from following through with recommended care
- Educating patients about treatment options, available resources, and clinical trials
- Communicating with payors and providers about patients’ needs
- Monitoring performance improvement

System integration of cancer care allows navigators to coordinate with each other to schedule needed services at another Main Line Health campus if a timely appointment is not available at the patient’s main care location.

Oncology nurse navigation

Oncology nurse navigation refers to individualized support provided to patients, families, and caregivers to reduce barriers and increase timely access to cancer-related clinical care and services. At Main Line Health, oncology nurse navigation spans all phases of cancer care, from screening through survivorship.

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Oncology social work

Oncology social workers provide critical services to support the lives and well-being of patients, families, and caregivers during and after cancer treatment at Main Line Health. A key focus is identifying and helping address issues that may prevent a patient from following through with recommended treatment or are a source of significant distress.

A screening tool is used to assess the degree of distress (from 0 to 10) and uncover any problems patients may be experiencing—from practical issues such as housing, transportation, insurance, or financial problems to physical, emotional, or spiritual burdens. Distress screening and appropriate response is a core competency for Commission on Cancer accreditation. A recent study found that routinely screening for and addressing significant cancer-related distress could result in 18% fewer emergency department visits and 18% fewer hospitalizations.

Main Line Health oncology social workers.
At Main Line Health, patients with a distress score of 4 or higher who report problems are engaged by oncology social workers to explore the issues further and work toward improvement or resolution. In 2018, social workers supported an estimated 1,585 patients to address identified needs.

Oncology social workers provide myriad services integral to optimal cancer care, including helping patients:
- Understand insurance coverage and disability benefits
- Access affordable health care and prescription drug coverage
- Apply for financial assistance
- Secure transportation to and from the hospital or temporary housing during treatment
- Cope with emotional and psychological effects of cancer or seek counseling
- Connect with community organizations offering assistance to individuals and families burdened by cancer
- Identify and seek sources of financial assistance

By eliciting patient preferences and addressing patient needs, palliative care teams help patients avoid unwanted medical interventions. Studies in patients with advanced cancer show that palliative care not only improves quality of life but also can sustain survival. A landmark study in patients with metastatic non–small cell lung cancer showed that patients managed with palliative care had a longer time to clinical progression and a better quality of life than patients on standard care alone.13

Standard care lived longer, were less depressed, and had a higher quality of life but also can extend survival. A landmark study in patients with metastatic non–small cell lung cancer showed that patients managed with palliative care had a longer time to clinical progression and a better quality of life than patients on standard care alone.13

Palliative care

Main Line Health offers inpatient, outpatient, and home-based palliative care services, allowing access at all phases of care for patients with cancer. The most robust services currently available in the inpatient setting, with a multidisciplinary palliative care team serving each acute care hospital. Palliative care service penetration refers to the percentage of annual hospital admissions seen by an inpatient palliative care team.

The financial toxicity of a cancer diagnosis is huge and permeates every aspect of a patient’s life. We help patients address the loss or reduction of income that often occurs during and after treatment as well as out-of-pocket expenses related to treatment. We also identify resources, for example, to help patients keep up with their mortgage or rent, utility bills, and afford their co-pays and medications so they are more likely to follow up with necessary care.

The Magnet Recognition Program® is a designation from the American Nurses Credentialing Center recognizing nursing excellence. Hospitals voluntarily apply and are evaluated on several criteria, including quality patient care, nursing research, and innovation in professional nursing practice. Hospitals achieving Magnet recognition are required to provide interim reporting, with redesignation possible every 4 years after a comprehensive evaluation.

Main Line Health offers inpatient palliative care services, for the period from April to December 2017, showed an average penetration rate of 9.8% across all acute care hospitals, surpassing the average penetration rate of 7.4% across the most well-staffed inpatient palliative care programs in the United States.14

Individualized Survivorship Care

Main Line Health moved to standard survivorship care planning for patients who have completed active cancer treatment at any of the system’s acute care hospitals. This process began with development and system-wide use of evidence-based protocols for follow-up care in patients completing treatment for common malignancies such as breast cancer, lung cancer, colorectal cancer, and endometrial cancer.

Survivorship care plans are provided to eligible patients (i.e., patients treated with curative intent who have completed their treatment), a document of the patient’s cancer care team, and the patient’s referring or primary care physician. The plans include a comprehensive summary of the patient’s treatment course and a follow-up care plan personalized to the patient and specifying the specialist involved in each care step.

