RIVERSIDE HEALTH SYSTEM

2006

Cancer Services

Gifted Physicians.

Dedicated Staff.

Healing Care.

ANNUAL REVIEW

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For additional information regarding Riverside Cancer Services, please call (800) 520-7006.
For comments or questions regarding this Annual Report or the Cancer Registry, please call (757) 594-3054.

Cancer Services Annual Report 2006

As part of the Riverside team treating cancer patients, I thank you for your interest in our program. This has been a truly monumental year in the development of Riverside's Cancer Program. Our highlight has been opening of the joint venture UVA/Riverside Radiosurgery Center, which already is being expanded into a neuroscience center with the addition of spine radiosurgery, which should begin early next year. Our thanks to Dr. James Lesnick, Dr. C. Ronald Kersh and Sandy Snapp for their efforts in bringing the program to fruition.

A second highlight was the development of an entirely new radiation treatment center, which is now freestanding with two brand new linear accelerators from Elekta capable of meeting the latest standards in IMRT and IGRT. The Riverside Cancer Care Center also houses medical oncology and a variety of cancer services. Our thanks go to Carrie Schmidt, Diana LoVecchio and Beverly Voglewede for their efforts in bringing the new cancer center to completion.

We have added several new physicians to the Riverside team including Lori Gillespie, who is Director of Women's Services for radiation therapy, and Dr. William Irvin, who is Director of Gynecologic Oncology services. Our thanks also to Dr. Peyser for taking an expanded role as liaison for the American College of Surgeons and Dr. Mark Ellis in continued development in the medical oncology program. We have also initiated a new patient navigator program headed by Yvonne Pike.

The leadership of Riverside Regional Medical Center and Riverside Health System has had a strong commitment both in human resources and technology to continue to enhance a program that brings the finest care possible in the community setting. As you read through the booklet, I hope a sense of pride will be felt for all who participate in the program and of thanks that these services are available locally for those who will need them.

Joseph Layser, MD
Chair, RRMC Oncology Committee
Medical Director, Riverside Cancer Care Center Radiation Oncology

The next few years promise to be exciting times for the Riverside Cancer Program. The recent affiliation of several teams of specialists within the Riverside Medical Group has created a team of cancer specialists for the Riverside system and throughout our geographic area, which will allow more cohesive and seamless care for our patients, from diagnosis through treatment. The Riverside Cancer Research Program continues to grow and provide access to the latest National Cancer Institute-sponsored clinical trials, so that patients in our region may be treated close to home with the most sophisticated and current treatment regimens available. The addition of our Gamma Knife® Radiosurgery Program, through a cooperative effort with the University of Virginia, and the opening of the new Riverside Cancer Care Center on the campus of Riverside Regional Medical Center have made 2006 an exciting year within our Cancer Program.

While these accomplishments have been gratifying and have improved access to quality care for the patients in our region, the Riverside Cancer Program continues to build on its past success. With improvements in information technology, development of algorithms for the management of specific cancers, the growth of our Patient Navigator program, and disease-specific cancer conferences, the Riverside Cancer Program will continue to be the leader in cancer care in our region and continue to achieve optimum therapeutic outcomes for the patients we serve.

Mark Ellis, MD
Medical Director, Riverside Cancer Care

Riverside Cancer Services

American College of Surgeons Accreditation: Riverside Regional Medical Center has been accredited as a Community Hospital Comprehensive Cancer Program by the American College of Surgeons' Commission on Cancer since 1982. Accreditation by the ACOS indicates that the five key elements of a cancer program are in place:

1) state of the art clinical services;
2) a multidisciplinary cancer committee;
3) a cancer registry to monitor the quality of care;
4) patient oriented case-conferences; and
5) a quality improvement program for improving patient outcomes.

Oncology Committee: Riverside Regional Medical Center's Oncology Committee is a multi-disciplinary team that convenes every other month to provide leadership and professional guidance to the cancer care program.

Cancer Registry: To adhere to state, federal and ACOS guidelines, RRMC's Cancer Registry has been maintaining its database of cancer cases since 1979. Data from the registry is submitted to the Virginia Cancer Registry and the National Cancer Data Base (NCDB), which serves as a comprehensive clinical surveillance center for the entire country. Information on each case is submitted annually to keep the information current. The NCDB combines the data from 1,438 hospitals in all 50 states to provide insight into the long-term outcomes of treatments. This helps researchers and physicians better investigate and evaluate advances in diagnostics and treatment. This Annual Report contains a review of all 2005 accessions (new cases), as well as site-specific studies on breast and brain cancer.

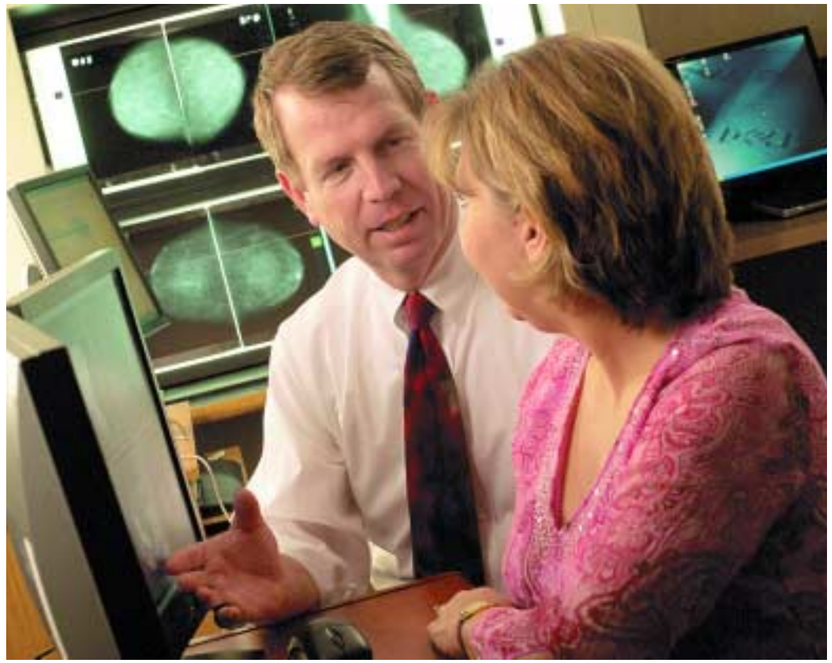
Cancer Case Conferences (Tumor Boards): Tumor Boards provide an opportunity for physicians to prospectively review cases with the multidisciplinary team. In addition to the weekly general tumor board, two site specific tumor boards were added in 2006: The Breast Cancer Case Conference and the Neuroscience Case Conference. In addition to helping determine treatment plans, case conferences serve as important education offerings for the physicians and other members of the healthcare team.

Research and Clinical Trials: Offering access to clinical trials is an important aspect of any cancer care program. While not appropriate for every patient, clinical trials can sometimes offer access to treatments that would be otherwise unavailable. The ACOS requires that 2% of the patients each year be enrolled in clinical trials, and Riverside is proud to once again exceed that benchmark.

Diagnostic Services

Imaging: Riverside offers a wide range of diagnostic imaging services across five locations (Riverside Regional Medical Center, Riverside Diagnostic and Breast Imaging Center - Oyster Point, Riverside Diagnostic Center - Williamsburg, Riverside Walter Reed Medical Center and Riverside Tappahannock Hospital). Riverside is proud to work with the physicians of Peninsula Radiologic Associates to bring you the following services:

- Mammography and Breast Imaging Services (screening, diagnostic, stereotactic, ultrasound, MRI)
- X Ray
- Ultrasound
- CT
- MRI
- Nuclear Medicine
- PET/CT



Laboratory and Pathology: Riverside provides a complete range of laboratory and pathology services. The physicians of Peninsula Pathology Associates work closely with the referring physicians and surgeons to provide the most accurate diagnosis to allow for the most precise treatment plan. In addition to the expertise of the physicians on staff, Riverside has partnered with The Mayo Clinic in Minnesota as a reference lab for the more unique tests that may be required or for second opinions on some specimens.

Inpatient Services

Riverside Regional Medical Center, the Peninsula's only Level II Trauma Center, offers a wide range of inpatient services. For oncology patients, the most commonly utilized departments and services include:

Care Management: The Oncology Care Management team is there to help patients and their supporters navigate the often confusing array of tests, treatments and feelings. The care coordinator works with the entire inter-disciplinary healthcare team to focus on minimizing the length of necessary hospital stays, while maximizing access to the best care available and preparing the patient and family for discharge to home or another facility.

5-East Post Surgical Unit: 5-East is a general surgical unit which specializes in the care of the post-operative patient. 5-East also offers a four bed step-down unit for patients requiring an increased level of nursing care following surgery. The nursing staff on 5-East are experts in helping a patient recover as rapidly as possible from a surgical intervention, including wound care issues, anesthesia recovery, pain management and getting the patient back to the activities of daily living.

5-West Oncology Unit: 5-West is a medical unit which specializes in the care of the oncology patient. Specialized offerings include two lead-lined rooms for patients who have received cesium implants and radioactive iodine therapy. Additionally, all of the RNs are certified in chemotherapy, and there are 5 Oncology Certified Nurses on the unit.

Hematology/Oncology Unit: The Hematology/Oncology Unit ("Hem/Onc") is a six bed specialty care unit designed for the critically ill oncology patient. As on 5West, the nursing staff is chemotherapy certified, and the unit boasts 3 Oncology Certified Nurses. The Hem/Onc staff members are also trained in critical care nursing, and are able to accommodate the most complex oncology patients, including intraperitoneal chemotherapy.

Surgeons: Riverside's surgeons are talented physicians who have spent years studying how to best operate on specific areas of the body. Depending on the type of cancer a patient has, they could see one of the following: Ear Nose & Throat (ENT) Surgeon, General Surgeon, Gynecologic Oncologist, Neurosurgeon, Plastic Surgeon, Surgical Oncologist, Thoracic Surgeon or Urologist.

Surgical Services: For many cancer patients, their only inpatient stay is immediately following surgery. Riverside's Surgical Services – from pre-operative testing, to the Operating Room to the Post-Anesthesia Care Unit (PACU)- are there to ensure that the right patient has the right procedure in the most safe and effective manner, and recovers as quickly as possible.

Outpatient Services

Home Care: Riverside Home Care offers a variety of services to patients in the Peninsula, Middle Peninsula and Northern Neck regions including home health, infusion, pharmacy and hospice services. Admission begins with a referral form the physician and a visit from an RN, physical or speech therapist to identify needs, establish goals for treatment and begin planning for continued care when home care services are no longer required.

Hospice: The Hospice program affirms life and regards dying as a natural process. The hospice program exists to provide support and care for patients, their families and caregivers in the last phases of incurable disease so the patient might live as fully and comfortably as possible. Hospice services neither hasten nor postpone death.

Medical Oncology / Peninsula Cancer Institute: Medical Oncology is a critical component of any cancer program. Riverside is thrilled to partner with the physicians of Peninsula Cancer Institute to offer medical oncology services, including outpatient chemotherapy at three sites (Newport News, Gloucester and Williamsburg).

Radiation Oncology: Riverside Cancer Treatment Center, Riverside Middle Peninsula Cancer Center and Williamsburg Radiation Therapy Center provided radiation oncology services to approximately one thousand (1000) new patients in 2005. A full range of external beam radiation and brachytherapy services, with the latest treatment options such as Intensity Modulated Radiation Therapy (IMRT), Prostate Seed Implants and Mammosite, are available for the Newport News, Williamsburg and Middle Peninsula communities. The focus of the new Riverside Cancer Care Center in 2006 encompasses new technology development for radiation oncology known as Image Guided Radiation Therapy (IGRT).

Riverside and University of Virginia Radiosurgery Center: Offering both Gamma Knife® and Synergy–S® technology, the Riverside and University of Virginia Radiosurgery Center opens up the world of knifeless surgery to patients with tumors in the brain, spine and other areas of the body. Using precise beams of intense radiation, the center allows outpatient surgery to previously inoperable tumors. Riverside is proud to offer the only Gamma Knife® in the Tidewater region, and is proud to be the only health system to offer both Gamma Knife® and Synergy-S® technology in the Commonwealth of Virginia.

Support Services

Bereavement Support: Riverside Hospice's Bereavement Aftercare Program provides support to adults as they adjust to life following the death of a loved one. Support and education are offered to help individuals learn about the grief process, and a support group meets twice a month.

Cancer Resource Library: Now located on the first floor of the Riverside Cancer Care Center, the new and expanded library is for patients, family members, community members and staff who want to learn more about cancer issues. The library offers resources on specific types of cancer – including prevention, diagnosis and treatment issues. There is also a wide array of books on the important psycho-social concerns of facing a cancer diagnosis. Additionally, there are two computers where individuals can research issues online, as well as a children's section.

Cancer Services – Outreach and Community Education: Riverside's Cancer Services offers a wide range of support, outreach, education and early detection programs to the community. Working with medical staff, oncology nurses, allied health care professionals and community partners, such as The American Cancer Society and the Leukemia and Lymphoma Society, Cancer Services sponsors numerous educational and screening events throughout the year. Programs include: community health fairs, prostate, cervical, breast and skin cancer screenings, Look Good Feel Better classes, Tell A Friend programs, nutritional programs and continued work with the Healing Eagle Free Clinic.

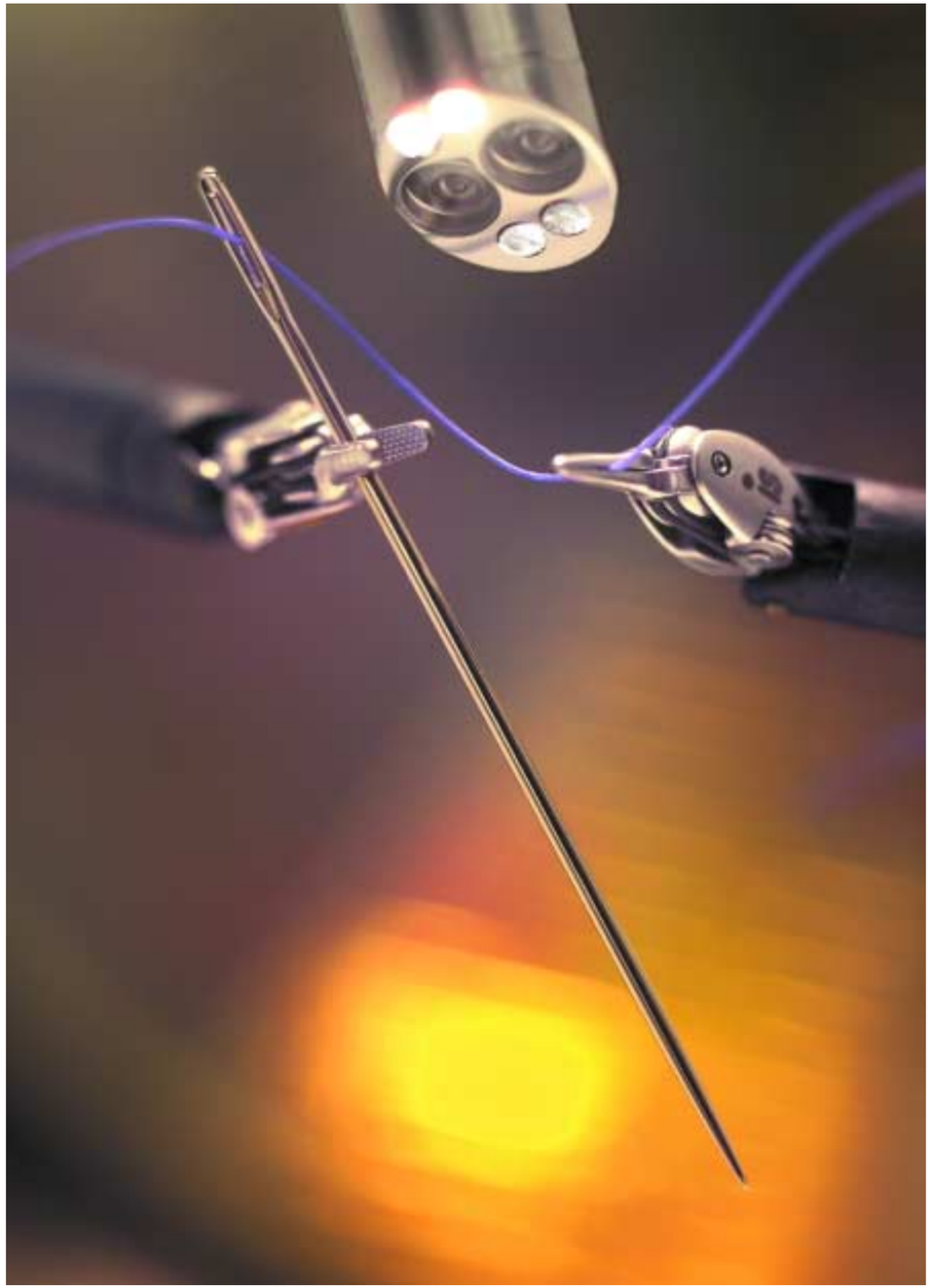
Connections with Community Organizations: Riverside Cancer Services recognizes its role in the broader cancer community, and works actively with numerous local and national cancer organizations. In addition to its work with local health departments, Riverside works with American Cancer Society, Leukemia and Lymphoma Society, Susan G. Komen Foundation, Colon Cancer Prevention Coalition, many local church groups, and the Lackey, Healing Eagle and Gloucester-Matthews Free Clinics.

Grant Programs: Riverside is proud to be the recipient of two major grants that allow access to breast and cervical cancer screenings for women who might not otherwise be able to get screened. The Every Woman's Life Grant is a part of the Centers for Disease Control and Prevention's Breast and Cervical Cancer Early Detection Program as managed through the Virginia Department of Health. Additionally, Riverside also receives funds from the Susan G. Komen Foundation for the Breast Health Alliance Program. Between the two programs, Riverside is able to provide these critical screenings to uninsured or underinsured women who meet the necessary age and income guidelines. Additionally, those women who detect a breast cancer can be enrolled in Medicaid to receive treatment.

Pastoral Care: The Riverside Chaplains are there to support cancer patients, families and friends in making use of faith or spiritual values to work with the challenges of cancer. Pastoral Care may include conversation, prayer, liturgy, worship, sacraments, scripture reading, reflection and referral. The pastoral care service is interfaith, personal, and specific for the individual and family in need. In addition to the community clergy and volunteers who support the program, Riverside's Pastoral Care consists of five full-time chaplains, including one chaplain dedicated to cancer care.

Patient Navigation: The Patient Navigation Program is a new addition to the support services offered through Riverside. Patient Navigators are there for patients and their loved ones from diagnosis through the entire treatment process. As most cancer patients discover, the diagnosis and treatment process is often confusing, and involves many physicians, nurses, therapists and locations, not to mention the overwhelming emotional component in addition to being sick. Patient Navigators are there to simplify the journey, and to be the one person you can always call with a question. They also help patients and caregivers know what to expect from various procedures and treatments. Currently, Riverside offers Patient Navigation to any patient in the breast, prostate or lung cancer programs. The hope is to expand that to additional diagnoses in coming years.

Support Groups: There are numerous support groups to support the cancer patient and their loved ones. Call Cancer Services for an up to date schedule of times and locations of the various groups.



da Vinci™ Robot

Review of 2005 Accessions

Riverside's commitment to providing comprehensive cancer care to our community is not limited to the use of the latest technological advances to diagnose and care for cancer patients. Riverside also contributes to the fight against cancer by identifying and following cancer patients diagnosed and/or treated at our facility as part of a nationwide effort to learn more about the disease. Over 28,000 patients are included in the Riverside Regional Medical Center Cancer Registry, and this patient data can be examined to identify patterns of frequency in the community as well as survival data and staging data. The Cancer Registry compiles the incidence of cancer by site for the hospital and forwards these statistics to the Virginia Cancer Registry and the National Cancer Data Base (NCDB) for use with statewide and national studies.

The Riverside Regional Medical Center Cancer Registry identified 1,242 new cancer cases for 2005. Of these cases, 985 (79%) were diagnosed and/or treated at Riverside Regional Medical Center during their first course of treatment.

In 2005, breast cancer remained the largest group of analytic cases, accounting for almost 18% of cancer cases. Of the 219 cases, there were 27 cases that were diagnosed/treated elsewhere and were presenting as a recurrence. There were 192 analytic cases, which represents a 3.1% (198 to 192) decrease from last year. Over 84% of the breast cancer patients were diagnosed with a localized stage (0, I, or II). The prognosis for patients is much better when the disease is localized. As the efforts for early breast cancer detection have increased, the stage at diagnosis has decreased, which is an excellent sign.

The next two leading cancer groups were lung cancer and colorectal cancer. Lung cancer cases increased by 4.1% (145 to 151) from 2004 to 2005. 65% of these lung cancer cases were diagnosed with regional or distant disease (stage III or IV). This can be attributed to the lack of a screening test, as well as many lung cancers being asymptomatic until metastasis.

Colorectal cancer cases diagnosed and/or treated at Riverside decreased by over 26% from 2004 to 2005. Early stage and late stage disease for colorectal cancer was similar with stages 0, I, and II contributing 50% of cases, and stages III, IV, and unknown stage contributing the other 50%. Many times the symptoms of colorectal cancer do not present themselves until very late. However, unlike lung cancer, colorectal cancer can easily be prevented or caught early through routine colonoscopy. This is why men and women over 50 should have a screening colonoscopy at least once every five years. Increased colonoscopy rates will lead to early detection and reduce the number of late-stage diagnoses.

One of the most significant changes from 2004 was the 30% increase in prostate cancer cases diagnosed and/or treated at Riverside Regional Medical Center. This increase in surgical prostate cancer cases could be attributed to the acquisition of the da Vinci™ robot technology for prostate cancer. This technology utilizes a physician-controlled robot to remove the prostate, thus reducing complications and recovery time when compared with the traditional radical retropubic prostatectomy. Localized disease was responsible for 90% of prostate cancer cases. Screening techniques and increased awareness (prostate-specific antigen (PSA) test and digital rectal exams (DREs) have helped in diagnosing prostate cancers at an early stage, preventing the spread of disease.

Melanoma is the fifth leading tumor group. Melanoma has decreased by 21% from 2004 to 2005. 91% of these were early stage (0, I, and II) cases and are likely to result in a very high cure rate. Skin cancer education and routine physical examinations have led to this early detection, and there is no indication that trend will change.

The rest of the top ten cancer sites are as follows: bladder, uterus, non-Hodgkins lymphoma, thyroid, and rectum. It should be noted that uterine cancer cases increased by 89% and ovarian cancers increased by 125%. These are drastic increases and are due to the growth of the GYN Oncology program at Riverside Regional Medical Center.

As a reminder, these statistics are facility-based, meaning they only pertain to Riverside Regional Medical Center. For national and state statistics, the National Institutes of Health and the American Cancer Society are the recommended resources.

Bradley W. Kirby, MPH, CTR
Cancer Registry Supervisor, Oncology Research Coordinator

Review of 2005 Accessions

Primary Site	Class of Case				Sex		Stage Distribution - Analytic Cases Only							
	Cases	%	Analytic	Non-Analytic	M	F	0	I	II	III	IV	NA	Unk	Blank/Inv
Buccal Cavity & Pharynx	**24**	**1.90%**	**23**	**1**	**15**	**9**	**1**	**5**	**2**	**1**	**12**	**0**	**2**	**0**
Tongue	3	0.20%	3	0	1	2	0	1	0	0	2	0	0	0
Salivary Glands	3	0.20%	3	0	2	1	0	0	1	1	1	0	0	0
Floor of Mouth	2	0.20%	2	0	2	0	0	1	0	0	1	0	0	0
Gum & Other Mouth	6	0.50%	5	1	1	5	1	2	1	0	1	0	0	0
Nasopharynx	2	0.20%	2	0	2	0	0	1	0	0	1	0	0	0
Tonsil	5	0.40%	5	0	4	1	0	0	0	0	4	0	1	0
Hypopharynx	3	0.20%	3	0	3	0	0	0	0	0	2	0	1	0
Digestive System	**182**	**14.70%**	**154**	**28**	**100**	**82**	**3**	**30**	**28**	**34**	**42**	**6**	**11**	**0**
Esophagus	11	0.90%	8	3	6	5	0	0	2	2	2	0	2	0
Stomach	17	1.40%	16	1	11	6	0	0	2	4	5	1	4	0
Small Intestine	4	0.30%	4	0	3	1	0	0	0	0	0	3	1	0
Colon Excluding Rectum	77	6.20%	61	16	40	37	1	18	12	15	14	1	0	0
Rectum & Rectosigmoid Junction	34	2.70%	31	3	21	13	1	7	8	7	7	0	1	0
Anus, Anal Canal & Anorectum	3	0.20%	2	1	0	3	0	0	0	1	0	0	1	0
Liver & Intrahepatic Bile Duct	9	0.70%	6	3	7	2	0	1	1	3	1	0	0	0
Gallbladder	3	0.20%	3	0	1	2	0	1	0	0	2	0	0	0
Other Biliary	3	0.20%	3	0	3	0	1	0	0	0	1	0	1	0
Pancreas	20	1.60%	19	1	8	12	0	3	3	2	10	0	1	0
Peritoneum, Omentum & