



Main Line Health®

CANCER CARE

INAUGURAL REPORT | 2019

synergy

STRONGER AND
BETTER TOGETHER

CANCER CARE

INAUGURAL REPORT | 2019

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Report based on 2017-2018 Main Line Health cancer registry data unless otherwise noted.



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 deeply 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.

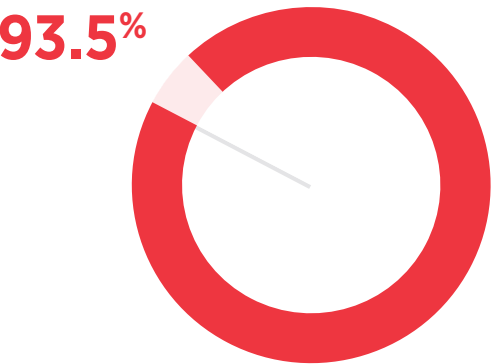
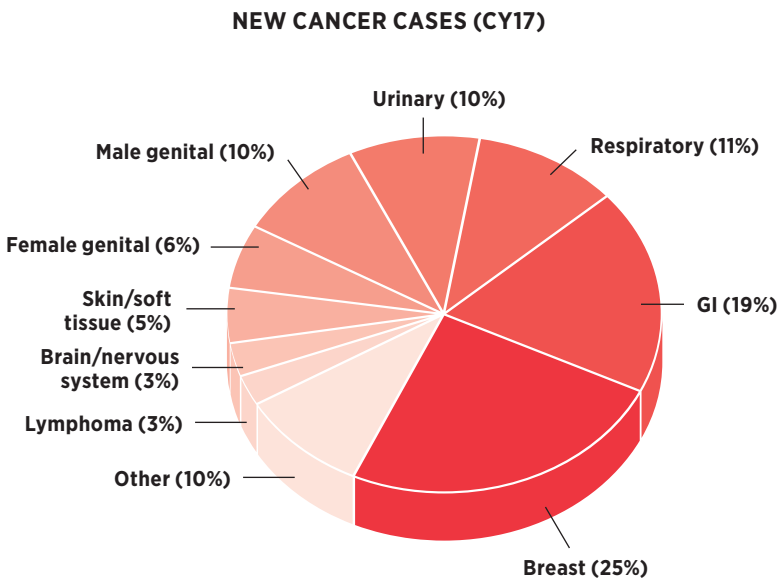
An important milestone in the evolution of Main Line Health’s system-wide cancer program, achieved in 2017, was Commission on Cancer accreditation as an Integrated Network Cancer Program. This inaugural report from Main Line Health Cancer Care highlights steps in our journey to integration, our progress 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



Percentage of patients diagnosed with cancer at Main Line Health who remain at Main Line Health for treatment

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^a

1622
Cases presented at multidisciplinary tumor conferences

1655
Tumor genomic tests analyzed^b

2030
Surgical procedures for treatment of cancer

25,908
Radiation therapy treatments

Reach
From 2015 through 2017, Main Line Health Cancer Care teams treated patients from 16 states

Research

9
Resident research faculty investigating cancer

\$6.5M
Total external funding for cancer-related research^c

67
Active cancer clinical trials and research studies across 14 tumor types^d

376
New patients accrued to cancer clinical trials and research studies

10
Cancer clinical trials staff members^d

Graduate Medical Education

101
Residents in specialty training emphasizing core competencies in cancer prevention, detection, diagnosis, treatment, follow-up, and survivorship^d

21
Fellows receiving training in hematology/oncology, breast oncology, medical management of lung cancer, medical management of GI cancers, and rectal cancer management^d

Recognition
1 of 74
U.S. health systems to achieve Commission on Cancer accreditation as an Integrated Network Cancer Program^d

1 of 46
National Cancer Institute NCORP sites

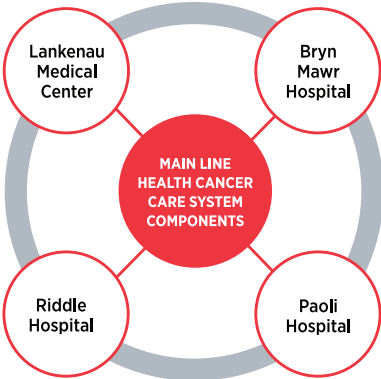
NOTE: Data from calendar year 2017 (CY17) unless otherwise noted.
^aCancer cases initially diagnosed or initially treated at a Main Line Health hospital.
^bFrom September 2017 through August 2018.
^cFrom July 2015 through June 2017.
^dAs of December 2018.



MAIN LINE HEALTH CANCER CARE

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



FOUR CANCER PROGRAMS BECOME ONE
Main Line Health Cancer Care brings together the knowledge, skills, and experience of specialists in cancer prevention, detection, diagnosis, and treatment, as well as all advanced diagnostic, medical, and surgical technologies and specialized cancer programs and support teams at Main Line Health's four acute care hospitals and affiliated community health centers.



Achieving accreditation as an INCP demonstrates Main Line Health's commitment to quality cancer care at a system level. Communication is one thing I see improving. Excellent patient care relies on effective physician-to-physician communication. I commend Main Line Health for taking the bold step to open lines of communication among cancer specialists across the system, and I applaud its progress to date, particularly in forming cohesive, highly functioning breast and lung cancer teams.



PAUL GILMAN, MD
Chief, Division of Hematology/Oncology,
Main Line Health

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 have had 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 health 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, a network cancer registry with standardized data metrics, and a system-wide cancer risk assessment and genetics program—and Main Line Health Cancer Care INCP took flight. In 2017, after 2 years of dedicated and focused teamwork, the newly formed INCP achieved 3-year accreditation with silver commendation from the Commission on Cancer.

Merging strengths, sharing expertise, advancing care

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 at Main Line Health's four acute care hospitals and affiliated health centers, as well as participate in its many specialized cancer programs and services. As physicians and clinical teams on the front line provide patient care, a nucleus of system-based teams provide support and work to drive the cancer program forward.

MAIN LINE HEALTH CANCER CARE: CORE SYSTEM COMPONENTS

Network cancer committee	Cancer program leadership team of clinical and administrative members from each acute care hospital; accountable for program performance
Tumor work groups	Physician-led, tumor site-specific work groups with members from each acute care hospital; charged with identifying and recommending tactics to address programmatic gaps
Cancer risk assessment and genetics program	Cancer risk assessment, genetic counseling, and genetic testing services offered by certified genetics professionals at each acute care hospital and certain health centers
Clinical trials program	System cancer research program overseeing clinical trials available through Main Line Health's NCI-funded NCORP as well as non-NCI-sponsored and investigator-initiated cancer clinical studies
Oncology data services	Cancer registry data management team for system-wide cancer cases; captures 350 standardized data points required for reporting to NCDB and requested by the network cancer committee to measure/document performance and identify quality improvement opportunities; maintains database
Cancer support services and survivorship care	Oncology nursing care, oncology nurse navigation, oncology social work and psychosocial services, nutrition services, palliative care, survivorship care, support groups, and other services

NCDB = National Cancer Database; NCI = National Cancer Institute; NCORP = NCI Community Oncology Research Program.



Main Line Health Cancer Care is accredited as an Integrated Network Cancer Program (INCP), demonstrating integration, coordination, and superior quality of comprehensive cancer services across a network of care facilities. INCPs have a unified cancer committee and patient registry. Each INCP entity meets quality performance expectations and participates in cancer-related clinical research.



Now that we are an INCP, delivering high-quality cancer care is a system imperative. We're continuously monitoring against quality metrics to identify opportunities to improve the care we provide to patients with all types of cancer, regardless of where they enter the health system.



LINNA LI, MD
Chief, Division of Radiation Oncology, Main Line Health



By forming a system-wide integrated cancer program, Main Line Health has merged the vast resources and multidisciplinary expertise at its four hospitals to ensure that patients throughout the region with or at high risk for cancer can receive tailored care that is delivered safely, efficiently, and with the goal of optimal outcomes.



PALLAVI RASTOGI, MD
Medical oncologist, Paoli Hospital

Moving the Needle

Network cancer committee 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 work 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 survivorship, 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 (eg, pulmonology, gastroenterology, 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, standardize care processes for patients with breast, lung, gastrointestinal, and genitourinary cancers.

While the cancer committee is responsible for maintaining compliance with accreditation standards, including setting and meeting at least two SMART (specific, measurable, achievable, realistic, timely) goals and completing at least three quality studies per year, the tumor work groups are the “boots on the ground,” investigating emerging technology, reporting on important clinical research findings, developing and tracking metrics, and recommending program goals and quality studies.



Multidisciplinary discussion at the May 2018 meeting of Main Line Health’s breast tumor work group. Tumor-specific work groups meet two to four times per year; clinical teams from each acute care hospital rotate in bringing complex or clinically challenging cases for group discussion and shared learning.

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.

COMMISSION ON CANCER RESOURCES FOR CANCER PROGRAM IMPROVEMENT	
National Cancer Database (NCDB) ^a	Nationwide database of records from all Commission on Cancer-accredited cancer program registries, used by individual programs to benchmark performance and improve quality and delivery of cancer care
Rapid Quality Reporting System (RQRS)	Web-based tool providing real-time assessment of program-level adherence to quality of cancer care measures
Cancer Program Practice Profile Reports (CP3R)	Web-based tool providing comparative information to assess adherence to/consideration of standard of care therapies for major cancers; currently reports 23 quality measures for 9 tumor sites
Cancer Quality Improvement Program (CQIP)	Annual report of a program’s short- and long-term quality and outcomes data, including 5-year survival rates for commonly treated cancers by stage

^aNCDB is a joint program of the Commission on Cancer and the American Cancer Society.