Main Line Health cancer care teams maintain close relationships with patients long after active cancer treatment ends. Staying watchful for recurrence or other health concerns and helping patients manage any ongoing effects of their disease or its treatment. Care teams also take time to recognize survivors’ struggles and victories. Every year, each Main Line Health campus celebrates National Cancer Survivors Day®, an event dedicated to honoring patients who have moved on from cancer treatment. Patients, families, and caregivers attend to connect and promote understanding of cancer survivorship and its challenges.

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That’s the pure reward of our work as a cancer program, when we see our patients get back to normal life, have fun, and make plans for the future. On Survivors Day, we get to see the people we have the honor of taking care of come in and see a family. It’s an incredible joy for a cancer physician.

MARIJA WESS, MD
Radiation oncologist, Lankenau Medical Center
Physician Education and Training

The field of oncology is expanding at an unprecedented rate, with dramatic advances in understanding of cancer biology and evolutions in diagnostic and prognostic tools and therapies. In this dynamic environment, Main Line Health is keenly aware that to keep pace with evidence-based practice, it must foster a culture where patient-centered care is linked with scientific inquiry, pursuit of new knowledge, and critical thinking. A dedication to education is paramount.

With more than a century history in medical education, Main Line Health has a deep commitment to preparing physicians for effective clinical practice and lifelong learning. Two health system hospitals—Lankenau Medical Center and Bryn Mawr Hospital—are nationally recognized centers of graduate medical education, together offering 34 accredited residencies and fellowship programs. In addition, 24 clinical clerkship and elective rotations are available to medical students from regional medical schools.

As the second-leading cause of death in the United States, cancer is a major focus of physician education at Main Line Health, with learning opportunities for physicians at all phases of their professional development and ranging from fundamental to highly specialized knowledge and skills relevant to cancer prevention, detection, diagnosis, treatment, and care across the disease continuum.

Oncology fellowships

Hematology/oncology. The hematology/oncology fellowship at Lankenau Medical Center provides intensive supervised training in multidisciplinary cancer care, cancer diagnosis and treatment, and use of systemic cancer therapies. Fellows participate in all interdisciplinary tumor conferences at Lankenau and provide outpatient continuity of care and inpatient consult services. Hematology/oncology fellows are the primary contact for patients with confirmed or suspected cancer who are referred to Lankenau’s multispecialty integrated practice for the care of vulnerable and underserved populations.

Breast oncology. The Barbara Bradley Endowed Fellowship at Comprehensive Breast Care at Bryn Mawr Hospital prepares trainees in all aspects of multidisciplinary breast cancer care. The fellowship emphasizes training in the surgical treatment of breast cancer, including oncoplastic and reconstructive techniques, with rotations in breast imaging, minimally invasive breast biopsy, breast pathology, breast medical oncology, and radiation oncology, as well as frequent interaction with cancer genetics specialists.

Minimally invasive colostomy surgery and advanced rectal cancer management. This subspecialty training program at Lankenau Medical Center provides intensive instruction in minimally invasive surgical approaches to colorectal disease, with a focus on advanced management of rectal cancer and sphincter-preserving techniques for the treatment of cancers in the distal rectum.

The following is a summary of cancer cases initially diagnosed and/or initially treated at a Main Line Health acute care hospital from January 2013 through December 2017.

### MAIN LINE HEALTH CANCER CARE: ANALYTIC CASES (CY13–CY17)

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<thead>
<tr>
<th>Primary site</th>
<th>2013</th>
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<td>All sites</td>
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<td>13</td>
<td>17</td>
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<td>17</td>
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<td>Colon/rectosigmoid</td>
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<td>Esophagus</td>
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<td>Kidney/renal pelvis</td>
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<td>100</td>
<td>97</td>
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<tr>
<td>Leukemia</td>
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<td>Liver/intrahepatic bile duct</td>
<td>31</td>
<td>29</td>
<td>19</td>
<td>49</td>
<td>34</td>
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<tr>
<td>Larynx</td>
<td>12</td>
<td>12</td>
<td>14</td>
<td>18</td>
<td>19</td>
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<tr>
<td>Lung/bronchus</td>
<td>326</td>
<td>337</td>
<td>375</td>
<td>408</td>
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<tr>
<td>Male genital system</td>
<td>309</td>
<td>257</td>
<td>283</td>
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<tr>
<td>Melanoma</td>
<td>162</td>
<td>202</td>
<td>165</td>
<td>128</td>
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<tr>
<td>Muscle/stereomuscular</td>
<td>16</td>
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<tr>
<td>Non-Hodgkin</td>
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<td>116</td>
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<tr>
<td>Ovary</td>
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<td>90</td>
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<td>3</td>
<td>9</td>
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<tr>
<td>Prostate</td>
<td>293</td>
<td>236</td>
<td>265</td>
<td>282</td>
<td>303</td>
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<tr>
<td>Rectum/rectosigmoid</td>
<td>113</td>
<td>113</td>
<td>102</td>
<td>121</td>
<td>107</td>
</tr>
<tr>
<td>Skin</td>
<td>162</td>
<td>202</td>
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<tr>
<td>Stomach</td>
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<td>Testis</td>
<td>15</td>
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<td>14</td>
<td>15</td>
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<tr>
<td>Thyroid/parathyroid gland</td>
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<tr>
<td>Vagina</td>
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<tr>
<td>Vulva</td>
<td>5</td>
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</tbody>
</table>

