

## **Virtua Fox Chase Cancer Program 2014 Annual Report Message from the Medical Directors**

Virtua is a multi-hospital healthcare system with facilities in Mt. Holly, Marlton, Voorhees, Berlin, Washington Township and Moorestown. The Virtua Fox Chase Cancer Program (VFCCP) serves Burlington, Camden and Gloucester counties and their surrounding communities in central and southern New Jersey.

VFCCP is accredited by both the American College of Surgeons Commission on Cancer and by the National Accreditation Program for Breast Centers. Accreditation by both of these organizations provides many notable benefits that enhance our quality of care by providing our patients with a full range of diagnostic, treatment and supportive services including community based resources. To maintain accreditation facilities must undergo a rigorous evaluation and review of its performance and compliance with standards established by each of these organizations.

Virtua offers a wide array of surgical oncology expertise in colorectal surgery, breast cancer surgery, urologic surgery, gynecologic surgery, thoracic, otolaryngotic surgery and spine surgery. Interventional radiology facilities are available at all hospital sites. Radiation oncology facilities and medical oncology and surgical oncology practices are also available throughout our service areas.

This year 24 physicians were appointed to the Virtua Fox Chase Physician Panel. This panel represents rigorous standards developed by Virtua and the Fox Chase Cancer Center (FCCC) in Philadelphia. All of these physicians are board certified; participate in quality assurance audits and continuing education programs along with collaborating with FCCC physicians.

In 2014, VFCCP continued to achieve and surpass its goals and objectives including:

- Received the Outstanding Achievement Award from the American College of Surgeons' Commission on Cancer, Virtua is 1 of only 10 hospitals in the country to receive this award 4 consecutive times. This prestigious award recognizes only a few cancer programs each year for excellence in providing cancer care to patients.
- Expanded our breast reconstruction program to include advanced micro-surgical oncologic reconstructive procedures including: gynecologic, orthopedic and colorectal by a nationally recognized oncologic reconstructive surgeon from Fox Chase Cancer Center.
- Implemented the Margin Probe System which is used by our breast surgeons performing lumpectomies on patients diagnosed with breast cancer. This tool assists the surgeon in identifying malignant tissue on or near the surgical margin. This tool allows the surgeon to remove the cancerous tissue, resulting in cancer free margins and reducing the need for future re-excisions.
- Expanded our Thoracic Program Service Line to include: A High Risk Lung Cancer Program that screens patients in our community, who may be at risk to develop lung cancer, based upon National Comprehensive Cancer Network eligibility criteria.
- Continued to expand our Survivorship Program services to include: Lymphedema clinics; additional support groups; expansion of LifeCare/ palliative care clinics;

- Continued to expand our Infusion Task Force to improve the following: Patient satisfaction, quality, safety, and revenue enhancement. In addition, secured approval for, active recruitment of a Pharm D., APN, and nurse manager, as well as a plan for a two physician Medical Directors and Supervisors for both infusion centers at Voorhees and Memorial in 2015.
- Expanded our Cancer Genetics Program with the approval to recruit and hire an additional full-time Certified Genetics Counselor due to increased volume.
- Implemented Prone Breast Radiation Therapy at our Virtua Fox Chase Cancer Center Radiation Oncology in Washington Township.

The 2014 Annual Report describes details of our Cancer Program and Cancer Registry statistics. This year's report focuses on an in-depth review of lung cancer presented by Dr. Kim, Dr. Steinberg, Dr. Krol and Dr. Lindenberg.

We are looking forward to 2015, as we continue to strengthen our oncology program working with our partners Fox Chase Cancer Center in Philadelphia and Samaritan Hospice. We wish to thank all the participants of the VFCC Program; Fox Chase Cancer Center and Samaritan Hospice for their commitment to excellence in cancer care for all the communities we serve.

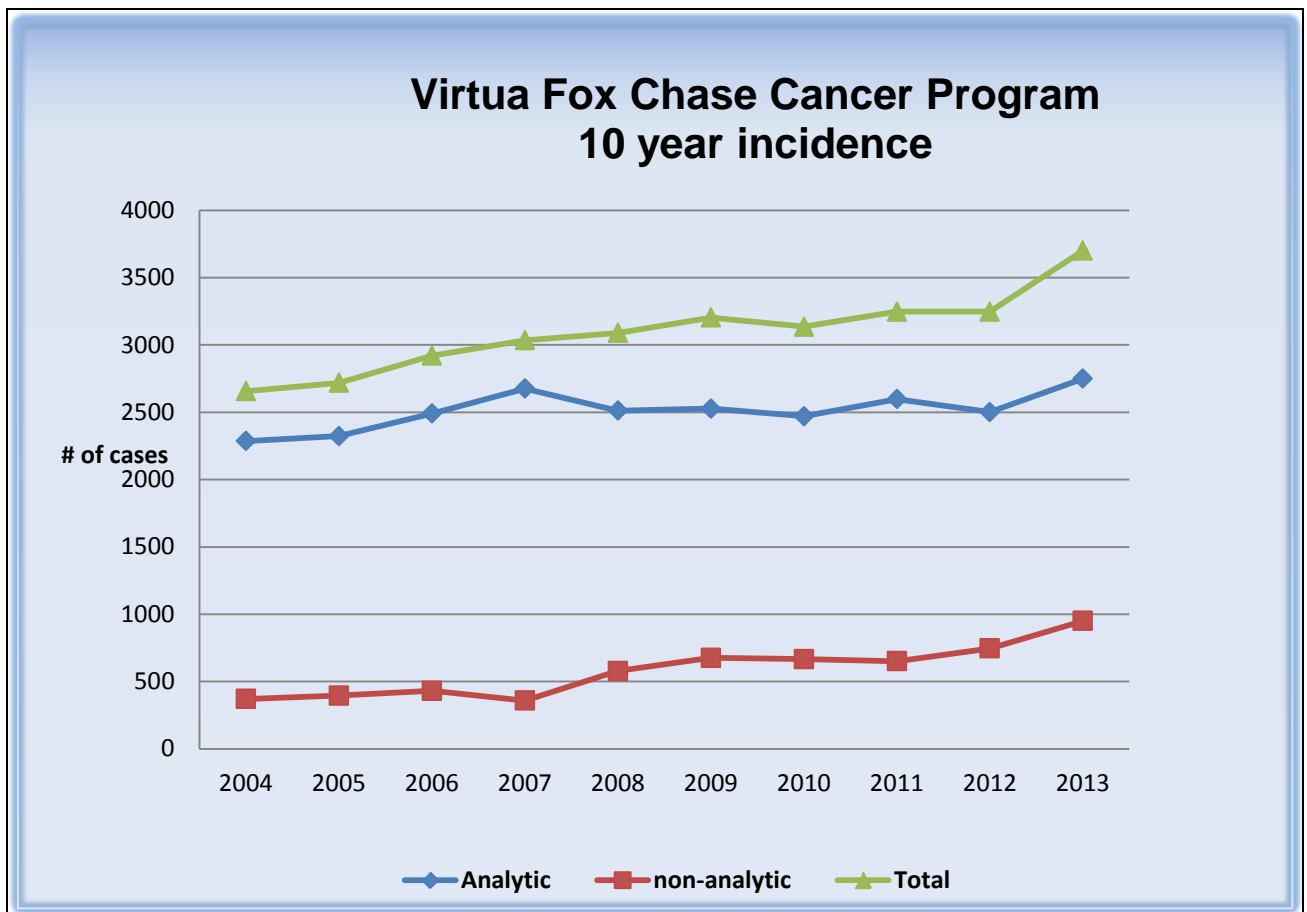
Sincerely,  
Stephen G. Wallace, MD, Medical Director  
Virtua Memorial

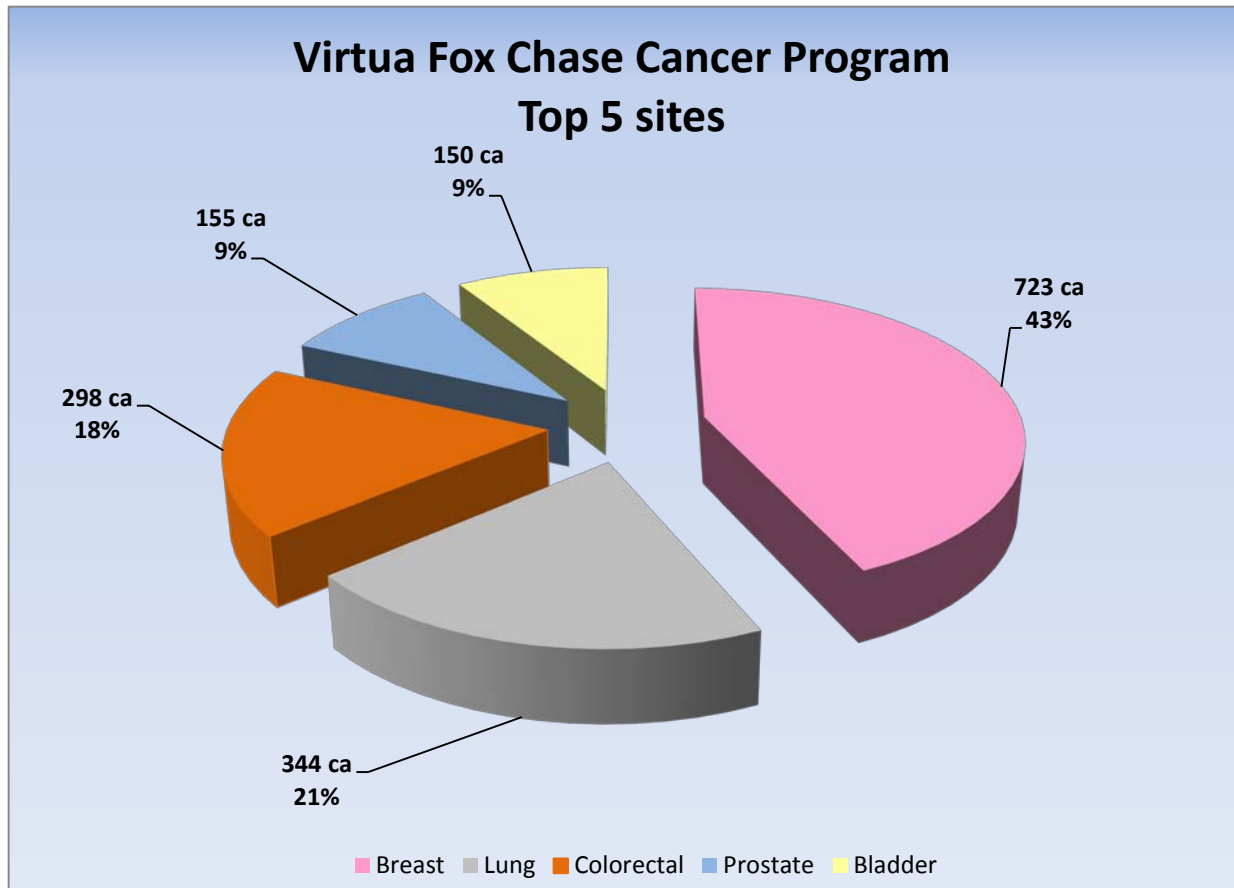
Ashok Bapat, MD, Medical Director  
Virtua Voorhees

## Virtua Fox Chase Cancer Program 2014 Cancer Registry Report

The Cancer Registry is a component of the cancer program that is responsible for the accurate, timely collection of cancer patient data which is used for the evaluation of patient outcomes. Additionally, the Cancer Registry coordinates many of the activities of the Virtua Fox Chase Cancer Program (VFCCP) and our participation in the American College of Surgeon's (ACoS) Commission on Cancer (CoC) accredited program and the National Accreditation Program for Breast Centers (NAPBC). The CoC establishes standards to ensure high quality, multi-disciplinary and comprehensive cancer care delivery in hospitals throughout the United States granting accreditation to only those facilities that have voluntarily committed to provide the best in cancer diagnosis and treatment and are able to comply with rigorous standards.