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



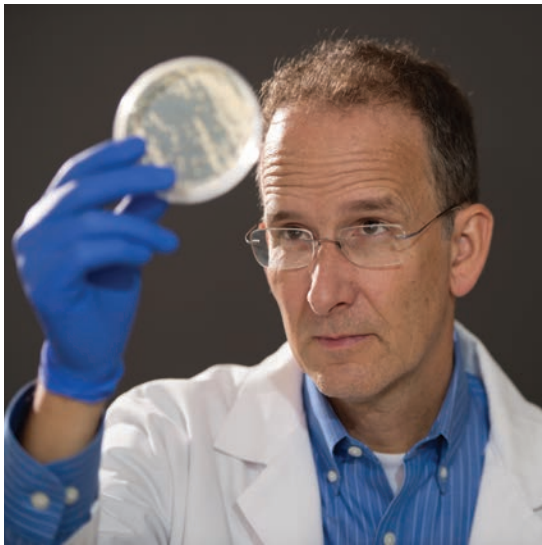
All Main Line Health hospitals have a history of delivering high-quality cancer care. Coming together lets doctors at each hospital meet and start working together. Now, we’re comfortable calling on each other, which is a tremendous benefit for our patients. We can easily transfer patients to the specialty care they need and prepare them for what to expect, which diminishes their anxiety. Integration also means pooled expertise. Each hospital doesn’t need specialists in every sophisticated tool or technique if they are in the system with a direct pathway for access.



LEE BOGART, MD
Medical oncologist, Riddle Hospital



Having a solid infrastructure to support research allows Main Line Health to recruit and retain highly trained, academic-minded physicians and scientists who choose to work in a less constrained, more personal community setting while developing the next generation of cancer care.



SCOTT DESSAIN, MD, PhD
Joseph and Ray Gordon Chair in Clinical Oncology and Research, Lankenau Institute for Medical Research

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 also is 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 codirected 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 *acapreneurial*. 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 scientific discoveries 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 plumbing the depths in pursuit of targets that can be exploited with novel therapies to help prevent immune escape, arrest metastasis, starve tumors of key nutrients, or disrupt essential tumor metabolic pathways to overcome drug resistance.

The ultimate goal of cancer therapy is to destroy and fatally 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 Reimann founds Lankenau Hospital Research Institute (LHRI)—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 LHRI and Memorial Hospital (later, Memorial Sloan Kettering Cancer Center) as the most significant U.S. cancer research labs at the time.

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

1944–1957 Growth and success of LHRI’s cancer research program lead the hospital to create the Institute for Cancer Research (ICR), a sister entity focused exclusively on cancer research. In 1949, LHRI and ICR 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 LHRI and ICR is consolidated under the name ICR, and all other LHRI 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 mammal 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 Baruch Blumberg discovers the hepatitis B virus, shows it can cause liver cancer, and develops a blood test to detect the virus and a vaccine to fight it. He later receives the Nobel Prize for his work.

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

1985–1998 Lankenau Hospital and LMRC become part of Main Line Health. LMRC moves to a new 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 13*).

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

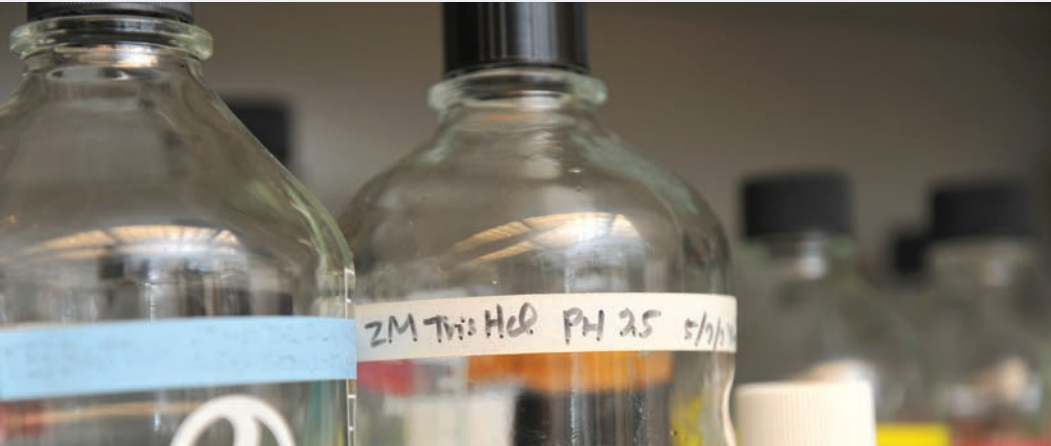
2004 to present Cancer genetics and biology researcher George Prendergast is appointed LIMR president, launching study of disease modifier genes and incubation of biotech companies that translate cancer discoveries into new prognostic and therapeutic tools for cancer care.



LIMR’s ‘acapreneurial’ culture bends toward invention, not simply new knowledge. Most new knowledge is not practical. LIMR’s hybrid culture enables a better read on what’s practical and what’s not. In essence, we’ve created a nonprofit test case in which knowledge and invention are equally weighted.



GEORGE PRENDERGAST, PhD (*pictured on left with biomedical research assistant Kaylend Manley*)
President, CEO, and Havens Chair for Biomedical Research, Lankenau Institute for Medical Research



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 the goal to develop IDO-blocking agents. The scientists pioneered the discovery and use of small-molecule inhibitors of IDO1. Their patents are licensed to NewLink Genetics, which is developing the IDO1 inhibitor indoximod in phase II combination drug trials for various cancers. Early clinical findings show indoximod can safely enhance chemotherapy, chemoradiotherapy, vaccines, and immune checkpoint therapy by leveraging responses to tumor neoantigens.

Limiting tumor blood supply

Tumors need a blood supply to survive and grow, and they initiate formation of blood vessels to create it. Tumor angiogenesis has long been hypothesized as a target for preventing outgrowth of many solid tumors. During their pioneering work defining IDO1's role in driving tumor immune escape, Drs. Prendergast and Muller discovered that IDO1 also supports tumor blood vessel formation, suggesting a new use for IDO1 inhibitors—

in combination with drugs that preferentially kill cells lacking key nutrients (a common characteristic of solid tumors). Dr. Muller notes that IDO1's angiogenic effect in the tumor microenvironment is akin to the enzyme's role in supporting pregnancy, an inflammatory state requiring not only immune tolerance toward the fetus but also remodeling of uterine arteries to create a fetal blood supply.

TARGET: THIOL

Destroying tumor back-up fuel

Glucose-starved tumors are notorious for giving rise to drug-resistant, pro-metastatic cell populations, leading Dr. Prendergast and LIMR research lab associate James DuHadaway to theorize that drugs that sensitize glucose-deprived cancer cells to destruction may be useful alone or as adjuvant therapy. In the glucose-deprived microenvironment of solid tumors, maintaining thiol homeostasis is critical for cancer cell survival.

Looking to exploit this dependency, the researchers identified a novel thiol antimetabolite, dubbed "TTL-315," that blocks cell survival in the setting of glucose deprivation. Using animal models of aggressive breast, lung, and skin cancers, they found that TTL-315 blocked tumor growth and supported the drug cisplatin in triggering tumor regression. Their findings offer proof for TTL-315 as a novel agent to help eradicate solid tumors by exploiting glucose deprivation in the tumor microenvironment. TTL-315 has been patented by LIMR and licensed for clinical development, with phase I testing expected to begin in 2020.

TARGET: POLYAMINES

Starving and exposing tumors

All cells need polyamines to proliferate, but tumor cells need high amounts to support oncogenic activity, which they obtain by increasing polyamine synthesis and upregulating polyamine transport. Induction of polyamine synthesis is a hallmark of tumorigenesis.

Susan Gilmour, PhD, professor and deputy director of LIMR, has spent her career studying the role of polyamines in cancer, in recent years collaborating with Otto Phanstiell, PhD, from University of Central Florida. Their work has led to the development of a novel polyamine-transport inhibitor shown in animal models to significantly inhibit tumor growth when combined with an inhibitor of polyamine synthesis. The combination blockade therapy starves tumor cells of polyamine and relieves polyamine-mediated immune suppression, allowing the activation of a tumor-specific immune attack.

Studies have demonstrated dramatic anti-tumor and anti-metastatic efficacy 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.

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 cytotoxic drug synthesized by Dr. Phanstiell. 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.

TARGET: HuR PROTEIN

Destroying cancer survival kits

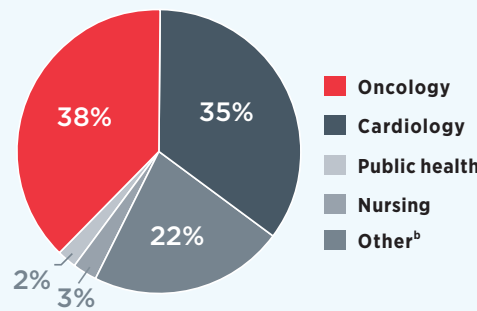
The protein HuR (human antigen R) is found in high amounts in cancer cells and regulates hundreds of genes that function in critical pathways for tumor cell survival. HuR kicks in during times of stress, as in the face of chemotherapy, to enable the most aggressive cancer cells to survive.

Seeking to disable HuR in ovarian cancer cells, LIMR professor Janet Sawicki, PhD, teamed up with scientists at Genisphere LLC to develop and test a novel treatment using Genisphere's 3DNA nanocarrier technology to deliver small interfering RNA (siRNA)—a molecular technique that inhibits function of a single gene—directly to metastatic ovarian tumors in mice. Targeted HuR inhibition reduced tumor growth rate and extended life span without harm to healthy cells, showing promise as a strategy to improve management of advanced, drug-resistant ovarian cancer as well as other tumor types, including pancreatic cancer. The siHuR-3DNA nanotherapy, copatented by LIMR and Genisphere, is slated to enter phase I testing in 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.

IRB-APPROVED STUDIES BY SPECIALTY^a



^a Percentage based on a total of 295 studies approved between July 1, 2017 and June 30, 2018.
^b Other = LIMR, pulmonology, gastroenterology, neurology, and orthopaedic surgery.