**Note:** This table reflects outpatient continuity of care and inpatient consult services for patients with confirmed or suspected cancer who are referred to or seen at Lankenau’s multispecialty integrated practice for the care of vulnerable and underserved populations.
network cancer committee

required members

chair
Michael Walker, MD

Cancer liaison physicians
Nicholas Molot, MD; Ronen Seidman, MD; Michael Schmulewitz, MD

Radiologists
Peter Villa, MD; Sebastian Moschos, MD

Pathologists
Dixie Doherty, MD; Robert Carr, MD

Surgeons
Joseph Caputo, MD; Robert Carr, MD

Medical Oncologists
Paul Szmulewitz, MD; Michael Walker, MD

Radiation therapists
Jason Doherty, MD; Adam Matlock, MD

Palliative care physicians
Esther Kert, CTR; Jennifer Burke, DO

Cancer Genetics representative
Vinit Mahindra, DO; Michael Schmulewitz

Imaging oncology nurse
Faye Carley, CRT, RN, ONC, OSN

Outpatient oncology nurse
L. Gayla Guay, MSPH, RN, CRNP; Mary Beth Flynn, RN

Clinical Cancer Research Represenative
Susan Thomas, CRNP, MSN; Linda Matherson, MD, MS

Cancer Registry Quality Coordinator
Lourdes Martin, CRNC

Quality improvement coordinator
Linda Packer, RN; Patricia Doherty, RN; Sandy Rehak

Conference Coordinator
Mary Beth Flynn, RN; Jennifer Burke, DO

Social worker, Psychosocial services coordinator
Mary Beth Flynn, RN, CCRP

Oncology Outpatient Navigation Represenative
Linda Packer, RN, CCRP

Nutrition Services representative
Scotty Daulton, MPT

Pharmacists
Cassi Lenz, PharmD; Ryan Franks, PharmD

Nurse Administrator
Karen Mihalcescu, RN, BSN; Michelle Gill, RN, BSN

Community Outreach Coordinator
Karen Harrison, RN, BSN; Deborah Mantegna, MSN, RN

Cancer Program Administrator
Jing Zhao, RN, BSN, MSN

network cancer committee

additional members

Breast surgeons
Jennifer Jakub, MD; Mitchell Sklar, MD

Colorectal surgeons
Katya Osipov, MD

General surgeons
William Apgar, MD

Medical oncologists
Joseph Caputo, MD

Medical Oncologist
Robert Frechette, MD

Oncology nurse navigators
Barbara Daulerio, RN, OCN; Jennifer Sabol, MD

American society of clinical oncologists
Kim Wexler

main line health cancer care

Main Line Health Cancer Care is an integrated system providing comprehensive, high-quality care across the spectrum of cancer prevention, screening, diagnosis, treatment, symptom palliation, and survivorship. At its core is a network of experienced oncologists, surgeons, radiologists, pathologists, specialists in cancer genetics and other relevant disciplines, and support teams at Main Line Health’s four acute care hospitals and affiliated community health centers working to ensure patients with or at high risk for cancer receive timely, appropriate, and high-quality personalized care.

Main Line Health Cancer Care is accredited by the American College of Surgeons Commission on Cancer as an Integrated Network Cancer Program. Also, Main Line Health’s Community Cancer Program is a National Cancer Institute (NCI) Community Cancer Program site, Main Line Health has been continuously funded since 1984 for participation in NCI-sponsored clinical trials focused on cancer prevention, screening, treatment, and quality of life.

Find a Main Line Health Cancer Care physician.

For a list of cancer care physicians at Main Line Health, go to mainlinehealth.org/cancercare.

REFERENCES


7. W. Bradford Carter, MD; Rosemarie Tucci, MSN, RN, AOCN, and Jennifer Gleich, MD; Radiation Oncology, Lung Nodule Program.