The Cancer Registry is a primary source of data included in the Virtua Oncology Dash Board which benchmarks Virtua's clinical outcomes against national standards. This year Virtua's Oncology Quality Dashboard included clinical quality measures endorsed by the National Quality Forum (NQF), American College of Surgeons (ACoS) and the National Cancer Comprehensive Network (NCCN); the National Accreditation Program for Breast Centers (NAPBC) and the Oncology Roundtable.





During 2013, the Cancer Registry collected data on 2,749 analytic and 950 non-analytic cases. Breast, prostate, lung, colorectal, and bladder are the most frequently seen sites at Virtua comprising 61% of the analytic cases accessioned into our database. The individual breakdowns are as follows: 26% breast, 13% lung, 11% colorectal, 6% prostate, and 5% bladder.

The Cancer Registry is staffed by one Supervisor and six Certified Cancer Registrars in the Voorhees Health and Wellness covering the entire Virtua hospital system. All of the cancer registrars are certified by the National Cancer Registrars Association (NCRA) and are active members of NCRA as well as the Oncology Registrar Association (ORANJ) of New Jersey. The entire staff has maintained professional competencies by attending multiple training sessions sponsored by NCRA and ORANJ.

Medical oncologists, radiation oncologists, surgeons and pathologists perform rigorous quality assurance activities throughout the year reviewing cases accessioned in the Cancer Registry for accuracy, completeness and timeliness.

The Cancer Registry responds to hundreds of data requests annually, supporting physicians, hospital administration and other components of the Virtua Fox Chase Cancer Program including clinical research, the nurse navigation program and the high risk programs.

*Virtua Fox Chase Cancer Program Performance Measures  
National Quality Forum*

The Virtua Fox Chase Cancer Program's (VFCCP) accreditation with the Commission on Cancer (CoC) American College of Surgeons requires our cancer program to submit data annually. This data is analyzed and then utilized to identify potential gaps in cancer care in an effort to improve quality of care. Annually, the CoC provides programs with Cancer Program Profile Reports on specific measures. Results of our performance measures for 2012 are as follows:

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

VFCCP Results: 90% CoC Benchmark: 90%

At least 12 regional lymph nodes are removed and pathologically examined for resected colon cancer.

VFCCP Results: 91.9% CoC Benchmark: 85%

Tamoxifen or third generation aromatase inhibitor is considered or administered within 1 year or 365 days of diagnosis with AJCC T1c or Stage IB-III hormone receptor positive breast cancer.

VFCCP Results: 98% CoC Benchmark: 90%

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

VFCCP Results: 96.2% CoC Benchmark: 90%

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

VFCCP Results: 95.3% CoC Benchmark: 90%

**Virtua Fox Chase Cancer Program**  
**20013 Analytic Case Distribution - by Site - Sex - AJCC Stage**

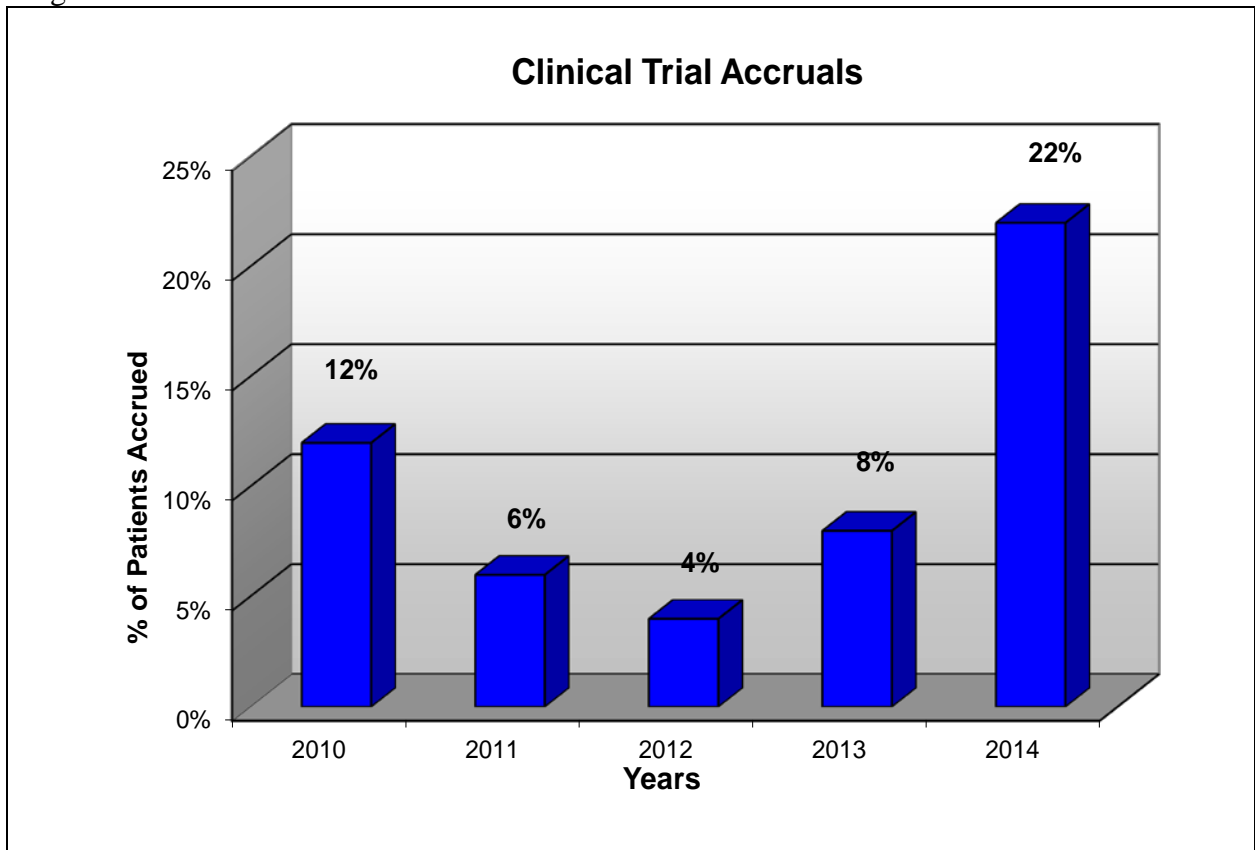
Primary Site	Total Cases	Male	Female	AJCC Stage						
				0	1	2	3	4	N/A	UNK
<b>TOTAL:</b>	<b>2749</b>	<b>1027</b>	<b>1722</b>	<b>271</b>	<b>781</b>	<b>562</b>	<b>317</b>	<b>451</b>	<b>275</b>	<b>92</b>
Oral Cavity & Pharynx	43	31	12	1	4	3	4	28	0	3
<b>Digestive</b>										
Esophagus	21	17	4	0	3	5	7	5	0	1
Stomach	35	20	15	0	7	4	4	15	0	5
Small Intestine	14	5	9	0	2	0	7	2	1	2
Colon (excl Rectum)	202	90	112	3	38	68	44	39	0	10
Rectum & Rectosigmoid	96	46	50	4	18	31	25	12	0	6
Anus, Anal Canal	16	3	13	1	1	6	6	1	0	1
Liver/Intrahepatic Bileduct/Other Biliary	27	18	9	1	5	2	3	10	4	2
Gallbladder	4	1	3	0	0	3	0	1	0	0
Pancreas	76	41	35	0	14	13	3	43	0	3
Retro & Peritoneum/Omentum/Mesent	6	1	5	0	0	0	2	2	0	2
Other Digestive	0	0	0	0	0	0	0	0	0	0
<b>Respiratory</b>										
Nose, Nasal Cavity & Middle Ear	1	0	1	0	0	0	1	0	0	0
Larynx	17	11	6	4	6	5	1	1	0	0
Lung/Bronchus	344	174	170	1	82	28	86	136	2	9
Trachea, Mediastinum,Pleura & Other	0	0	0	0	0	0	0	0	0	0
Bones & Joints	0	0	0	0	0	0	0	0	0	0
Soft Tissue incl Heart	5	4	1	0	1	2	0	2	0	0
<b>Skin</b>										
Melanoma	34	14	20	2	11	10	3	6	0	2
Other Non-epithelial Skin	6	3	3	0	2	3	1	0	0	0
<b>Breast</b>	<b>723</b>	<b>6</b>	<b>717</b>	<b>177</b>	<b>278</b>	<b>191</b>	<b>39</b>	<b>30</b>	<b>2</b>	<b>6</b>
<b>Female Genital</b>										
Cervix	15	0	15	0	5	1	5	0	1	3
Corpus & Uterus, NOS	106	0	106	0	81	4	8	8	0	5
Ovary	37	0	37	0	7	2	12	16	0	0
Vagina	1	0	1	0	1	0	0	0	0	0
Vulva	10	0	10	0	3	2	2	1	1	1
Other Female Genital	2	0	2	0	1	0	0	1	0	0
<b>Male Genital</b>										
Prostate	155	155	0	0	21	106	12	16	0	0
Testis	9	9	0	0	8	0	1	0	0	0
Penis	2	2	0	0	1	1	0	0	0	0
Other Male Genital	1	1	0	0	0	0	0	0	1	0
<b>Urinary</b>										
Bladder	150	109	41	76	32	22	4	13	1	2
Kidney/Renal Pelvis	112	64	48	0	68	12	5	19	1	7
Ureter	6	2	4	1	2	1	2	0	0	0
Other Urinary Organs	3	3	0	0	0	1	0	0	1	1
Eye & Orbit	0	0	0	0	0	0	0	0	0	0
Brain & Central Nervous System	75	22	53	0	0	0	0	0	75	0
<b>Endocrine</b>										
Thyroid	101	23	78	0	59	11	11	6	0	14
Other Endocrine	14	5	9	0	0	0	0	0	14	0
<b>Lymphoma</b>										
Hodgkin	14	6	8	0	1	6	4	2	0	1
Non-Hodgkin	86	45	41	0	19	17	14	35	0	1
Myeloma	27	12	15	0	0	0	0	0	27	0
Leukemia	42	23	19	0	0	0	0	0	42	0
Mesothelioma	9	8	1	0	0	2	1	1	0	5
Kaposi Sarcoma	2	2	0	0	0	0	0	0	2	0
Other/Unknown/Uncertain Malig	100	51	49	0	0	0	0	0	100	0

## *Virtua Fox Chase Cancer Program 2014 Annual Report Clinical Research Report*

The Virtua Fox Chase Cancer Program has a robust clinical research program, participating in national cooperative group trials through Fox Chase Cancer Center. We are one of a select group of community-based hospitals in New Jersey and Pennsylvania whose cancer programs are affiliated with Fox Chase Cancer Center in Philadelphia. Virtua was chosen to be part of this network of community cancer programs by consistently demonstrating outstanding cancer-care standards and supporting an infrastructure to offer clinical trials. This affiliation allows Virtua patients to have access to the latest advances in cancer care, treatment and research.

The Virtua Fox Chase Cancer Program's Clinical Research Program is staffed by Clinical Research Coordinators and a Clinical Research Assistant. The research staff works closely with our physician clinical investigators to ensure new clinical trials with the latest treatment options are available for our patients. A Scientific Review Committee comprised of our principal investigators meets monthly to discuss and recommend new trials to the Institutional Review Board (IRB) for approval.

Currently, there are 45 oncology clinical trials open through the Virtua Fox Chase Cancer Program.



\* 2014 represents data through 12/1/14

- ◆ The Virtua Fox Chase Cancer Program participates in multiple national cooperative groups including: Eastern Cooperative Oncology Group (ECOG), NRG Oncology, SWOG Cooperative Oncology Group.
- ◆ Through the Virtua Medical Group over 500 patients have an opportunity to participate in screening trials.
- ◆ Information is available for patients and staff about Virtua's offered oncology clinical trials on the Virtua web site ([www.virtua.org](http://www.virtua.org)).

*To learn more about clinical trials or find out about open prevention and treatment studies available at the Virtua Fox Chase Cancer Program, call 1-888-Virtua-3 or visit our Virtua website [www.virtua.org](http://www.virtua.org)*



## Oncology Services

*Advancing oncology care through education and coordination of care*

### ***Breast Care Program***



The Breast Care Program is specifically designed to meet the needs of patients through the entire continuum of breast care. The program was established to support our growing Women's Health Program of Excellence, for patients seeking breast care at our institutions, and to provide greater access and enhanced services to patients in our community. We offer a full range of comprehensive clinical services from prevention and screening, through cancer diagnosis, multi-modality therapy, and supportive services. Under the direction of Dr. Diane R. Gillum and Dr Eric J. Miller, Virtua's Breast Care Program strives to provide innovative, integrated; high quality oncology care. Virtua strongly believes in a multidisciplinary team approach to breast cancer care that includes the patients and their family, physicians, nurse navigators, genetic counselors, Licensed Clinical Social Worker's, and support from health care professionals who specialize in all aspects of breast care. Virtua's Breast Care program was re-accredited from the National Accreditation Program for Breast Centers, passing on all 27 standards in September 2012. The Breast Program Leadership steering committee, under the guidance of Dr. Diane R. Gillum, monitors program quality, measures outcomes, sets standards of care system-wide and addresses all aspects of breast care. The multidisciplinary committee meets 6 times a year.

Care through the breast program is provided at 2 campuses, North and South to serve patients from across 5 counties. The program on the South campus at the Voorhees Health and Wellness Center includes a state of the art radiation oncology facility along with all program support services for the oncology program. Our oncology breast plastic reconstructive program is at the North campus with Fox Chase Cancer Center plastic surgeons Dr. Sameer Patel M.D. Breast cancer represents approximately 26% of all cancer cases seen at Virtua. Since 2009, the breast case load at Virtua has increased with an average of 675 cases a year. In November 2011 Virtua enrolled in the Rapid Quality Reporting System (RQRS) through the Commission on Cancer. The intent of RQRS is to promote and facilitate evidence-based cancer care with access to real clinical time performance rates.

The goals of the breast navigation program are to support physicians in achieving optimal clinical outcomes, enhance communication between the various disciplines and referring physicians, and improve patient satisfaction. It allows for more efficient use of physician time spent with patients and ensures timely delivery of services. Access Navigation assists patients in obtaining prompt appointments with a breast surgeon for evaluation.

The breast nurse navigators are oncology nurses with additional training in breast health and breast cancer care. Nurse navigators are available to newly diagnosed patients to assist with education, support and access to resources. The role of the nurse navigators has been expanded to include clinical trials support and recruitment. The success of this is being monitored by the Cancer committee and Breast Program Leadership committee.

Patient education and community outreach are important components of the Breast Care program. Many breast cancer educational programs are provided free to the community.

### ***Other Oncology Nurse Navigation Services***

Virtua's Nurse Navigation program has been recognized as best practice from Fox Chase Cancer Center and the Association of Community Cancer Centers. Nurse navigators also offer support for thoracic, prostate, GI, GYN and head and neck cancer patients. Nurse navigators are available to newly diagnosed patients to assist with education, support and access to resources. To date, all the navigation services have patient satisfaction scores of 97-100%.

### ***Oncology Social Services***

The Virtua Fox Chase Cancer Program provides a full range of clinical oncology social work services to meet the psychosocial needs of cancer patients and their families. We provide psychosocial counseling and emotional support to patients and their families through individual, family, and couples counseling. The clinical oncology social workers also support patients' psychosocial needs by providing appropriate referrals to numerous community resources including outpatient therapists who specialize in ongoing treatment of chronic illnesses and grief and loss. In addition, they refer to local and national support groups for families affected by cancer including the Gilda's Club Cancer Wellness Support Group which meets in the Virtua Voorhees Health and Wellness Center every other Thursday and organizations dedicated to helping meet the varied practical and financial challenges faced by patients. Oncology social workers continue to recommend and facilitate psychiatric referrals, when indicated, and develop, implement, assess, and facilitate oncology support groups for breast and gynecologic cancer. Cancer survivorship needs are addressed through supportive individual counseling, Cancer Survivors support group and appropriate referrals to a wide array of both Virtua and community resources.

### ***Palliative Care and Survivorship Services***

Virtua Oncology offers palliative care services through its LifeCare program. Partnering with Samaritan Healthcare and Hospice, Dr. Stephen Goldfine and his team provide these services that are available to Virtua patients. These clinics are offered at 2 campuses, Memorial and Voorhees and address care of the patient as a whole

Already existing survivorship programs include Look Good Feel Better sponsored by the American Cancer Society, massage therapy, Virtua Physical Therapy and Rehabilitative Services as well as cancer fitness classes. Additional services include: the psychosocial distress screening tool, Polaris Oncology Distress Management System, which assists in identify patient needs. Virtua Centers for HealthFitness and researchers at the University of Pennsylvania have teamed up to bring *Strength after Breast Cancer* to breast cancer survivors. The program educates survivors about lymphedema and helps them to build strength. Registered Dietitians are available to provide oncology nutrition counseling and our Chaplain is available to provide spiritual support and encouragement.

## *Virtua Fox Chase Cancer Program's Cancer Genetics Report*

In 2003, through our partnership with Fox Chase Cancer Center, we developed our Cancer Genetics Program. The program began with a focus on hereditary breast and ovarian cancer syndromes and in 2009 expanded to include gastrointestinal and other adult cancer genetic syndromes. The volume of patients that has been in our program has grown 3000% since it began in 2003.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>New Patient</b>	<b>12</b>	<b>16</b>	<b>58</b>	<b>28</b>	<b>67</b>	<b>175</b>	<b>287</b>	<b>255</b>	<b>255</b>	<b>260</b>	<b>355</b>	<b>435*</b>

\* Patients 1/1/14-12/1/14

### **Breast and ovarian cancer**

Genetic tests are available for hereditary breast cancer. Among them are the most common hereditary breast cancer syndromes involving the BRCA1 and BRCA2 genes. When genetic testing is completed and an alteration is found in one of the identified genes, an individual's risk for developing certain types of cancer is significantly increased. For women, there is an increased risk for developing breast and/or ovarian cancer. For men, there is an increased risk for breast and prostate cancer. In addition, men and women who have already been diagnosed with these cancers are at increased risk for developing a second cancer.

### **Colorectal cancer**

Genetic tests are available for hereditary colon cancer. Common hereditary cancer syndromes include Lynch Syndrome and FAP. Lynch Syndrome (or HNPCC) is an inherited condition that increases your chances for colon, uterine and other cancers. FAP (familial adenomatous polyposis) is an inherited condition that may cause an individual to have hundreds of colon polyps and significantly increases the risk for colon cancer. Testing is also available for other gastrointestinal hereditary cancer syndromes.

In 2011, in conjunction with Virtua's Pathology Department, a quality initiative was implemented to conduct routine screening of all colorectal cancers and uterine cancers for patients who are age 60 and younger diagnosed with cancer by surgical pathology. In 2012, we expanded those criteria to screen all colorectal and uterine cancers regardless of age. In 2013, we began automatic reflexing to MLH1 hypermethylation on all uterine cancers with absent MLH1 by IHC because a data review revealed a great majority of these cancers are sporadic. The aim of tumor screening is to identify patients who are at risk for having Lynch Syndrome to reduce the morbidity and mortality due to Lynch-related cancers in our patients and their family members.

### **The Team Approach**

The Cancer Genetics Program at Virtua is unique in that it consists of a multidisciplinary team of oncology and genetics experts including medical oncologists, an advanced practice nurse in genetics (only one of 4 in New Jersey), 3 board certified genetic counselors, and master's prepared licensed clinical social workers. The team discusses

genetics cases and review current literature during monthly team meetings and the cancer genetics staff participates in weekly cancer case conferences at Virtua.

Clinicians at Virtua Fox Chase Cancer Genetics Program help guide patients through the cancer risk counseling process to identify their risk for cancer. The counselors help patients who are uncertain about their family's medical history or have concerns about other cancers by obtaining medical records and pathology reports from the various healthcare centers at which their family members have been treated. Other benefits of the program include:

- Receive individualized and comprehensive counseling from cancer genetics experts including medical oncologists trained in cancer genetics, advanced practice nurses, board-certified genetic counselors and social workers
- Discover an increased risk for cancer
- Learn about the benefits, risks and limitations of genetic testing
- Undergo genetic testing, if appropriate
- Learn ways to decrease risk for developing cancer and early detection strategies for high risk individuals (screening or medical and surgical approaches)

### **Clinical trials**

Patients, who have a personal or family history certain cancers, may be eligible for research studies.

Participation will:

- Help provide insight into hereditary factors, or genes, that influence cancer risk
- Gain access to the latest news and information on cancer genetics

### **Community Outreach**

Our cancer genetics staff is committed to community education of healthcare providers and the lay community. Our clinicians travel throughout our surrounding communities fulfilling many speaking engagements and one on one interaction. Lectures are given free of charge as a community service. Requests for lectures are made through Virtua's speaker's bureau and through community contacts that the Virtua Fox Chase Cancer Program has made with organizations within Burlington, Camden and Gloucester counties.

For our clinicians, we hosted two CME events with Dr. Elias Obeid and Dr. Michael Hall from Fox Chase Cancer Center in Philadelphia with a focus on national, evidence-based referral guidelines for breast, gynecologic and colon cancer genetics and the latest information on Next Generation Sequencing of cancer genes.

The Cancer Genetics Program has been interviewed and featured in many Virtua publications and local newspapers, magazines and television programs discussing the identification and management of high risk individuals. The Cancer Genetics Program is an established clinical site for the graduate students enrolled in the Genetic Counseling program at Arcadia University. Our program hosted one student in 2014.

***Virtua Fox Chase Cancer Program  
Education and Community Outreach Report***

The Virtua Fox Chase Cancer Program (VFCCP) works closely with cancer advocacy organizations and community partners to improve and enhance cancer education, prevention and supportive services throughout the region. The cancer program continually reviews cancer incidence and prevalence within the region and develops resources and services to augment existing programs while identifying the future direction for cancer education and prevention efforts. Resources and services are designed across the continuum of care, from prevention to risk reduction and support. This report will detail all of the community and education activities of the VFCCP held throughout this year.

***Oncology Lectures given in the community***

Many of our oncology physicians, nurses, therapists, educators and executives are active members of the Virtua Speakers Bureau. These experts travel throughout our surrounding counties speaking on cancer related topics for lay and professional audiences. Lectures are given free of charge as a community service. Requests for lectures are made through Virtua’s speaker’s bureau and through community contacts that the Virtua Fox Chase Cancer Program has made.

Our oncology clinicians have been interviewed and featured in many Virtua publications and local newspapers, magazines and television programs discussing many aspects of oncology care from prevention to survivorship.

	<b>Total Lectures Jan-Dec</b>	<b>Total Attendance</b>
<b>TOTAL LECTURES</b>	<b>10</b>	<b>664</b>

***Outreach Health and Wellness Events***

Health fairs give the VFCCP the opportunity to reach out to people and the community about their health and well-being. By bringing health professionals and lay people together, a health fair educates people about health, behavior modification, prevention and available resources through the VFCCP. Our participation in health fairs can include exhibits, mini-workshops, demonstrations and screenings.

<b>Display and Health Fairs</b>	<b>Encounters</b>
<b>24</b>	<b>2,563</b>

*\*Encounters are the total number of people that the employee comes in contact with at a health fair/event*

### ***Grant Funded Programs***

***The New Jersey Cancer Education and Early Detection Program*** (NJCEED) is sponsored by the New Jersey Department of Health and Senior Services. NJCEED provides grants to facilitate comprehensive screening services for breast, cervical, prostate and colorectal cancer for uninsured or underserved populations. The NJCEED grant provides monies for outreach, education and cancer screening services with case management for breast, cervical, prostate and colorectal cancer. Services are provided by Virtua affiliated physicians to residents of Camden and Burlington Counties. This year's NJCEED grant totaled \$ 460,500 and was awarded to Virtua as a regional grant for both Camden and Burlington County.

<b>Camden County CEED screenings</b>	<b>Totals Screened</b>
Breast & Cervical Ca.	245
Prostate Cancer	8
Colon Cancer	65

<b>Burlington County CEED screenings</b>	<b>Totals Screened</b>
Breast & Cervical Ca.	380
Prostate Cancer	10
Colon Cancer	72

***Susan G Komen for the Cure Central & South Jersey Affiliate*** funded the Breast Care Program \$ 46,000 to provide bilingual outreach to increase screening compliance among NJCEED patients. And provide breast education in Gloucester County.

### ***Support Groups and Counseling***

Virtua Fox Chase Cancer Program offers support groups that provide patients and their loved ones an opportunity to learn ways of coping with their cancer diagnosis and treatment. These specifically designed groups can provide emotional support and decrease the sense of isolation commonly associated with treatment. They provide a forum where patients can get practical advice as well as share thoughts, feelings and concerns. The support groups are facilitated and managed by oncology professionals from the Virtua Fox Chase Cancer Program.

In addition to support groups, patients have access to oncology social workers that provide support both in the hospital and on an outpatient basis including individual and group support, and counseling for children whose parents have cancer. An oncology social worker is a professional who has specialized training in how a diagnosis of cancer affects a person and his or her family and friends. An oncology social worker understands that there are many aspects of a person's life outside of cancer, and that cancer affects

each person in a different way. The oncology social worker's expertise provide a comprehensive view to the person living with cancer that is respectful of each individual's ethnicity, spirituality, family situation, unique strengths and challenges. It is his or her job to represent a person's interests and needs to the medical team.

Support Groups	Virtua Location	# Of mtgs.	Avg. pts. /
BRCA Support/Women Supporting Women	Mt. Holly	11	7
GYN Cancer Support Group	Voorhees	11	5
Cancer Survivors Support Group	Voorhees	17	4

### ***Workshops***

***Look Good Feel Better*** is a program that teaches female cancer patients beauty techniques to help restore their appearance and self-image during chemotherapy and radiation treatments. A licensed cosmetologist teaches participants about makeup, skincare, nail care and options related to hair loss such as wigs, turbans and scarves. Each group receives a free kit of cosmetics to use during and after the workshop. The Virtua Fox Chase Cancer Program sponsors this workshop with the American Cancer Society as a community service and offers it on-site at Virtua Memorial and Virtua Voorhees.

### ***Advocacy and Community Events***

Virtua Fox Chase Cancer Program's employees actively participate in community awareness and cancer advocacy fund raising events independent of their employee responsibilities. This year, teams of employees, physician and patients walked, raced, rowed and raised funds to support cancer research and cancer care in our community.

### ***FCVHP Teams participation in events held in our community include:***

- Susan G. Komen Breast Cancer Foundation's *Race for the Cure* in PA and NJ
- Leukemia and Lymphoma Society's *Light the Night Walk*
- American Cancer Society's *Making Strides Against Breast Cancer* walk
- American Cancer Society's "*Relay for Life*" event
- *William G. Rohrer Center for Health Fitness 5K Race* to benefit Fox Chase Virtua Health Cancer Program

### ***Additional programs and activities of distinction for oncology patients:***

- **Moving On** is a fitness and exercise program that offers a supervised exercise program for cancer survivors. This program is based in Virtua's William G. Rohrer Center for Health Fitness.
- **Strength after Breast Cancer** is an evidence-based rehabilitation adapted from Physical Activity & Lymphedema Trial conducted by University of Pennsylvania. Virtua in Motion Physical Therapy and Rehabilitation, Virtua's Center for Health-Fitness and researchers at the University of Pennsylvania have teamed up to bring exercise to breast cancer survivors.

- **Outpatient nutrition services** are offered to meet the needs of patients who are undergoing cancer treatment. Patients undergoing chemotherapy or radiation will be counseled by a registered dietician through meal plans that incorporate their individual food preferences.
- **Complementary health services** are available for our patients. They include massage therapy, guided imagery and mind/body healing.
- **Collaborative Efforts:** Virtua collaborates with many organizations in our community while trying to meet the needs of all community members. We actively participate in cancer-related coalitions on many levels to help meet some of these needs. Examples include: American Cancer Society, the Susan G Komen Breast Cancer Foundation Central & South Jersey Affiliate, Burlington County Department of Health, Camden County Department of Health, South Jersey Cancer Coalition, South Jersey Breast Cancer Coalition, ACS Nutrition Task Team, Camden County CEED Coalition, NJ State CEED Coalition, New Jersey Cancer Control Task Force, and the Camden and Burlington County CAT Coalition.

Virtua Fox Chase Cancer Program will continue to improve upon its effectiveness to bring to the community the best cancer prevention, education, screening services and supportive programming available.

**To receive complimentary Virtua Fox Chase Cancer Program publications for your office, please call 1-888-Virtua-3. Topics include smoking cessation, clinical trials, Breast Cancer Handbook, Prostate Cancer Handbook, Cancer Survivor's Guidebook, and health alerts on a variety of cancers and cancer-related topics.**



## *Virtua Fox Chase Cancer Program Radiation Oncology Services Report*

The Virtua Fox Chase Cancer Program offers the following treatment options and advanced technologies to treat cancer patients:

- MOSAIQ oncology information system that streamlines the entire radiation oncology workflow from the first diagnosis and staging, through treatment planning, treatment, long term follow up and cancer registry. The image enabled EMR allows the radiation oncology staff across the Virtua system communicate information about their patients.
- Precision computerized treatment planning system to accurately target the tumor so it receives higher levels of radiation with minimal exposure to normal tissue
- Conformal radiation therapy to use 3-D treatment planning with CT scanning to target the exact location of tumors.
- 4 D CT Simulator allows for assessment of tumor motion to precisely plan treatments.
- External beam radiation using state of the art linear accelerators, to include the Varian TrueBeam, equipped with the latest imaging technology; enabling staff and physicians to localize treatment volumes and deliver treatments with precision.
- Intensity Modulated Radiation Therapy (IMRT) which uses computer generated images of the tumor to aim thin beams of radiation from many different angles, to the tumor and sparing the surrounding tissue
- RapidArc: which allows for the ability to deliver IMRT treatments in two minutes or less.
- Image Guided Radiation therapy (IGRT) to precisely target the tumor prior to treatment delivery.
- Calypso tumor tracking system precisely tracks tumors during treatment.
- Stereotactic Radiosurgery to precisely treat small tumors in the brain, lung and other parts of the body.
- High dose rate (HDR) brachytherapy delivers a high dose of radiation from within the tumor bed (area where the cancerous tumor has been removed) and may be completed in fewer treatments then with external radiation.
- MammoSite and SAVI radiation therapy system(s) to use for early stage breast cancer, delivering high dose partial breast radiation from within the tumor bed
- Brachytherapy which uses radioactive material placed directly into or near the cancer and delivers low doses of radiation over several months.

**Lemuel Ariaratnam, MD** directs the radiation oncology facilities located in Mount Holly and Voorhees. In 2014 the Voorhees Facility delivered approximately 2515 radiation treatments per quarter, and Memorial 2079. Average patient satisfaction surveys have revealed “overall satisfaction” for both facilities at 95%.

**Charu Sharma, MD, MS**, is an assistant professor in the department of radiation oncology at Fox Chase Cancer Center and sees patients at the Virtua Health and Wellness Center in Washington Township, NJ. She specializes in treating a range of cancers including breast, lung, prostate and gastro intestinal cancers. In 2014 the Washington Twp Facility delivered approximately 524 radiation treatments per quarter. Average patient satisfaction surveys have revealed “overall satisfaction” of 96%.

Virtua is accredited by the American College Of Radiology and is also credentialed by the Radiological Physics Center at MD Anderson to participate in Radiation Therapy Oncology Group treatment clinical studies.

*Virtua Fox Chase Cancer Program  
Lung Cancer Site Study  
Presented by: Catherine S. Kim, MD, Roman Krol, MD, Jay M. Steinberg,  
DO,  
Noah L. Lindenberg, MD and Susan VanLoon, RN, CTR*

***Overview***

This report will provide a review of non-small cell lung cancer with a focus on advanced diagnostics and treatment options. The epidemiology of lung cancer; discussion of risk factors; description of the disease process and a description of staging will be provided. In addition this report will include a presentation of lung cancer data from the Virtua Fox Chase Cancer Registry. An overview of the services available for screening and managing patients with lung cancer at Virtua Fox Chase Cancer Program will also be discussed.

***Epidemiology***

Lung cancer is the second most common cancer in both men (after prostate cancer) and women (after breast cancer). Lung cancer is the leading cause of cancer death among men and women exceeding the number of deaths from cancer from prostate, breast, and colon combined.

According to the American Cancer Society approximately 224,210 new cases of lung cancer will be diagnosed (116,000 men and 108,210 women) in the United States and there will be an estimated 159,260 deaths from lung cancer (86,930 men and 72,330 women). Lung cancer is more common in men than in women; and occurs predominately in persons aged 50-70 years. The probability of developing lung cancer remains very low until age 39 years in both sexes. It then slowly starts to rise and peaks among those older than 70 years. The risk of developing lung cancer remains higher in men than women in all age groups after age 40 years.

African Americans have higher lung cancer incidence rates than any other ethnic or racial group, including Caucasians (64.4 per 100,000). In 2006, African Americans had an age adjusted lung cancer incidence rate of 74.7 per 100,000. The incidence rate for African Americans males was 104.3 per 100,000, compared with an incidence rate of 54.7 per 100,000 for African American females. (SEER)

The age-adjusted death rate was 51.6 per 100,000 men and women per year. These rates are based on patients who died in 2004-2008 in the US. From 2004-2008, the median age at death for cancer of the lung and bronchus was 72 years of age. Approximately 0.0% died under age 20; 0.1% between 20 and 34; 1.3% between 35 and 44; 7.9% between 45 and 54; 19.6% between 55 and 64; 30.5% between 65 and 74; 30.6% between 75 and 84; and 10.0% 85+ years of age. (SEER)

Statistics on survival in people with lung cancer vary depending on the stage of the cancer when it is diagnosed. According to the National Cancer Institute SEER data base five year observed survival for Stage IA is 49%; IB is 45%; IIA is 30%; IIB is 31%; IIIA is 14%; IIIB is 5%; IV 1%.

Lung cancer can be broadly classified into two main types: non-small cell lung cancer and small cell lung cancer. Non-small cell lung cancer (NSCLC) accounts for 85% of lung cancers, while small cell lung cancer (SCLC) accounts for 15%. This report will only focus on the NSCLC carcinoma type.

### ***Non-Small Cell Carcinoma***

There are three types of non-small cell carcinoma:

- Squamous is the most common and forms in the lining of the bronchial tubes.
- Adenocarcinoma forms in the mucous lining in the outer region of the lung and is most common in women and in nonsmokers.
- Large-cell undifferentiated carcinoma may appear in any part of the lung. It tends to grow and spread quickly, which can make it harder to treat.

### ***Risk Factors***

Cigarette smoking is the leading cause of lung cancer and accounts for 80% of lung cancer cases in the United States. The role of cigarette smoking in causing lung cancer is one of the most thoroughly documented causal relationships in biomedical research. The risk for lung cancer among cigarette smokers increases with the duration of smoking and the number of cigarettes smoked per day. (Peto, R Lopez, AD, Boreham, J. et al)

Passive smoking was first considered a possible risk factor in 1981. Several studies done during the early 1980's concluded that non-smoking spouses who were married to cigarette smokers were approximately 30% more likely to develop lung cancer. Estimates indicate that passive smoking accounts for approximately 3,000 lung cancer deaths per year in the United States. (Fontham ET, Correa P, Reynolds P. et al.)

Research on diet and lung cancer has been conducted for three decades. The focus of much of this research has been on fruits, vegetables, micronutrients and antioxidants and their possible role in the preventing lung cancer. It has been difficult for researchers to isolate dietary factors especially since cigarette smoking has been associated with less healthy lifestyles and also because cigarette smoking impacts on concentrations of antioxidants in the blood stream. (Alberg, A)

Lung cancer has been associated with many occupational exposures such as coal, tar and soot; and a number of metals including arsenic, chromium and nickel, cadmium, beryllium, silica and diesel fumes. Asbestos exposure has been noted to increase the risk of lung cancer. Asbestos in combination with cigarette smoking has been studied and found to further increase lung cancer risk. (Churg, A, Stevens, B.)

Exposure to high doses of radiation has been shown to increase the risk of lung cancer. The risks of low-level radiation that are relevant to the general population are difficult to evaluate and assess.

Radon is an inert gas produced naturally. Radon is of interest because it is a ubiquitous indoor air pollutant that enters buildings in soil gas. Exposure to radon in indoor air is assumed to cause lung cancer but the magnitude of the risk is uncertain. Risk models have been developed utilizing data and findings from exposures of uranium miners. Estimates by the Environmental Protection Agency and Biological Effects of Ionizing Radiation IV and VI Committees led to estimates of 15,000-20,000 deaths annually per year in the United States caused by radon. Over the years there have been several studies attempting to assess the risk of air pollution exposure indoors as well as outdoors. Estimates are 1-2 % of lung cancers may be related to air pollution

Research findings are now providing tools and a better framework for understanding cell biology and genetic susceptibility to lung cancer. There are studies that have been done that suggest an increased risk among first-degree relatives of patients with lung cancer with multiple affected members. Research in this area is actively being done.

Increased susceptibility to lung cancer may result from underlying lung disease but this topic is extremely complicated and clarifying the possible relationship between an underlying disease and or exposure remains controversial. A history of Chronic Obstructive Pulmonary Disease (COPD) has been associated with lung cancer and this association may be due to smoking. (Sarnet JM, Humble CG, Pathak, DR)

Over the last 30 years, epidemiological studies have shown that COPD is the single most important risk factor for lung cancer after smoking exposure. Recent genetic studies using genome-wide approaches suggest that the genetic risk factors predisposing smokers to COPD and lung cancer may overlap. (Young RP, Hopkins RJ)

### ***Signs and Symptoms of Lung Cancer***

In early stage lung cancer there may be no symptoms. Symptoms of lung cancer may include chronic cough, fatigue, chest pain, blood in sputum, weight loss and shortness of breath, wheezing and hoarseness.

In more advanced stages of lung cancer additional symptoms may present such as bone and joint pain, fever, memory loss and generalized weakness and facial swelling.

### ***Screening***

In November 2010, The National Cancer Institute concluded its eight year National Lung Screening Trial (NLST) and released the initial results which proved that screening people at high risk for lung cancer with CT scans can save lives. This randomized national trial involving more than 53,000 current and former heavy smokers ages 55 to 74, compared the effects of screening procedures using low-dose helical computed

tomography (LDCT) and standard chest X-ray on lung cancer mortality and found 20 percent fewer lung cancer deaths among participants screened with low-dose helical CT. The National Comprehensive Cancer Network issued guidelines in 2011 that endorse screening eligibility based on the NLST criteria, but also endorse screening in adults at lower risk based on age and smoking history and the presence of one additional risk factor such as documented high radon exposure, certain occupational exposures, family history of lung cancer, chronic obstructive pulmonary disease or pulmonary fibrosis. (National Lung Screening Trial Research Team)

### ***Diagnostics for Lung Cancer***

Although the treatment of choice for the patients with stage I lung cancer is surgery, many patients have co-morbidities and are medically inoperable. Being the central technique in diagnosing lung cancer, bronchoscopy also has the potential to apply endoscopic therapy to small lung lesions in a minimally invasive way in patients that are high-risk for surgery. Unfortunately, bronchoscopy cannot always reach lesions in the peripheral lung, in particular the smaller lesions. Therefore, new guidance techniques like virtual bronchoscopy and electromagnetic navigation are now available here at Virtua and instead of using the systems as a diagnostic tool; these techniques may provide an option for therapeutic interventions to patients with inoperable lung. With endoscopic fiducial marker placement for robotic radiosurgery and endoluminal high-dose brachytherapy, local radiotherapy of peripheral lung tumors becomes feasible, reducing radiotherapy-induced toxicity.

After the diagnosis of lung cancer has been confirmed, usually a patient undergoes what is called staging, a procedure aimed at making sure that disease has not spread to other parts of the lungs, lymph nodes or distant parts of the body.

Just a few years ago a combination of radiologic assessment and surgery with lymph node biopsy would often be necessary prior to curative cancer removal.

Fortunately, along with minimally invasive electromagnetic bronchoscopy our team can now offer staging and diagnosis at the same time. One procedure of combined ENB bronchoscopy and what is called endobronchial ultrasound (EBUS) allows us to achieve previously unthinkable results. Patients come early in the morning and are discharged home in the afternoon without any significant time loss for recovery.

### ***Staging Lung Cancer***

The stage of disease is based on a combination of clinical factors and pathological factors. The determination of stage is important in determining appropriate care for patients. The patient's history, physical examination, laboratory evaluations, chest x-ray; chest CT scans and PET scans, bronchoscopy, mediastinoscopy, thoracentesis and thorascopy as well as thoracotomy may all be used to help determine clinical stage. Pathologic staging provides precise data used in assessing the patient's prognosis and

extent of disease. Pathological staging of NSCLC requires microscopic examination of the tumor, resected margins, and careful assessment of lymph nodes.

The TNM staging system is used to stage NSCLC. In 2010 the American Joint Committee on Cancer revised the staging system redefining the T and M classifications for staging lung cancer. The T category is defined by the size and extent of the primary tumor. The N category refers to the regional lymph node assessment and the M category refers to distant metastasis. Stage and prognostic groups are assigned based on tumor size, regional nodal involvement and distant metastasis. Specific definitions related to stage assignment, tumor size etc. can be referenced in the AJCC Cancer Staging Manual, seventh edition.

**Anatomic Stage/Prognostic Groups:**

Occult Carcinoma	TX	N0	M0
Stage 0	Tis	N0	M0
Stage IA	T1a	N0	M0
	T1b	N0	M0
Stage 1B	T2a	N0	M0
Stage IIA	T2b	N0	M0
	T1a	N1	M0
	T1b	N1	M0
	T2a	N1	M0
Stage IIB	T2b	N1	M0
	T3	N0	M0
Stage IIIA	T1a	N2	M0
	T1b	N2	M0
	T2a	N2	M0
	T2b	N2	M0
	T3	N1	M0
	T3	N2	M0
	T4	N0	M0
	T4	N1	M0
Stage IIIB	T1a	N3	M0
	T1b	N3	M0
	T2a	N3	M0
	T2b	N3	M0
	T3	N3	M0
	T4	N2	M0
	T4	N3	M0
Stage IV	Any T	Any N	M1a
	Any T	Any N	M1b

***Surgical Treatment for Lung Cancer***

Lung cancer patients present as a very heterogeneous group and the practice of tailoring all management decisions, including suitability for surgery, on the basis of a multidisciplinary team is recommended. The thoracic surgeon is a key member of the

multidisciplinary team. Surgical treatment for early stage non-small cell lung cancer (NSCLC) (i.e. Stage I, II) is the treatment of choice and gives the highest chance of cure. Furthermore, studies suggest that adjuvant (postoperative) treatment may be of benefit in selected patients with Stage IB and II disease. Surgical treatment may also be indicated for some patients with Stage IIIA disease who demonstrate a favorable response to neoadjuvant (preoperative) therapy with chemotherapy/radiotherapy and those with early (single lymph node station) disease as determined by PET Scan, Endobronchial Ultrasound (EBUS), and mediastinoscopy. Most studies suggest a survival benefit with this multi-modality approach. Surgical treatment is usually not indicated for advanced local regional disease (Stage IIIB) or distant metastasis (Stage IV) except in rare instances where only a solitary site of metastasis is discovered and complete resection of the primary tumor and definitive treatment of the solitary metastasis may be curative. Surgery may be considered for a select group of patients with small-cell lung cancer (SCLC), in particular those with limited disease (Stage I, solitary peripheral nodule).

Surgery confers a five year survival of between 60-70% for Stage I lung cancer. Stage II disease has a five year survival of 40-50% and Stage IIIA disease has a 25-35% five year survival depending upon whether mediastinal lymph node disease is discovered preoperatively or during surgery.

A number of different surgical interventions (i.e. wedge resection, lobectomy, and pneumonectomy) exist and may be utilized to tailor the operation to each individual patient's performance status and pulmonary function tests. Limiting the scope of the operation lowers mortality at 30 days; wedge resection has the lowest mortality rate, followed by lobectomy, pneumonectomy and extended resection in that order. Lobectomy is still the preferred option to wedge resection on the basis of a reduced recurrence rate, except in patients who are unfit for surgery. Sleeve lobectomy may be a preferable option to pneumonectomy in suitable cases where a parenchymal sparing operation may be necessary.

Complete mediastinal lymph node dissection (MLND) may be associated with improved survival in patients with Stage II and IIIA disease as compared to a lymph node sampling strategy. Analysis of a randomized, prospective trial by the Eastern Cooperative Oncology Group (ECOG) demonstrated a median survival of 58 months for those patients undergoing MLND compared to 29 months for those patients who underwent a sampling strategy only. However, hesitancy for performing MLND still exists due to potential for increased morbidity. Currently, the American College of Surgeons Commission on Cancer recommends at least 3 lymph node stations be explored during surgical resection.

Video-assisted thoracic surgery (VATS) or minimally invasive pulmonary resection for lung cancer has been determined to be safe and effective for resection of Stage I and II lung cancer with similar three and five year survival as compared to open surgery. Patients may experience reduced pain and require shorter hospital stay than those undergoing conventional surgery. Additionally, in VATS procedures complication



rates and mortality are similar to the rates for open surgery. Some evidence also suggests that VATS is more appropriate for patients with lower performance status.

### ***Chemotherapy Treatment:***

Chemotherapy plays an important role in the treatment of lung cancer. It has been proven to improve survival rates in resected disease. It can also be used in conjunction with radiation as a definitive curative treatment for patients who are not candidates for surgery due to the location of the disease, or the physiologic health of the patient. It can also be given in the neoadjuvant setting to potentially downstage the disease in hopes of converting a patient into a surgical candidate.

### ***Adjuvant Treatment***

Chemotherapy has been shown to increase survival in patients with resected stage II and stage III disease. It has even been shown to benefit highly selected patients with Stage IB disease with more sinister pathologic features. While early studies were conflicting, more recent data based on Platinum therapy from the LACE meta-analysis, as well as several multi-centers well powered studies like ANITA and CALB 9633, clearly demonstrate this survival benefit in appropriate patients.

### ***Neoadjuvant Treatment***

Neoadjuvant therapy for lung cancer is emerging as a viable option for carefully selected patients. Historically it has been controversial with inconsistent results from the literature. A careful review of a large meta-analysis suggests some patients with limited nodal involvement may benefit from this approach. Giving systemic therapy has the potential benefit of down staging disease and converting patients into surgical candidates, an approach associated with the highest cure rate. It also offers the ability to determine chemo-sensitivity, which may have prognostic implications.

### ***Molecular Targets***

It is rapidly becoming apparent that lung cancer is not merely one disease, but a heterogeneous group of diseases with distinct molecular pathways and resultant targets. We are rapidly discovering actionable molecular targets important to the treatment of lung cancer. Several of these molecular targets can now be targeted with specific agents that are much better tolerated than conventional cytotoxic chemotherapy as they preferentially target malignant cells and are relatively innocuous to normal cells. In many cases, patients with advanced metastatic disease can often enjoy not only a high quality of life with less toxicity, but also long term survival measured in years.

Currently defined NSCLC subsets for which specific targeted therapies have been standard therapy include those with mutations in the epidermal growth factor receptor (EGFR) and those with the EML4-ALK fusion oncogene. Other driver mutations, such as ROS1 and BRAF, have also been identified and specific treatments are being developed. Several other potentially actionable targets being studied include BRAF, HER2, MET, RET, MEK1, DDR2 and FGFR1.

Understanding this molecular profile of patients with lung cancer allows for personalized, genotype directed therapy that produces some of the best survival rates we have seen to date in metastatic disease.

### ***Radiation Therapy Treatment of Lung Cancer***

Radiation therapy can be used in all stages of lung cancer. Radiation therapy can be given with curative intent for early stage lung cancer or with chemotherapy for definitive or neoadjuvant therapy for locally advanced lung cancer. In some patients, radiation therapy has been given after surgery. Radiation therapy also plays an important role in palliation for patients with metastatic disease.

#### ***Adjuvant Therapy***

The role of radiation therapy in the postoperative setting has been controversial. Past studies looking at postoperative radiation therapy produced mixed results. Reduction in the risk of recurrence was seen but without improvement in survival. Recent study analysis revealed an overall survival benefit in patients with N2 (mediastinal) disease who received postoperative radiation therapy compared to those who did not receive radiation therapy (Douillard et al). At present, postoperative radiation therapy is generally recommended in patients who are at high risk for recurrence such as N2 disease, extracapsular extension, or close or positive margins. Postoperative radiation doses range from 50-54 Gy. In cases where there are positive margin(s) or extracapsular extension, a boost to higher dose is required to this high risk region. Radiation target includes the bronchial stump and high risk draining lymph node stations.

#### ***Neoadjuvant Therapy***

Preoperative therapy with chemoradiation can be given in patients with surgically resectable Stage III NSCLC. Patients who underwent lobectomy seem to have a favorable outcome compared to those who were treated with definitive chemoradiation therapy. One randomized study showed improvement in progression-free survival in patients with N2 disease (Stage IIIA) who received neoadjuvant therapy. Survival was also greater in the group who achieved pathologic complete response in the nodes (pN0) compared to those who did not (Albain et al). Standard preoperative radiation doses range from 45-50.4 Gy. Definitive radiation doses can be given preoperatively but require expert thoracic surgical techniques to reduce risk of surgical complications.

#### ***Definitive Therapy***

Some patients with stage I NSCLC are not surgical candidates due to high operative risk from poor cardiopulmonary function, comorbid conditions, or advanced age. Others refuse to have surgery despite recommendations. In these patients, stereotactic body radiation therapy (SBRT) or stereotactic ablative body radiation (SABR) can be given as a safe and effective alternative option to surgery. At Virtua, we have offered and delivered stereotactic treatments for Stage I medically inoperable patients with excellent results.

SBRT (also known as SABR) involves giving high dose of radiation therapy with precision to lung tumors. This is typically delivered in 3-5 sessions over 1-2 weeks. Several institutional and large randomized studies have shown that local tumor control is 85-95%. Radiation Therapy Oncology Group (RTOG) has looked at various fractionation schedules in medically inoperable patients with peripheral lung tumors less than 5 cm as well as for central tumors (defined as within 2 cm of the proximal bronchial tree) (Timmerman et al.). Typical regimen we deliver is 48 Gy in 4 fractions (12 Gy per fraction) over 1-1/2 weeks for peripheral tumors and smaller dose per fraction for 5-10 fractions for central tumors. For detailed information on SBRT technique, please refer to section on Modern Radiation Therapy Techniques below.

The role of SBRT in operable patients is unknown. Currently, there is a RTOG study looking at this specific question.

For Stage II inoperable patients, definitive radiation therapy has been offered although with results not comparable to surgery. This may be due to the fact that this population has poorer performance status and comorbid conditions. Generally, these patients, if fitness allows, have been treated definitively with radiation therapy and chemotherapy.

#### *Locally Advanced Cancer*

In the past, radiation therapy alone was considered the standard of care for treatment of unresectable patients with locally advanced lung cancer (Stage IIIA/IIIB). However, long term survival as well as local and distant control was poor. Various efforts looked at fractionation schedules and dose escalation to improve outcomes. The role of dose escalation was studied in RTOG 9311 (dose escalation trial) and RTOG 0617 (60 Gy vs. 74 Gy comparison trial) (Timmerman et al., Kong et al, Bradley et al). Interim analysis of RTOG 0617 showed no benefit to the high dose arm with reported worse survival and toxicity (Bradley et al). Studies also looked at integrating chemotherapy with radiation therapy (Curran et al, Furuse et al.). In the end, survival benefit was seen in patients treated with concurrent chemotherapy with radiation therapy.

Currently, concurrent chemoradiation therapy is recommended for unresectable patients with Stage IIIA/IIIB lung cancer with good performance status. Sequential approach can be considered for patients who may not tolerate concurrent treatment. Typical radiation dose for definitive treatment is once daily regimen to total dose of 60-70 Gy. Radiation target includes primary lung tumor and involved lymph nodes in the chest.

#### *Palliation*

Often, lung cancer metastasizes to organs (lung, brain, and bone) that can cause distressing symptoms for patients. Patients can present with airway obstruction or SVC syndrome from primary tumor or nodal metastases. Patients can also present with pain from bony involvement as well as weakness or paralysis from spinal cord or nerve root compression by tumor. Others can present with neurologic symptoms such as headaches, nausea, vomiting, or weakness from brain metastases. Radiation therapy can palliate these symptoms.

For patients with brain metastases, radiation options include whole brain radiation therapy (WBRT), stereotactic radiosurgery (SRS), or both. Various RTOG studies have looked at radiation schedules for whole brain radiotherapy. RTOG 9508 study demonstrated a benefit with regards to survival in patients with solitary metastasis who were treated with WBRT followed by SRS (Andrews et al.). WBRT doses range from 30-37.5 Gy. Typical SRS doses are 15-24 Gy given in one fraction depending on tumor size.

For patients with symptomatic bony metastases, typical palliative regimen of 30 Gy in 10 fractions is given. Single fraction of 8 Gy was found to be just as effective when compared to the 30 Gy regimen, although some of these patients may require retreatment in the future (Hartsell et al.).

Other palliative regimen includes 35 Gy in 14 fractions for patients with metastatic disease with bronchial obstruction or SVC syndrome.

### *Modern Radiation Techniques*

Goals of radiation therapy are to maximize tumor control and minimize treatment-related toxicities. CT-based treatment planning is utilized for 3D conformal radiation therapy. During simulation, patient undergoes a CT for planning purposes. CT gives 3D view of the internal body to help identify and localize tumor and normal critical structures. Volumes are contoured on the obtained CT images for treatment planning. In cases where tumor delineation is difficult on CT alone, fusion with PET-CT or MRI is required to accurately identify and delineate tumor and its extension. PET-CT or MRI is registered with planning CT images and contours of tumor and avoidance structures are drawn to facilitate treatment planning. In cases where there is significant lung tumor movement with respiration or SBRT is recommended, a 4D-CT scan is used during simulation. 4D-CT obtains images at various phases of the respiratory cycle and therefore tracks tumor movement during breathing.

SBRT (also known as SABR) is a treatment that delivers high doses of ionizing radiation to the target with high degree of accuracy and reproducibility. This technique maximizes tumor cell kill of the target while minimizes radiation-related injury to normal critical structures. SBRT treats extra-cranial sites such as the lung, liver, and bone. The term “stereotactic” refers to the procedure of localizing the target lesion relative to a three dimensional reference system in order to allow precise and accurate delivery. Patient immobilization system along with image guidance is required for accurate patient positioning and tumor localization prior to delivery of each treatment. Patients are immobilized either on a wing board with Vac-lok cast or Vac-lok cast alone depending on site. 4D-CT scan is used for lung tumors to account for respiration motion. Cone-beam CT (CBCT) is obtained for localization purposes prior to delivery of each fraction.

SRS is a treatment that delivers high dose of radiation in a single fraction to targets in the head or spine. The target is defined by high-resolution imaging. MRI fusion is required for accurate target delineation. Computer-assisted three-dimensional treatment planning is required to deliver accurate and precise treatment. Image guidance with CBCT is used

for tumor localization prior to treatment delivery. Patient immobilization and positioning can be frame-based (rigid frame attached to patient) or frameless (mask). Various radiosurgery technologies are available. At Virtua, we use Linear accelerator based system to deliver stereotactic treatment.

IMRT is a technology that delivers highly conformal external beam radiation therapy to defined target(s) with varying beam intensities. It is helpful when targets are irregularly shaped and treatment geometry is challenging, near normal critical tissues, and/or requires high doses of radiation therapy. Volumetric modulated arc therapy (VMAT) uses state of the art technology to deliver arcs with varying intensities to spare normal tissues while reducing overall treatment time. VMAT has been found to be favorable when compared to IMRT for multiple clinical sites. IMRT or VMAT produces highly conformal dose coverage to the target with steep dose gradients to preserve normal surrounding tissues. Patient immobilization is critical as well as image guidance prior to treatment delivery. During simulation for lung cancer, patients are immobilized on a wingboard with arms above the head. Image guidance systems include stereoscopic kilovoltage or megavoltage X-ray, conebeam or megavoltage CT, or ultrasound. These are known as Image Guided Radiation Therapy (IGRT). IGRT employs 2D or 3D imaging that is acquired in the treatment room to confirm optimal patient position for each treatment. They account for daily patient and/or tumor motion in order to deliver accurate and precise treatment. IGRT improves tumor targeting for treatment and is recommended when using SBRT or IMRT where there is steep dose gradients around tumor, and critical normal organs are near high dose regions.

These state of the art technologies are all utilized at Virtua including SBRT, SRS, IMRT, VMAT, IGRT, and 4D-CT.

### ***Virtua Fox Chase Services:***

#### *Lung Screening:*

Virtua offers low-dose helical computed tomography (LDCT) screening to those patients that meet the National Comprehensive Cancer Network criteria. The test requires an order from a physician which may be provided by a primary care specialist or one of our lung specialists. A Nurse Navigator screens all patients and assists patients through the entire process in addition to assisting with smoking cessation and assuring appropriate follow up if needed. To qualify, individuals must meet the following criteria in order to receive a prescription from their Primary Care Physician:

- 55-74 years with  $\geq 30$  pack year history
  - Smoking cessation  $< 15$  years
  - Absence of signs or symptoms of lung cancer
- Or**
- $\geq 50$  years and  $\geq 20$  pack year history and one additional risk factor (other than 2nd hand smoke)
  - Documented radon exposure

- Occupational exposure (arsenic, asbestos, beryllium, cadmium, soot, chromium, diesel fumes, nickel, silica, coal smoke) mining, firefighter, military-active combat
- Cancer History
- Family History of lung cancer (mother, father, sibling, child)
- Disease History (COPD, pulmonary fibrosis, emphysema, chronic bronchitis)
- Absence of signs or symptoms of lung cancer

### *Multidisciplinary Conferences*

An important part of each patient's treatment plan includes Virtua's interdisciplinary lung cancer conference. These conferences are attended by surgeons, radiation oncologists, medical oncologists, radiologists, pathologists, oncology nurses, genetics counselors, social workers and other health care providers with a special interest in lung cancer. These conferences focus on collaborative strategies for the assessment, staging, diagnosis, treatment, and follow-up of each patient. Pertinent information including patient history, physical examination findings, and pathology, imaging and operative findings are reviewed and discussed. Staging, treatment options, clinical trial eligibility, journal article review and latest cancer therapies are also considered as the team formulates consensus-driven management decisions.

### *Support Services*

A Nurse Navigator is available to newly diagnosed patients with lung cancer to assist with education, support and access to resources. The goal of the Nurse Navigation Service is to support physicians in improving clinical outcomes and to enhance patient satisfaction. Nurse navigation offers personalized service and helps guide each individual through the patient's cancer journey.

The Virtua Fox Chase Cancer Program offers support groups for patients and their families. Support groups provide a forum where patients can get practical advice as well as share thoughts, feelings and concerns.

### *Clinical Trials:*

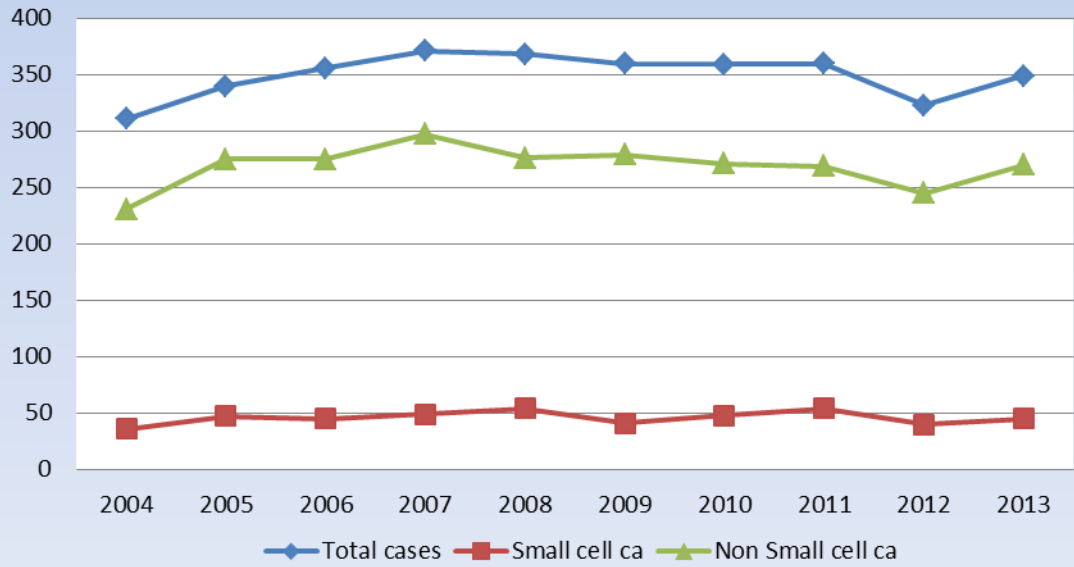
The Virtua Fox Chase Cancer Program also participates in National Cancer Institute Cooperative Group clinical trials. Presently there are several clinical trials available for patients with lung cancer meeting specific protocol requirements. Additional information pertaining to open clinical trials is available on the Virtua web site [www.virtua.org](http://www.virtua.org).

### ***Overview of Thoracic Program Quality Initiatives Monitoring Compliance with Evidence-Based Guidelines:***

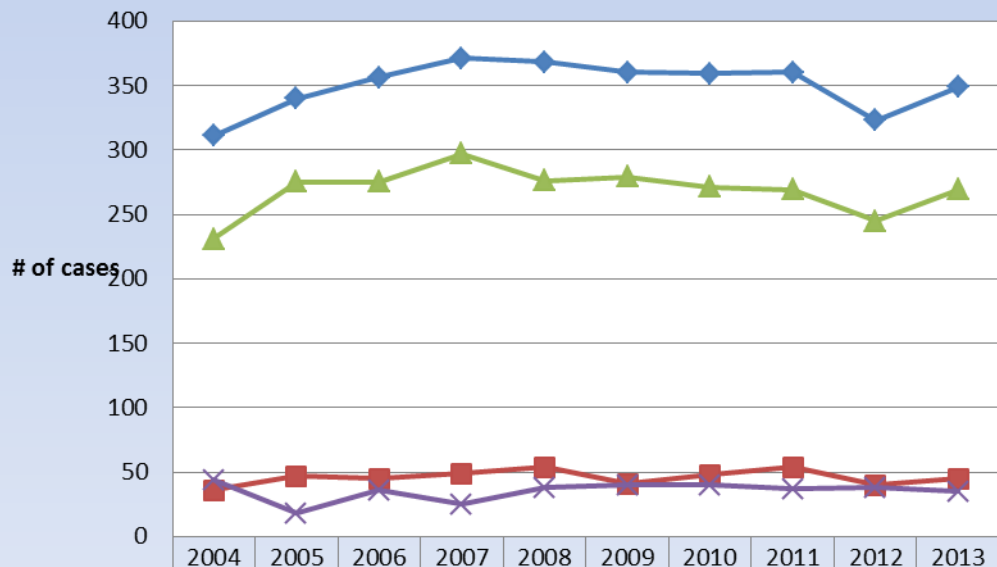
The Virtua Fox Chase Cancer Program formed the Thoracic Program Leadership Committee to ensure that all of our lung cancer patients are evaluated and treated according to National Comprehensive Cancer Network guidelines. The Thoracic Program Leadership is co-chaired by Dr. Jay Steinberg, board certified thoracic surgeon and Dr.

Roman Krol, a board certified pulmonologist. This committee includes radiologists, medical oncologists, radiation oncologists, a primary care physician, pathologists, thoracic nurse navigators, tumor registry and oncology administrators. Goals of the Thoracic Program were set by the committee and include developing a multidisciplinary model of care and improving access to care for patients in addition to developing and implementing a lung screening program based on the results of the National Lung Screening trial. Review of our analytic lung cancer cases for the years 2012-2013 revealed 67.5% of these patients were diagnosed with Stage IV disease. The Lung Screening and Nodule Program have been launched and to date 5% of the patients who have had the LDCT have revealed positive findings. Weekly multidisciplinary lung cancer conferences have been scheduled. The Thoracic Program Leadership Committee will continue to monitor compliance with evidence-based guidelines and work is underway to develop quality metrics specific to the activities of this program.

**Virtua Fox Chase Cancer Program  
10 year Lung cancer incidence  
Non-small cell vs small cell**



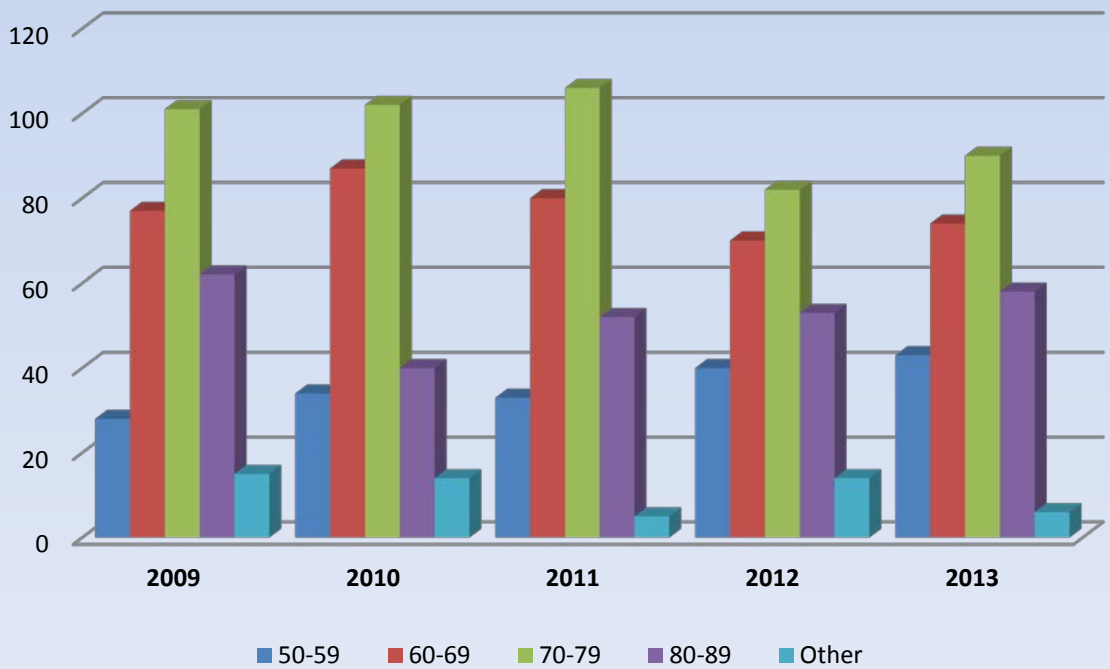
**Virtua Fox Chase Cancer Program  
Lung cancer by Histology  
2004 - 2013**



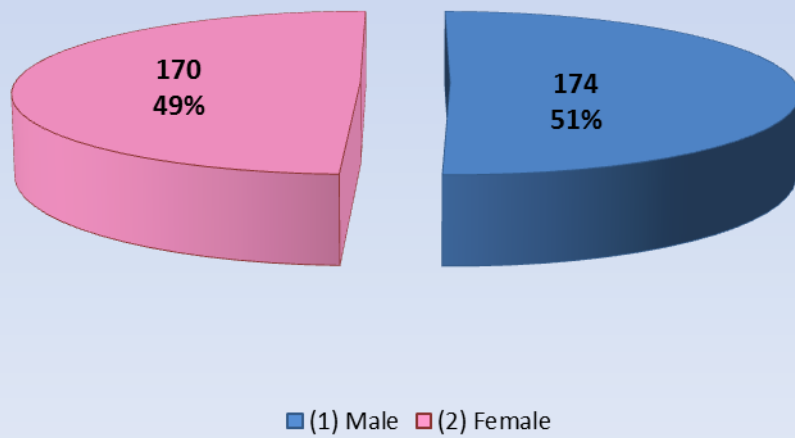
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
◆ Total cases	311	340	356	371	368	360	359	360	323	349
■ Small cell ca	36	47	45	49	54	41	48	54	40	45
▲ Non Small cell ca	231	275	275	297	276	279	271	269	245	269
✕ Other	44	18	36	25	38	40	40	37	38	35

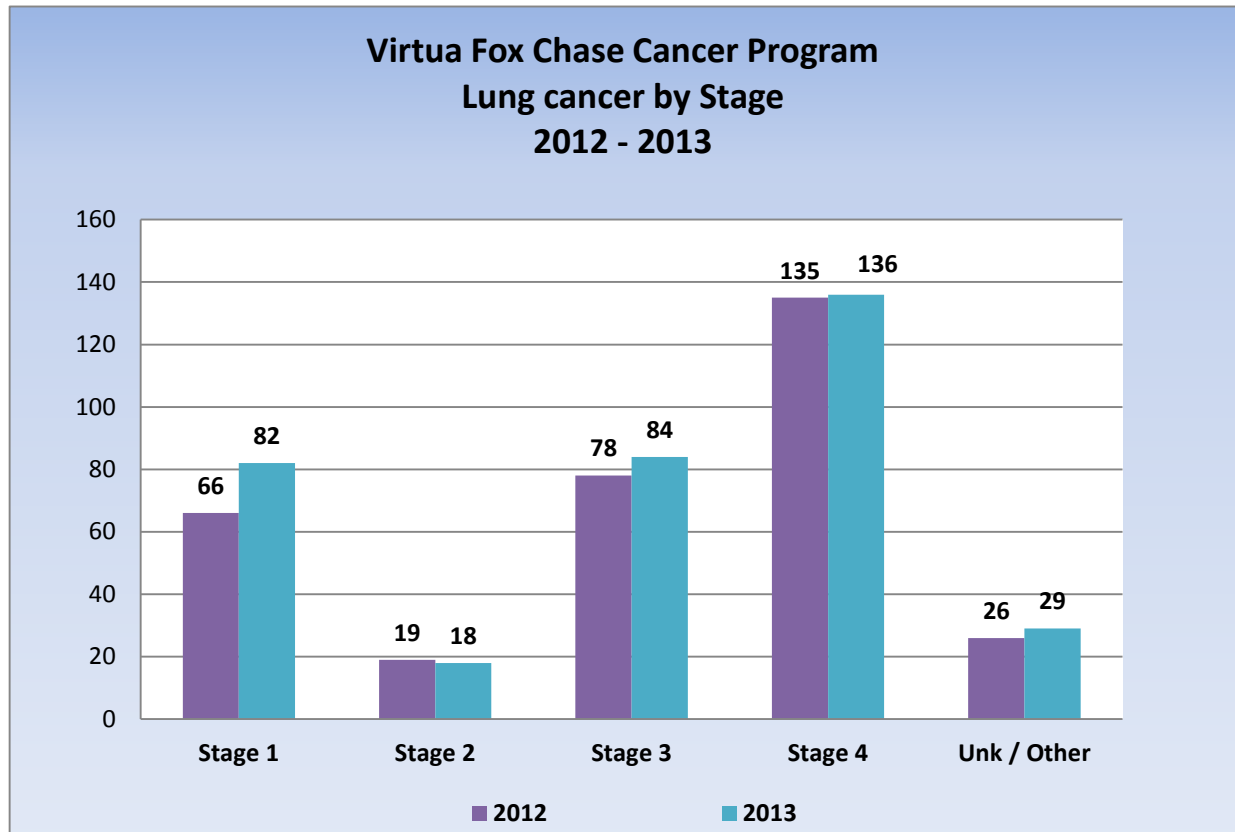


**Virtua Fox Chase Cancer Program  
Non-small cell lung cancer by age group  
2009 - 2013**



**Virtua Fox Chase Cancer Program  
2013 Lung cancer by sex**





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