Translational Cancer Research

LIMR’s unique dynamic fosters collaborative translational research. Ease of access and a fluid environment allow LIMR 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, teamed up with gastroenterologists and gastroenterology fellows at Lankenau to study the potential chemopreventive action of oral zinc in patients with BE.

The team’s first test, in patients with BE under endoscopic surveillance for cancer development, showed positive results of oral zinc on surrogate markers 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 radiofrequency ablation of Barrett’s tissue and prior to routine 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 (ie, 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.

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’ nausea sensitivity in 89% of cases. A test in a second group of 97 patients confirmed the accuracy of the test. 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 LIMR, led by Dr. Gilman, oversees all cancer-related clinical research activity across 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-approved cancer clinical 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.



Main Line Health cancer clinical trials coordinators.

49 NCORP clinical trials currently enrolling patients^a

63 NCORP clinical trials active but closed to enrollment^a

^a 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.



ALBERT DeNITTIS, MD
Radiation oncologist, Lankenau Medical Center
NCORP principal investigator, Main Line Health



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.



TERRI McHUGH, DO
Medical oncologist, Lankenau Medical Center
Co-Medical Director, Cancer Risk Assessment and Genetics Program, Main Line Health

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 consideration of genetic testing
- Provide comprehensive cancer risk assessment, including pre-test genetic evaluation and counseling
- Coordinate genetic testing, interpret test results, and provide post-test genetic counseling
- Discuss customized risk-reduction options and risk-appropriate screening recommendations, including opportunities for research participation
- Provide referral resources for follow up and support of patients and families affected by hereditary cancer syndromes
- Increase awareness among care providers, patients, and families about evolving evidence-based recommendations for preventing mortality from hereditary cancers

Setting the bar for excellence in system-wide cancer care

The Cancer Risk Assessment and Genetics Program has evolved with the genetics field, seeing tremendous growth annually, with more than 1300 patients evaluated in 2017.

The first fully integrated clinical component of Main Line Health Cancer Care, the genetics program now manages patients at all four acute care campuses and at three community health centers. Program co-medical directors Terri McHugh, DO, and Michael Dabrow, DO, and certified genetic counselors collaborate with medical and surgical teams across the health system. The genetics team participates in multidisciplinary tumor conferences to identify patients appropriate for cancer genetics referral and provides pre-/post-test counseling for all patients choosing to pursue testing.

The cancer genetics program serves as a model for system-wide integration of cancer services and illustrates how unification, standardization of best practices and protocols, and shared learning can improve care for patients, access to services, and efficiencies for care teams. The program ensures that patients receive the same personal attention from the genetics team regardless of their point of entry within the health system.

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 germline—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

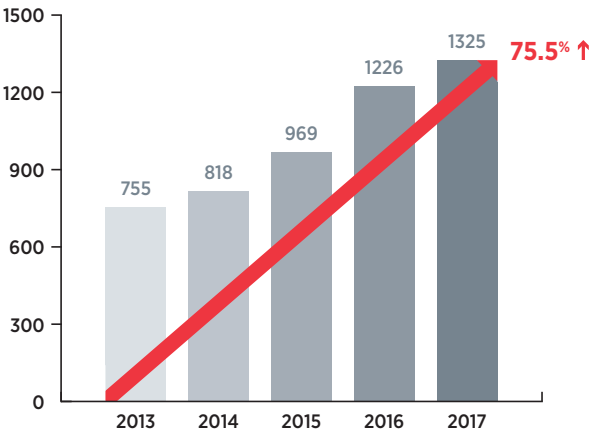


Program at a glance

- 1325 New patient visits^a
- 90% Percentage of patients seen for genetic counseling who elected to have genetic testing^a
- 20% Percentage of patients who elected to have genetic testing and tested positive for genetic cancers^a
- 7 Care centers served
- 4 Certified genetic counselors

^a CY17 data.

NEW PATIENT GENETIC CONSULTATIONS (CY13–CY17)^a



^aIncludes patients seen at all seven care centers served.



Genetic testing is increasingly complex, with many lab choices and ways to test. A wrong test decision can eliminate future test access. Poor test integrity may lead to unexpected costs. Genetic counseling is key to helping patients choose the best, most cost-efficient test as well as understand what the results mean for them or their family.

RACHAEL BRANDT, PhD, MS, LCGC

Manager, Cancer Risk Assessment and Genetics Program, Main Line Health



Main Line Health certified genetic counselors.

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, uterine, 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 cancers. 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.

ADVANCING QUALITY: Ensuring genetics referral 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.

Guiding Principles

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

- Prevention, early detection, and eradication of cancer whenever possible
- Individualized, multidisciplinary cancer 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 campuses, with 1622 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 nurse navigation, 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 genitourinary tumor conferences are held two to four times per year and focus on rare or clinically complex cases.

Support across the care continuum

From the earliest indication of cancer, patients have the support of an oncology nurse navigator. On staff at each acute care campus, 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).

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 physicians specializing in pre- and early cancer eradication. We are all trying to find patients at high risk and help them change their story.



ROBIN CIOCCA, DO

Breast surgeon, Lankenau Medical Center



We have access to the most advanced technologies available for precise tumor classification and identification of genetic and molecular markers important for selecting therapies most likely to benefit patients. Our pathologists use the latest evidence to make informed testing decisions, prioritizing tests that can have an impact.



PRADEEP BHAGAT, MD
Chair, Department of Pathology,
Main Line Health

Diagnosis and Treatment

Diagnosis

Surgeons, radiologists, and pathologists use a full complement of cancer diagnostic tools and technologies, including:

- Ultrasound, CT, MRI, PET/CT, nuclear medicine scans, and digital breast tomosynthesis
- Fine-needle aspiration, core needle, image-guided, endoscopic, and surgical biopsy
- Lymphatic mapping and sentinel lymph node biopsy
- The latest tumor genomic tests for optimal selection of chemotherapy, targeted therapy, and/or immunotherapy

Surgery

More than 80 surgeons participate in cancer care, including a core group of nearly 40 dedicated breast, colorectal, and thoracic surgeons; surgical oncologists; gynecologic oncologists; urologists; neurosurgeons; and plastic and reconstructive surgeons. Surgical teams work in sophisticated operating suites equipped with advanced technology to support safe, effective surgical interventions for cancer diagnosis, staging, curative treatment, and symptom palliation. Advanced robotic surgical technology is appropriately used at each Main Line Health acute care hospital, including the latest-generation robot designed for single-incision robotic surgery, now available at Lankenau Medical Center.



Innovation in minimally invasive oncologic surgery is a core competency at Main Line Health. Our surgeons have a long-standing commitment to excellence in advanced surgical treatment of colorectal, genitourinary, gynecologic, thoracic, and hepatopancreaticobiliary cancers, with a focus on laparoscopic, robotic, and endoscopic innovations that offer improved safety, effectiveness, and patient-centered outcomes.

PATRICK ROSS, MD, PhD

Thoracic surgeon, Main Line Health
Chair, Department of Surgery, Main Line Health



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.

388 Robotic surgical procedures for treatment of cancer in 2017

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 beam radiotherapy), 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.

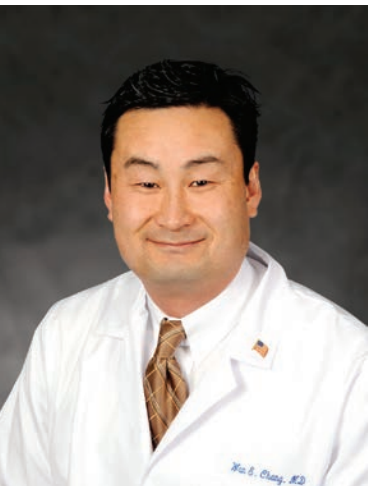
11,000+ IMRT treatments annually

500+ SBRT/SRS treatments annually



SAMEER GUPTA, MD, MPH

Medical oncologist, Bryn Mawr Hospital



WON CHANG, MD

Radiation oncologist, Paoli Hospital



The Cardio-Oncology Program is an example of Main Line Health's commitment to bring academic-level cancer care to the community. The program's 13 cardiologists and 9 oncologists are dedicated to keeping pace with advances in this fast-evolving field, integrating the latest strategies for preventing and managing cardiovascular complications in patients undergoing cancer treatment or being followed in cancer surveillance programs across Main Line Health.



IRVING HERLING, MD
Cardiologist and Medical Director,
Cardio-Oncology Program, Main Line Health

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 26) and gastrointestinal malignancies (see page 31), respectively. In addition, a specialized cardio-oncology team takes steps to prevent and manage cancer treatment-related cardiotoxicity.

Cardio-Oncology Program

Cardiotoxicity is a recognized risk with many cancer therapies. Cardiovascular (CV) complications may develop during, soon after, or years following use of cardiotoxic therapies, the severity of which depends on the therapy dose and mode of administration, the presence of pre-existing CV disease or risk, 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 160 patients have been referred to the Cardio-Oncology Program since 2015.

CARDIO-ONCOLOGY SERVICES

- CV risk assessment prior to initiation of cancer treatment; risk factor management in patients with or at high risk for CV disease
- Individualized cancer treatment planning to minimize CV risk from potentially cardiotoxic cancer therapies
- Monitoring and adjusting cancer and CV therapies to minimize/prevent CV complications while permitting optimal cancer treatment
- Surveillance of cardiac function during and after cancer treatment
- Caring for patients presenting with CV disease after treatment with known cardiotoxic cancer therapies
- Monitoring for and treating CV complications in long-term cancer survivors



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,
Main Line Health

INTERVENTIONAL RADIOLOGY SERVICES

- Percutaneous biopsy (all body sites); transjugular liver biopsy
- Percutaneous radiofrequency ablation, cryoablation, and microwave thermal ablation
- Selective internal radiation therapy (radioembolization using radioactive Y90 beads)
- Transarterial chemoembolization using drug-eluting beads
- Hepatic artery and renal artery embolization
- Preoperative portal vein embolization

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 declining as a result of advances in prevention, early detection, and treatment. In addition, the ability to strategically target tumors with adjuvant drugs and radiation makes it possible to offer breast-conserving therapy to more patients, while refinements in oncoplastic 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, patients 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 proactive discussions 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 work group 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.



Our team is passionate about helping women who are worried about developing breast cancer better understand their risk and what if anything they should do. We offer many services, including a personal 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.



JENNIFER SABOL, MD
Director, Comprehensive Breast Center at
Lankenau Medical Center

Program at a glance

- 818** New breast cancer cases^a
- 756** Breast cancer resections^a
- 72.7%** Breast-conserving surgery rate for American Joint Committee on Cancer (AJCC) stage 0-II breast cancer^a
- 19** Enrolling breast cancer clinical trials and research studies^b

^a CY17 data.
^b As of December 2018.



WILLIAM AYERS, MD
Director, Comprehensive Breast Center at
Riddle Hospital



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.



W. BRADFORD CARTER, MD
Director, Barbara Brodsky Comprehensive Breast Center at Bryn Mawr Hospital
Director, Breast Oncology Program, Main Line Health

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 work group 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 in 93% of cases reviewed, the group conducted a system-wide educational program addressing current AJCC staging 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® test ordering 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.

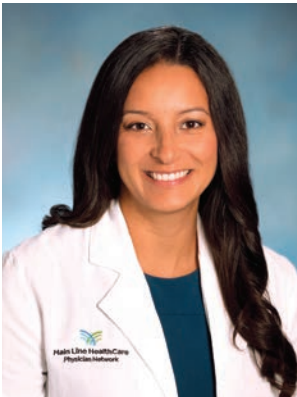
Patient access

≤ 2 days Average time from abnormal mammogram to breast biopsy

7 days Average time from abnormal biopsy to first available surgical appointment



MARISA WEISS, MD
Radiation oncologist, Lankenau Medical Center



LINA SIZER, DO
Breast surgeon, Bryn Mawr Hospital

BREAST CANCER SERVICES

- Prevention and early detection**
- Breast cancer risk assessment; genetic counseling/testing in patients identified as being at high risk for hereditary breast cancer
 - Comprehensive breast imaging procedures; digital breast tomosynthesis with computer-aided detection
 - Chemoprevention and prophylactic surgery in appropriate high-risk patients; management of high-risk breast lesions
- Diagnosis and treatment**
- Core needle, MRI-/ultrasound-guided, stereotactic, and surgical biopsy of suspicious breast lesions
 - Radioactive seed and wire-free radar localization of nonpalpable breast cancer
 - Sentinel lymph node biopsy
 - Tumor marker/molecular analysis and staging; Oncotype DX® testing in appropriate patients
 - Breast-conserving and oncoplastic breast surgery; nipple- and skin-sparing mastectomy; comprehensive options for breast reconstruction
 - Comprehensive chemotherapy, targeted therapy, and immunotherapy options; clinical trials of investigational agents and combination regimens
 - Targeted radiation therapy (RT), including hypofractionated whole 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 monitoring and risk management in patients treated with cardiotoxic therapies
 - Oncology nurse navigation, psychosocial support, and personalized survivorship care planning

TOTAL BREAST IMAGING PROCEDURES^a

Procedure	All locations ^b
Screening mammogram	44,632
Diagnostic mammogram	20,898
Breast ultrasound	12,176
Breast MRI	2108
TOTAL	79,814

^a From July 1, 2017 to June 30, 2018.
^b Includes screening and diagnostic mammograms and breast ultrasound procedures performed at Main Line Health's five community health centers.

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 Tilde Smink 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 early 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 largest contributors to the NSABP B-32 study establishing sentinel lymph node dissection as a standard of care.



We have a personal relationship with each patient who comes here and is diagnosed with breast cancer. We know her family situation and background and how they may 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 cancer care and return for years afterward.



ROBERT FRIED, MD
Director, Holloway Breast Center at Paoli Hospital



Main Line Health's four comprehensive breast centers all have been granted 3-year, full accreditation by the National Accreditation Program for Breast Centers.

RESEARCH SPOTLIGHT: Cryoablation in early invasive breast cancer

Used for years to treat benign fibroadenomas of the breast, cryoablation has recently emerged as a potential nonsurgical treatment option for select patients with early-stage breast cancer. Surgeons at Lankenau Medical Center are currently enrolling patients in a phase II multicenter study to assess the effectiveness of in-office, ultrasound-guided cryoablation as an alternative to standard resection (lumpectomy) for the management of patients with small, early-stage invasive breast cancer. The FROST (freezing instead of resection of small breast tumors) study further evaluates the cryoablation protocol tested in the ACOSOG Z1072 phase II study, which showed complete target tumor ablation in 92% of cancers treated and 100% ablation success in tumors < 1.0 cm.¹ Lankenau was the second-highest enrolling site for the Z1072 study.

The primary outcome measure in FROST is the rate of complete tumor ablation, defined as absence of residual viable invasive or in situ carcinoma detected by core needle biopsy at 6 months post-cryoablation. The study is open at Lankenau to eligible women 50 years of age and older with unifocal invasive breast cancer and tumor size ≤ 1.5 cm.

Breast cancer clinical studies

Main Line Health participates in national clinical trials investigating a wide spectrum of issues in breast cancer. Select examples include current active but closed studies assessing the local recurrence rate after breast-conserving therapy in patients with multiple ipsilateral breast cancer (ACOSOG Z11102) and the value of MRI and a genomic profiling assay in the treatment of patients with ductal carcinoma in situ (ECOG 4112), as well as the following enrolling randomized phase III treatment trials in triple-negative breast cancer.

- **NSABP B55 (Olympia).** This trial is assessing the effect of adding the oral poly(ADP-ribose) polymerase (PARP) inhibitor olaparib as adjuvant 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 how well the immune checkpoint inhibitor pembrolizumab works as adjuvant treatment in patients with triple-negative breast cancer and ≥ 1 cm residual invasive cancer or positive nodes following neoadjuvant chemotherapy.
- **NRG BR003.** This trial is assessing the effect of doxorubicin hydrochloride and cyclophosphamide followed by paclitaxel with or without carboplatin in treating patients with node-positive or high-risk node-negative triple-negative breast cancer.
- **EA 1131.** This trial is comparing platinum-based chemotherapy (cisplatin or carboplatin) to capecitabine in treating patients with residual basal-like triple-negative breast cancer following surgery and neoadjuvant chemotherapy.

OTHER ENROLLING BREAST CANCER CLINICAL TRIALS*

Phase	Trial ID	Breast cancer type/stage	Trial title/description
III	NSABP B51	Early-stage	Standard or comprehensive radiation therapy in treating patients with early-stage breast cancer who have undergone surgery and neoadjuvant chemotherapy
III	S1207	HR-positive and HER2/neu-negative	Adjuvant endocrine therapy with or without everolimus in treating patients with high-risk, hormone receptor-positive and HER2/neu-negative breast cancer
II	FROST	Early-stage	Freezing alone instead of resection of small breast tumors: a study of cryoablation in the management of early-stage breast cancer
II	TRIUMPH-T	Early-stage	Accelerated partial breast radiation therapy using high-dose-rate brachytherapy in treating patients with early-stage breast cancer after surgery

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

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 tumors.

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 at an advanced stage when discovered, an increasing number are identified through follow up of incidental pulmonary nodules and through targeted screening.

Main Line Health is taking both paths to find more lung cancers at an early stage, with the goals to increase the overall 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.

PREVENTION THROUGH SMOKING CESSATION

With nearly 90% of lung cancers linked to tobacco smoke, smoking cessation is the most effective strategy to reduce lung cancer mortality. Every current smoker who is screened for lung cancer at Main Line Health receives smoking cessation education and the opportunity to participate in SmokeFREE—a free, six-session smoking cessation program offered during the day and evening at locations throughout the Main Line Health community. SmokeFREE addresses physical and psychological addiction to smoking and focuses on behavior modification strategies, skills training, and stress management. Instructors provide follow-up telephone support to participants throughout the smoking cessation process.

From January 2017 through December 2018, 326 people attended SmokeFREE sessions; the quit rate for the 2-year period was 35% after 30 days and 13.5% after 6 months. In addition, Main Line Health clinicians provided 2540 inpatient tobacco consultations.

Program at a glance

348	New lung cancer cases ^a
101	Lung cancer resections ^a
64%	Percentage of lung cancers treated with a minimally invasive surgical approach ^a
10	Available lung cancer clinical trials ^b

^a CY17 data.
^b As of December 2018.

Lung Nodule Program at a glance

1705 Patients referred into lung nodule program^a

3.9% Percentage of lung nodule program patients diagnosed with lung cancer (N = 68)^a

77.5% Percentage of lung nodule program lung cancers diagnosed at stage 0–II^b

8.7 days Average time from referral to lung nodule evaluation

^a As of October 2018.
^b CY15– CY17 data.



Primary care physicians often tell us that without the support of the Lung Nodule Program, they’re not sure they’d get reports about 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.

ROSEMARIE TUCCI, MSN, RN, AOCN
Lung Nodule Program Coordinator, Main Line Health

Lung Nodule Program

Between 2006 and 2012, an estimated 1.57 million adults in the United States had a lung nodule identified on unrelated chest CT examination, including 63,000 patients who received a lung cancer diagnosis within 2 years (4.01%).² Data collected at Main Line Health reflect a similar picture, with 3.98% of patients diagnosed with lung cancer during follow-up for an incidental lung nodule.

At Main Line Health, interest in standardizing management of incidental lung nodules led to the development of a lung nodule program based on Fleischner 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 navigator and team of radiologists. Referral leads to prompt patient evaluation, nodule assessment, and recommendations for next steps in care. The nodule team tracks patients and provides reminders to both patients and physicians to ensure compliance with recommended follow-up.

LUNG CANCER SERVICES

Early detection and diagnosis

- Low-dose CT (LDCT) lung screening based on 2018 National Comprehensive Cancer Network (NCCN) guidelines
- Incidental lung nodule management based on 2017 Fleischner Society guidelines
- Endobronchial ultrasound (EBUS)–guided diagnostic techniques (biopsy of central lesions, intrathoracic lymph node staging, radial probe EBUS for localization and biopsy of peripheral lesions, transbronchial needle biopsy)
- Percutaneous image-guided biopsy
- Virtual bronchoscopy system for procedural planning
- Tumor molecular testing in step with evolving guidelines for precision lung cancer treatment

Treatment

- Minimally invasive lung surgery (video-assisted thoracoscopic and robotic-assisted)
- Comprehensive chemotherapy, targeted therapy, and immunotherapy options; clinical trials of investigational agents and combination regimens
- Stereotactic body radiation therapy (SBRT) for early-stage NSCLC; intensity-modulated radiation therapy (IMRT) for NSCLC and limited-stage SCLC; respiratory gating
- Percutaneous cryo- and radiofrequency ablation of NSCLC not treatable with surgery or SBRT

Palliative care, support, and survivorship care

- Interventional techniques for management of pleural effusions (pleurodesis, insertion of drainage catheters), hemoptysis, and airway obstruction (stenting, balloon dilatation, laser therapy, cryotherapy, electrocautery, argon plasma coagulation, photodynamic therapy)
- Cardiovascular monitoring and risk management in patients treated with cardiotoxic therapies
- Oncology nurse navigation, psychosocial support, and personalized survivorship care planning

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.³ 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.

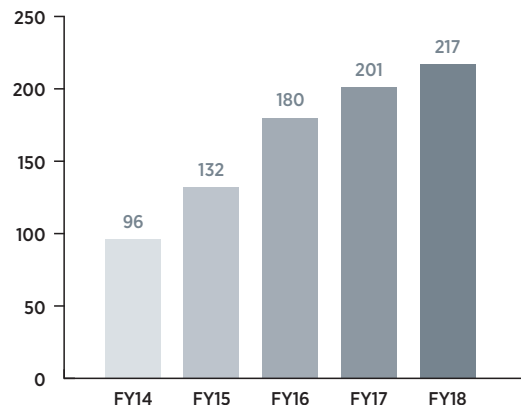
In 2017, a total of 929 LDCT screens were performed and identified 12 primary lung cancers (cancer detection rate = 1.3%); 229 other findings (eg, lung nodule, emphysema, coronary calcification, thyroid nodule, pancreatic cyst, renal cyst) also were reported, with evaluation and/or referral as appropriate.

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 experienced in the use of stereotactic body radiation therapy (SBRT) and intensity-modulated radiation therapy (IMRT), as well as interventional pulmonologists and radiologists, pathologists, and supportive clinical staff.

Patients with suspected lung cancer receive expedient evaluation according to current evidence-based practices for tumor diagnosis and staging. Several biopsy methods are used, including endobronchial ultrasound (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).

ANNUAL VOLUME OF EBUS-GUIDED BIOPSIES (FY14–FY18)



EBUS = endobronchial ultrasound. FY = July 1 to June 30.

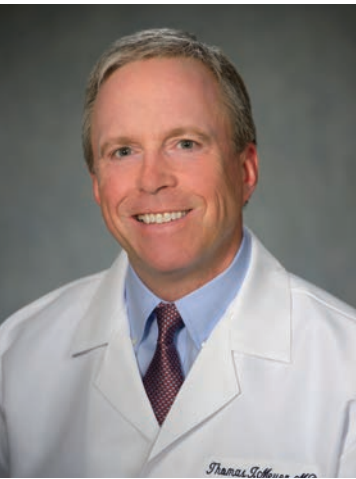
Lung Cancer Screening Program at a glance^a

1642 Number of LDCT screens performed

1.6% Percentage of screened patients diagnosed with lung cancer (N = 27)

71% Percentage of screening program lung cancers diagnosed at stage 0–II

^a CY15–CY17 data.



THOMAS MEYER, MD
Interventional pulmonologist,
Lankenau Medical Center
Co-Medical Director, Thoracic
Oncology Program, 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 the specialized and supportive care they may need as well as clinical trials.”



JOHN DEVLIN, MD
Medical oncologist, Bryn Mawr Hospital
NCORP associate principal investigator,
Main Line Health

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

SBRT 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.

“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 and to see those patients do very well.”

MICHAEL WALKER, MD
Chief, Division of Thoracic Surgery, Main Line Health



Postoperative mortality, NSCLC resections^a

0.6% 30-day unadjusted mortality

2.8% 90-day unadjusted mortality

^aNSCLC resections performed at Main Line Health hospitals, 2013–2015. Source: CQIP (Cancer Quality Improvement Program) 2017 annual report, Main Line Health Cancer Care.

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 therapy (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, targetable driver mutations are matched to appropriate therapies; patients without targetable mutations are considered for immunotherapy.

Adjuvant 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.

ENROLLING LUNG CANCER CLINICAL TRIALS^a

Phase	Trial ID	Tumor type/stage	Trial title/description
III	ECOG 4512	Stage IB–IIIA NSCLC	Crizotinib in treating patients after surgical resection of early-stage NSCLC harboring <i>ALK</i> fusion mutations (an ALCHEMIST treatment trial)
III	A081105	Stage IB–IIIA NSCLC	Erlotinib hydrochloride in treating patients after surgical resection of <i>EGFR</i> -mutant early-stage NSCLC (an ALCHEMIST treatment trial)
III	EA 5142	Stage IB–IIIA NSCLC	Nivolumab in treating patients after surgical resection and adjuvant chemotherapy for early-stage NSCLC (ANVIL; an ALCHEMIST treatment trial)
II/III	NRG LU002	Stage IV NSCLC	Maintenance chemotherapy with or without SBRT in treating patients with stage IV NSCLC
II	S1400F	Stage IV squamous cell lung cancer	Durvalumab plus tremelimumab in treating patients with anti-PD-1/PD-L1-resistant stage IV squamous cell lung cancer (Lung-MAP nonmatch substudy)
II	S1400K	Stage IV squamous cell lung cancer	ABBV-399 in patients with c-MET-positive stage IV or recurrent squamous cell lung cancer (Lung-MAP substudy)

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

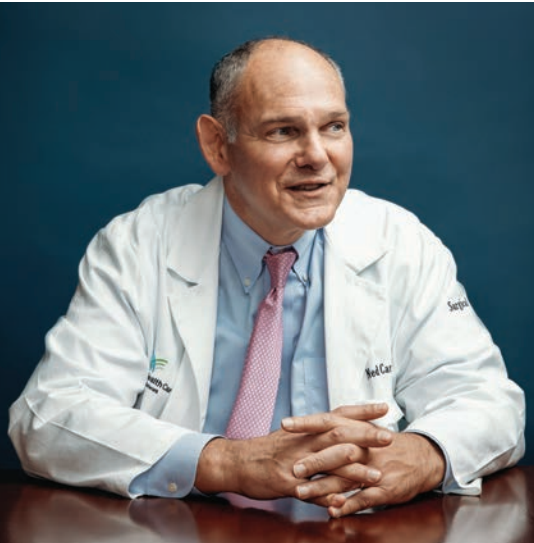
“There’s a lot of nihilism around lung cancer that isn’t appropriate any more. We now have treatments that can lead to durable response, and patients can lead high-quality lives living with lung cancer. We also have the ability to cure more patients than ever before with chemotherapy and immunotherapy 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



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.



NED CARP, MD
Barbara Brodsky Chief of Surgery Chair, Lankenau Medical Center
Dr. Carp is a surgical oncologist with a special interest in hepatopancreaticobiliary cancers. He co-chairs Main Line Health’s GI tumor work group with colorectal surgeon John Marks, MD, and medical oncologist Michael Dabrow, DO.

Gastrointestinal Cancer Program

Gastrointestinal (GI) cancers significantly impact patient survival and quality of life when identified at a late stage. Fortunately, technological advances 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 high 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 of patients needing advanced procedures or treatments.

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 thrust 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.

NEW GI CANCER CASES ^a	
Primary site	Cases
Colon	252
Rectum/rectosigmoid	107
Pancreas	88
Stomach	42
Esophagus	37
Liver/intrahepatic bile duct	34
Small intestine	27
Anus/anorectum	22
Gallbladder/other biliary	5
^a CY17 data.	

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 1100 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 probe-based confocal laser endomicroscopy
- Endoscopic ultrasound (EUS) and EUS-guided fine-needle aspiration, injection, fiducial placement, and brachytherapy
- Endoscopic retrograde cholangiopancreatography, including stent-in-stent procedures
- Cholangiopancreatography
- Endoscopic mucosal resection, submucosal dissection, and radiofrequency ablation
- Enteral and biliary stent placement
- Single- and double-balloon enteroscopy



MALINI MATHUR, MD
Co-Director, Interventional Endoscopy and Pancreaticobiliary Program, Lankenau Medical Center



A major focus of our work is prevention of GI cancers through detection and eradication of premalignant lesions and early-stage malignancies. Over the past 8 years, our organ-sparing endoscopy program has saved thousands of patients from undergoing surgery to remove precancerous lesions and early cancers of the colon, rectum, and esophagus.



BOB ETAMAD, MD
Medical Director, GI Endoscopy Services, Main Line Health

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:

- 1035 adenomas were detected on 2509 screenings in men, for an ADR of 41%
- 842 adenomas were detected in 2909 screenings of women, for an ADR of 29%



PHILIP PEARSON, MD

Colorectal surgeon, Bryn Mawr Hospital and Paoli Hospital



SUMEDH KAKADE, MD

Colorectal surgeon, Riddle Hospital

COLORECTAL CANCER SERVICES

Prevention, early detection, and organ-sparing intervention

- Colorectal cancer risk assessment and genetic counseling/testing in patients and families identified as being at high risk for hereditary colon cancer
- Guideline-based screening (average-risk) and surveillance (high-risk) programs
- Advanced screening options, including high-definition colonoscopy, fecal immunochemical test (FIT), and multitarget stool DNA test
- Colonoscopy with complete polypectomy
- Endoscopic microscopic inspection to differentiate benign from malignant lesions; endoscopic mucosal resection/submucosal dissection of large polyps and early cancers

Diagnosis and treatment

- Tumor histologic examination, immunohistochemical testing, and molecular profiling/next-generation sequencing
- Rectal tumor assessment via specialized MRI protocol to identify patients needing neoadjuvant therapy
- Strict adherence to principles of total mesorectal excision for surgical treatment of rectal cancer
- Laparoscopic and robotic-assisted surgical tumor resection; transanal endoscopic surgery
- Comprehensive chemotherapy, targeted therapy, and immunotherapy options; clinical trials of investigational agents
- Intensity-modulated radiation therapy (IMRT), image-guided IMRT, and stereotactic body radiation therapy with respiratory gating
- Treatment of liver metastases via surgical resection, selective internal radiation therapy, and tumor ablative techniques

Palliative care, support, and survivorship care

- Palliative endoscopic stent placement for relief of obstruction
- Oncology nurse navigation, psychosocial support, and personalized survivorship care planning



JOHN MARKS, MD

Chief, Division of Colorectal Surgery, Main Line Health

Dr. Marks leads Main Line Health's multidisciplinary rectal cancer team at Lankenau Medical Center, which is among an elite group of international rectal cancer specialists currently working to define new pathways for improved outcomes in rectal cancer care. Main Line Health's rectal cancer team has treated more than 1400 patients and frequently publishes findings from systematic follow-up in this patient population.

RESEARCH SPOTLIGHT: Transanal TME for rectal cancer

Total mesorectal excision (TME) is the cornerstone of curative treatment for resectable rectal cancer. Combined with chemoradiation, complete TME with negative resection margins is associated with sustained control even in patients with locally advanced disease—unfortunately, 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 laparoscopic 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 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.⁵

As of December 2018, five 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 and functional outcomes using three validated tools and one questionnaire designed by the investigators.

Colon and rectal cancer resections^a

201 Colon cancer resections (80% via minimally invasive approach)

57 Rectal cancer resections (96% via minimally invasive approach)

Postoperative mortality, rectal cancer resections^a

0% 30-day unadjusted mortality

0% 90-day unadjusted mortality

^aRectal cancer resections performed at Main Line Health hospitals, 2013–2015. Source: CQIP (Cancer Quality Improvement Program) 2017 annual report, Main Line Health Cancer Care.

^a CY17 data.

ENROLLING GI CANCER CLINICAL TRIALS ^a			
Phase	Trial ID	Tumor type	Trial title/description
II	EA2165	Anal cancer	Nivolumab after combined modality therapy in treating patients with high-risk stage II–IIIB anal cancer
III	A021502	Colon cancer	Combination chemotherapy with or without atezolizumab in treating patients with stage III colon cancer and deficient DNA mismatch repair
III	S0820	Colon or rectal cancer	Eflornithine and sulindac to prevent recurrence of high-risk adenomas and second primary colorectal cancers in patients with stage 0–III colon or rectal cancer (PACES trial)
II	S1613	Colon or rectal cancer	Trastuzumab and pertuzumab or cetuximab and irinotecan hydrochloride in treating patients with unresectable locally advanced or metastatic HER2/neu–amplified colon or rectal cancer
II	NRG G1002	Rectal cancer	Veliparib or pembrolizumab with combination therapy in treating patients with locally advanced rectal cancer—a clinical trial platform for sensitization testing using total neoadjuvant therapy (TNT) in rectal cancer
II	NCT03144765	Rectal cancer	Transanal total mesorectal excision (taTME) with laparoscopic assistance for rectal cancer
^a For a complete list of enrolling cancer clinical trials, go to mainlinehealth.org/cancertrials .			

Hepatopancreaticobiliary Cancer

Main Line Health offers multidisciplinary evaluation and management of patients with primary malignancies of the liver, pancreas, and bile ducts. These complex cases often require the expertise of a variety of specialists at multiple sites across the health system. Lankenau Medical Center hosts a biweekly teleconference among relevant specialists to review and plan next steps in the care of patients with suspected or diagnosed hepatopancreaticobiliary tumors.

Pancreatic 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 early pancreatic cancer as well as care of patients with advanced disease.

Interventional endoscopy. Main Line Health interventional 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 also is used for fiducial placement prior to radiation therapy and for therapeutic interventions, including targeted delivery of antitumor agents and celiac plexus neurolysis.

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 remove pancreatic cysts determined to have a high malignant potential. In 2017, 46% of pancreatic resections were performed via a minimally invasive approach.

Barrett’s Esophagus and Esophageal Cancer

At Main Line Health, the predominant focus in esophageal cancer care is prevention through guideline-based endoscopic surveillance and treatment of patients with Barrett’s esophagus.

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 esophageal adenocarcinoma in this patient population. They have had significant success using organ-sparing ablative procedures and endoscopic mucosal resection to treat high-grade dysplasia and early (T1a) esophageal cancers.

NEW SERVICE: Pancreatic cyst program

In 2019, Main Line Health will launch a system-wide program for the care of patients with incidentally discovered pancreatic cysts that have malignant potential. The program will be a collaborative effort involving general and interventional gastroenterologists, surgeons, and radiologists.

Ordering physicians will be notified when a pancreatic cyst is found on imaging and given the option to refer into the program. Referred patients will be entered into the program registry and evaluated and managed according to a guideline-based protocol. Management may include evaluation with EUS and cyst fluid cytology, cyst surveillance, surgery, or no further care unless the patient develops symptoms.

Surgical Management of Genitourinary Cancers

Malignancies of the urinary tract and male reproductive system were the second most frequent cancers diagnosed and treated at Main Line Health in 2017, with a total of 649 new cases.

Surgery plays a prominent role in the care of many of these patients. In 2017, 330 genitourinary (GU) cancer–related surgical procedures were performed at Main Line Health hospitals. With the advance of minimally invasive urologic surgery, many of these technically challenging procedures can now be performed through tiny incisions.

A more precise approach to surgery

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 resection 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.

Main Line Health–affiliated urologists embrace promising new approaches to the surgical management of GU cancers. They have been regional leaders in minimally invasive surgical treatment of prostate, bladder, kidney, and other GU cancers, performing most abdominal procedures for GU cancers via robotic-assisted laparoscopic techniques, including:

- Radical prostatectomy and pelvic lymph node dissection for prostate cancer
- Radical cystectomy with urinary diversion (ileal conduit, orthotopic neobladder) for muscle-invasive bladder cancer
- Partial and radical nephrectomy, ureterectomy, and nephroureterectomy for renal cell carcinoma and urothelial carcinoma
- Retroperitoneal lymph node dissection for testicular cancer

Robotic-assisted surgical options for treatment of GU cancers are available at all acute care campuses of Main Line Health.

NEW GU CANCER CASES ^a	
Primary site	Cases
Prostate	303
Bladder	195
Kidney/renal pelvis	122
Testis	14
Ureter	11
Other	4
^a CY17 data.	

Robotic GU cancer resections^a

180	Prostatectomies
68	Nephrectomies, ureterectomies, and nephroureterectomies

^a CY17 data.

The challenging landscape of prostate cancer care is territory worth traveling on behalf of men living with the disease. The best care involves shared, clinically intelligent decisions about screening, biopsy, and whether, 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.



DAVID MCGINNIS, MD
Urologist, Bryn Mawr Hospital

Dr. McGinnis chairs Main Line Health's system-wide tumor work group for genitourinary cancers.



Advanced prostate MRI studies have allowed us to find worrisome prostate cancers in patients with a previous negative biopsy and help urologists plan as minimally invasive a surgery as possible for each patient. Now, it is also allowing urologists to biopsy intelligently—to do fewer biopsies that get better results, so patients can be assured we’re not missing cancer that could harm them.



NACHUM STOLLMAN, MD
Radiologist, Bryn Mawr Hospital

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

Active surveillance is a strategy being used to prevent overdiagnosis from leading to overtreatment. Research is underway worldwide to define additional strategies that can lead to 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 tools are being incorporated into prostate cancer care across Main Line Health.

SERVICE SPOTLIGHT: Prostate multiparametric MRI program

Multiparametric MRI (mpMRI) of the prostate gland is an advanced imaging technique for assessing prostate tissue anatomy, volume, cellularity, and vascularity. The test requires highly specialized equipment and expertise in test 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 diagnosed prostate cancer. More than 1500 prostate mpMRI studies have been performed since the program was 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.^{6,7}

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 disease. Prostate mpMRI also is used in patients with high PSA levels after a negative biopsy to assess for suspicious areas that may have been missed and in patients electing to undergo surgery to assess level of tumor invasion prior to planned surgery with the goal of nerve sparing.

Tools to inform biopsy. In patients with elevated PSA levels, several factors weigh into decisions about proceeding to prostate biopsy, including how high the PSA level is and how quickly it is rising, patient age and general health, and the presence of signs or symptoms of prostatitis. 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 tests to help stratify risk and avoid unnecessary biopsies.

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



MAX AHN, MD
Urologist, Lankenau Medical Center

RESEARCH SPOTLIGHT: SBRT for localized prostate cancer

Moderately hypofractionated external beam radiation therapy (EBRT) has emerged as a standard-of-care treatment for appropriately selected men with localized prostate cancer.⁸ Moderate hypofractionation involves 20 to 30 treatments as opposed to 38 or 40 with conventional fractionation. Hypofractionated image-guided intensity modulated radiation therapy (IG-IMRT) is available at all Main Line Health acute care locations for the treatment of prostate cancer.

Ultrahypofractionated EBRT, or stereotactic body radiation therapy (SBRT), is now recognized as an alternative treatment for men with localized, low/intermediate-risk prostate cancer, with use in high-risk disease limited to the setting of a clinical trial or multi-institutional registry.⁸ SBRT delivers highly conformal, high-dose radiation in five or fewer treatments.

At Main Line Health, two clinical studies of SBRT are available to eligible patients with localized prostate cancer.

- NRG GU005 is a nationwide randomized phase III trial in patients with previously untreated stage IIA-B intermediate-risk prostate cancer. The study is comparing SBRT to hypofractionated IMRT for differences in associated GU and GI toxicities and disease-free survival. This study is available at Lankenau Medical Center and Paoli Hospital.
- Also at Lankenau, radiation oncologist Albert DeNittis, MD, is conducting a prospective phase II study to evaluate 5-year survival and immediate- and long-term toxicities after gantry-mounted, linear accelerator-delivered SBRT for localized low/intermediate-risk prostate cancer. Patient data from this study are being pooled with data from five other institutions for an analysis being conducted at the University of California Los Angeles, with publication anticipated in 2019.



Being accessible to women with concerns about a possible gynecologic cancer is a priority for us. We feel that no one with a worry about cancer should have to wait to be seen by a specialist. We take great pride in the care and service we provide to women threatened by gynecologic malignancy. Our patients’ needs, concerns, and best interests are at the center of everything we do.



DAVID HOLTZ, MD
Chief, Division of Gynecologic Oncology, Main Line Health

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 790 new patients for evaluation or management and diagnosed or treated 198 new gynecologic cancers.

CONDITIONS EVALUATED AND TREATED	
Gynecologic cancers	Cervical cancer, endometrial cancer, ovarian cancer, fallopian tube cancer, primary peritoneal cancer, vulvar cancer, vaginal cancer, gestational trophoblastic disease, and ovarian germ cell and stromal tumors
Premalignant/high-risk gynecologic conditions	Cervical intraepithelial neoplasia, endometrial intraepithelial neoplasia, complex adnexal masses, hereditary breast and ovarian cancer syndrome, and Lynch syndrome

Patient-Centered, Technically Advanced Care

The gynecologic oncology program is committed to providing compassionate care of women using every breakthrough 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 confer or collaborate with colleagues in medical and radiation oncology, cancer genetics, fertility, surgical 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.

NEW GYNECOLOGIC CANCER CASES*	
Primary site	Cases
Corpus uteri	124
Ovary	44
Cervix uteri	17
Vulva	9
Other	4
*CY17 data.	

Patient access

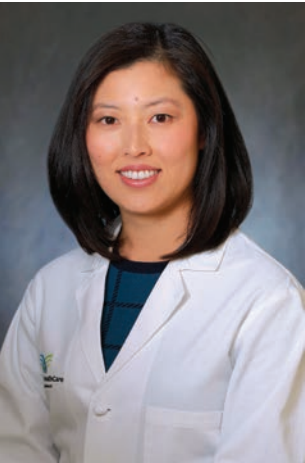
≤ 48 hours	Women needing evaluation for a possible gynecologic malignancy are seen within 48 hours of contacting the gynecologic oncology program
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Each patient’s care—from diagnosis, through all phases of treatment, to life-long follow-up—is directed 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.

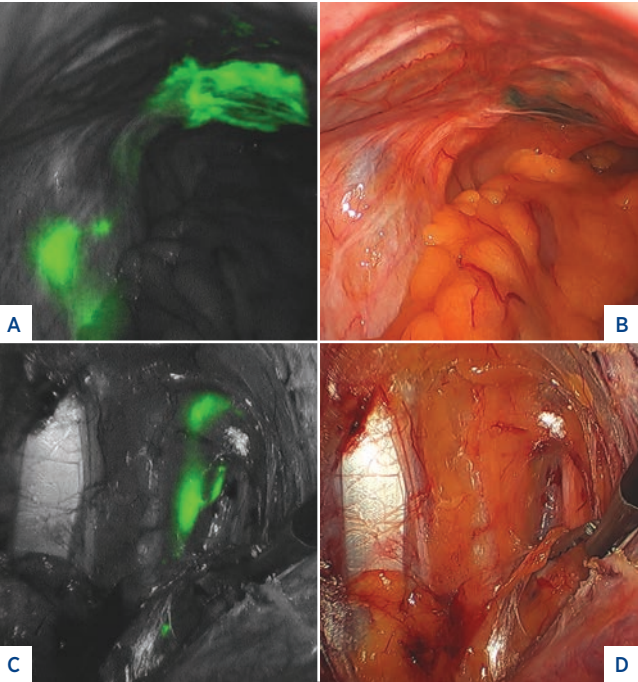
Open and minimally invasive procedures. For women who are candidates for surgical treatment, gynecologic oncologists offer extensive experience with all approaches to complex gynecologic surgery, including the latest laparoscopic and robotic-assisted techniques. Minimally invasive procedures are used whenever appropriate for the patient and in accordance with current best practices 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,⁹ 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 all stage IB2 tumors).



XIAOMANG STICKLES, MD
Gynecologic oncologist, Paoli Hospital

Radical cytoreductive surgery. Main Line Health gynecologic oncologists are committed to the principles of cytoreductive surgery (tumor debulking) for the treatment of 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. Whenever 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 surgical 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.



At Main Line Health, gynecologic oncologists use indocyanine green (ICG) dye to identify sentinel lymph nodes for dissection during surgical treatment of certain early-stage gynecologic cancers. ICG dye, which is fluorescent and easily detected with near-infrared imaging, is injected just before the operation and allows visualization of sentinel nodes through other tissue, minimizing dissection and the chance of missing a node. This series of intraoperative images was captured at Lankenau Medical Center during surgical treatment of a patient with early-stage endometrial cancer. The images on the left show the surgical site under near infrared light; sentinel lymph nodes are clearly seen through tissues prior to dissection (A). The images on the right show the surgical site under white light, prior to (B) and during (D) lymph node dissection.

SPOTLIGHT: Hyperthermic intraperitoneal chemotherapy

Hyperthermic intraperitoneal chemotherapy (HIPEC) is a treatment for advanced abdominal malignancies that combines cytoreductive surgery and intraperitoneal chemotherapy in a single procedure. Immediately following complete or optimal cytoreductive surgery, a heated chemotherapy solution is delivered by catheter into the abdominal cavity and circulated for 90 minutes to 2 hours. The solution is then drained, and the abdomen is closed.

In October 2018, the gynecologic oncology team at Main Line Health performed its first HIPEC procedure in a patient with advanced ovarian cancer, following publication earlier in 2018 of results from a pioneering phase III randomized trial showing survival benefits of the therapeutic approach.¹⁰ Among women with advanced ovarian cancer, HIPEC plus complete or optimal interval cytoreductive surgery afforded a 5-month improvement in median recurrence-free survival and a 12-month improvement in median overall survival compared with cytoreductive surgery alone.¹⁰

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 peritoneal disease amenable to cytoreductive surgery. Lankenau surgical oncologist Ned Carp, MD, assisted gynecologic oncologist David Holtz, MD, in the first ovarian case.

GYNECOLOGIC CANCER SERVICES

Diagnosis and treatment

- Colposcopy with biopsy, cone biopsy (conization), and LEEP (loop electrosurgical procedure) for suspected cervical cancer
- Endometrial biopsy and dilation and curettage for suspected endometrial cancer
- Transvaginal ultrasound, tumor marker (CA-125) testing, and surgical evaluation and biopsy for suspected ovarian cancer
- Medical management of preinvasive endometrial and vulvar cancers
- Radical cytoreductive surgery (tumor debulking) for advanced gynecologic malignancies
- Laparoscopic and robotic-assisted surgery for tumor diagnosis and staging and for treatment when appropriate
- Sentinel lymph node mapping and staging of endometrial, cervical, and vulvar cancers
- Fertility-sparing hormonal therapy and surgery, including trachelectomy for early-stage cervical cancer
- Risk-reducing surgery in women with inherited risk for ovarian and/or endometrial cancer
- Tumor histologic examination, immunohistochemical testing, and molecular profiling/next-generation sequencing
- Comprehensive options for systemic therapy (chemotherapy, hormone therapy, targeted therapy); clinical trials of investigational agents
- Standard (normothermic) and hyperthermic intraperitoneal chemotherapy
- High-dose-rate brachytherapy and intensity-modulated radiation therapy

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 guidelines and emerging scientific evidence, with comprehensive options available, including:

- Hyperthermic 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)

A distinguishing feature of Main Line Health’s gynecologic oncology program is involvement of gynecologic oncologists through 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.

ENROLLING GYNECOLOGIC CANCER CLINICAL TRIALS^a

Phase	Trial ID	Tumor type	Trial title/description
II/III	NRG GY009	Ovarian	Pegylated liposomal doxorubicin hydrochloride with atezolizumab and/or bevacizumab in treating patients with recurrent ovarian, fallopian tube, or primary peritoneal cancer
II	NRG GY012	Endometrial	Olaparib plus cediranib versus cediranib alone and olaparib alone in treating patients with recurrent, persistent, or metastatic endometrial cancer
II	NRG CC004	Any gynecologic cancer	Bupropion hydrochloride versus placebo for improving sexual desire in women with breast or gynecologic cancer

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

RESEARCH SPOTLIGHT: Breast oncology nurse navigator services

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 navigation. 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 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.

In future planned studies of nurse navigation services, CPHR researchers will assess patient-reported outcomes and evaluate how care delivery processes work within subgroups of patients of different ages, races, and ethnicities as well as in subgroups with unique traditions or cultural practices.

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-intensive 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



Main Line Health oncology nurse navigators.

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. In 2018, nurse navigators supported an estimated:

- 2192 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
- Identifying 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 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 19% fewer hospitalizations.¹¹

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 in patients with cancer. This research question relates to the site of cancer and how patients perceive their life satisfaction after controlling for the effect of gender, age, and income and other resources.

In a preliminary study, patients and survivors were asked about their level of energy during the past month; 24% responded “little or none,” and 10% reported feeling that “everything was an effort most or all of the time.” CPHR researchers hope that further study will identify groups of patients who would benefit from additional services to improve their short- and long-term quality of life, as well as point the way for Main Line Health Cancer Care’s continued effort to offer comprehensive wellness services to patients with cancer.



Main Line Health oncology social workers.

CANCER CARE PRINCIPLES: The meaning and value of palliative care

Misconceptions about palliative care are common. An important misconception is that palliative care is synonymous with hospice care. In fact, palliative care can be provided concurrently with curative or life-prolonging care. It is appropriate at any stage of serious illness.

Palliative care refers to specialized care delivered by multidisciplinary teams with the goal of optimizing quality of life through prevention and treatment of suffering. It involves addressing physical, intellectual, emotional, social, and spiritual needs to facilitate patient autonomy. 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 extend survival. A landmark study in patients with metastatic non-small cell lung cancer showed that patients managed with a once-monthly palliative care visit in addition to standard care lived longer, were less depressed, and received less aggressive care at the end of life than patients on standard care alone.¹³

At Main Line Health, patients with a distress score of 4 or higher or 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 1568 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

An increasing focus for oncology social workers is addressing patients' financial concerns and worries about having adequate insurance coverage. Distress or hardship arising from the financial burden of cancer treatment has been described as *financial toxicity*.¹² Similar to potential toxicities of treatment, financial toxicity after a cancer diagnosis is a major contributor to poorer quality of life and treatment delay or nonadherence.

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 are 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 measure is used to determine how well inpatient palliative care programs are reaching patients in need.



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, pay utility bills, and afford their co-pays and medicines so they are more likely to follow up with their care.

EUCHARIA BORDEN, MSW, LCSW, OSW-C

Outpatient oncology social worker,
Lankenau Medical Center

Main Line Health's most recent assessment of 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 is moving to standardize 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 (ie, patients treated with curative intent who have completed active treatment), each member 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 detailed 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 joys and challenges.



That's the pure reward of our success 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 with their families. It's an indescribable joy for a cancer physician.

MARISA WEISS, MD

Radiation oncologist, Lankenau Medical Center

QUALITY SPOTLIGHT: Magnet® recognition for nursing excellence



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 excellence, and innovations in professional nursing practice. Hospitals achieving Magnet recognition are required to provide interim reporting, with redesignation possible every 4 years after a comprehensive evaluation.

In 2015, Lankenau Medical Center, Bryn Mawr Hospital, and Paoli Hospital earned their third consecutive Magnet designation and Riddle Hospital, Bryn Mawr Rehabilitation Hospital, and Main Line HomeCare & Hospice earned their first, making Main Line Health one of only 22 health systems in the nation to achieve system-wide Magnet status.

Magnet recognition signals superb nursing performance and dedication to excellence in all aspects of patient care. Studies show better outcomes for patients treated in Magnet-recognized hospitals, including fewer postoperative complications and lower 30-day mortality rates in surgical patients.¹⁵ Patients at Magnet-recognized hospitals also report significantly better experience with their hospital care.¹⁶

CANCER-RELATED MEDICAL EDUCATION AND TRAINING AT MAIN LINE HEALTH

- Fellowships in hematology/oncology, breast oncology, and minimally invasive colorectal surgery and advanced management of rectal cancer
- Pulmonary medicine and gastroenterology fellowships with intensive training in the diagnosis and multidisciplinary management of cancers of the lung and gastrointestinal tract, respectively
- General surgery and obstetric and gynecology residencies with intensive training in general surgical oncology and gynecologic oncology, respectively
- Fellow and resident mentoring in clinical cancer research, with opportunities for basic and translational cancer research collaborations at Lankenau Institute for Medical Research
- Medical student rotations in hematology/oncology and cancer research
- Cancer genetics rotations for fellows, residents, and medical students
- Didactic and interactive educational activities, including multidisciplinary cancer conferences held regularly at each acute care campus, biannual to quarterly system tumor work group conferences, and cancer symposia offered through the Continuing Medical Education Department

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 fostering lifelong learning. Two health system hospitals—Lankenau Medical Center and Bryn Mawr Hospital—are nationally recognized centers of graduate medical education, together offering 14 accredited residency 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 and training 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 Brodsky Endowed Fellowship in 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 colorectal 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)					
Primary site	2013	2014	2015	2016	2017
Oral cavity/pharynx	37	50	36	37	39
Tongue	12	18	11	9	14
Gum/other mouth	1	3	3	3	6
Tonsil	13	12	8	10	7
Hypopharynx	1	4	4	2	3
Other	10	13	10	13	9
Digestive system	520	552	546	635	630
Esophagus	21	28	31	30	37
Stomach	22	44	40	37	42
Small intestine	13	11	20	14	27
Colon	199	203	204	252	252
Rectum/rectosigmoid	113	113	102	121	107
Anus/anal canal/anorectum	7	14	12	12	22
Liver/intrahepatic bile duct	31	29	19	49	34
Gallbladder/other biliary	15	20	19	25	13
Pancreas	87	83	88	90	88
Other	12	11	11	5	8
Respiratory system	342	351	392	435	368
Larynx	12	12	14	18	19
Lung/bronchus	326	337	375	408	348
Other	4	2	3	9	1
Soft tissue	16	18	21	15	18
Skin	162	202	165	128	138
Melanoma	156	194	159	118	128
Other	6	8	6	10	10
Breast	792	781	750	817	818
Female genital system	214	256	204	237	198
Cervix uteri	20	13	17	22	17
Corpus uteri	130	174	130	155	124
Ovary	53	57	41	43	44
Vulva	5	12	11	9	9
Other	6	0	5	8	4
Male genital system	309	257	283	299	318
Prostate	293	236	265	282	303
Testis	15	17	14	15	14
Other	1	4	4	2	1

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

Primary site	2013	2014	2015	2016	2017
Urinary system	269	297	304	292	331
Bladder	170	174	189	186	195
Kidney/renal pelvis	91	100	97	99	122
Ureter	4	12	14	6	11
Other	4	1	4	1	3
Nervous system	64	70	67	82	97
Brain	27	36	18	22	38
Cranial nerves/other nervous system	37	34	49	60	59
Endocrine system	67	55	64	72	81
Thyroid	58	49	54	60	68
Other	9	6	10	12	13
Lymphoma	148	151	141	128	108
Hodgkin	17	19	12	12	10
Non-Hodgkin	131	132	129	116	98
Myeloma	43	31	34	34	29
Leukemia	51	43	56	51	50
Mesothelioma	10	6	10	5	11
All other	102	94	78	77	76
All sites	3146	3214	3151	3344	3310



Main Line Health oncology data services team.

NETWORK CANCER COMMITTEE Required Members	
Chair	Michael Walker, MD
Cancer Liaison Physician	Michael Walker, MD, <i>Thoracic Surgeon</i> John Devlin, MD, <i>Medical Oncologist</i> ^a
Radiologist	Peter Villas, MD Emma Simpson, MD ^a
Pathologist	Vince Ciocca, MD Robert Carr, MD ^a
Surgeon	Ned Carp, MD Robert Fried, MD ^a
Medical Oncologist	Paul Gilman, MD Michael Dabrow, DO ^a
Radiation Oncologist	Jessie DiNome, MD Albert DeNittis, MD ^a
Palliative Care Physician	Karl Ahlswede, MD Jennifer Burke, DO ^a
Cancer Genetics Representative	Terri McHugh, DO, <i>Medical Oncologist</i> Rachael Brandt, PhD, MS, CGC ^a
Inpatient Oncology Nurse	Amy Callahan, DNP, RN, CNE, AOCNS
Outpatient Oncology Nurse	K. Lynne Quinn, MSN, RN, CRNP Mary Beth Flynn, RN ^a
Clinical Cancer Research Representative	Elene Turzo, MSN, CRNP Lorie Matson, RN, CCRP ^a
Cancer Registry Quality Coordinator	Louise Widmer, CTR
Quality Improvement Coordinator	Linna Li, MD, <i>Radiation Oncologist</i> Susan Zuk, RN ^a
Cancer Conference Coordinator	Amy McGrath, MS, CTR Esther Kert, CTR ^a
Social Worker, Psychosocial Services Coordinator	Vicki Hughes, MSW, LSW Ruthmary Strohm, MSW, LSW ^a
Oncology Outpatient Nutrition Representative	Carolyn Farhy, MS, RD, LDN
Rehabilitation Services Representative	Scott Quaile, MPT
Pharmacist	Al Celidonio, RPh Kiyo Yoda, PharmD ^a
Hospice Administrator	Terre Mirsch, MS, BSN, RN Michelle Gies, MSN, RN ^a
Community Outreach Coordinator	Maureen Hennessey, EdD Deborah Mantegna, MSN, RN ^a
Cancer Program Administrator	Greg Kasmer, MBA, MHSA
^a Designated alternate.	

NETWORK CANCER COMMITTEE Additional Members	
Breast Surgeons	Jennifer Sabol, MD W. Bradford Carter, MD
Colorectal Surgeon	John Marks, MD
Gynecologic Oncologist	David Holtz, MD
General Surgeon	William Ayers, MD
Medical Oncologist	Lee Bogart, MD
Oncology Nurse Navigators	Barbara Daulerio, RN, <i>General Oncology</i> Annette Hargadon, MSN, RN, CBCN, <i>Breast Cancer</i> Rosemarie Tucci, MSN, RN, AOCN, <i>Lung Nodule Program</i>
Survivorship Care Representative	Kathleen Sacharian, MSN, CRNP
American Cancer Society Representative	Erin Moskel

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 a National Cancer Institute (NCI) Community Oncology Research Program site, Main Line Health has been continuously funded since 1994 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.

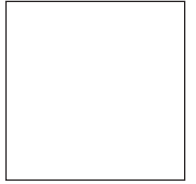
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Main Line Health®

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MAIN LINE HEALTH

CANCER CARE

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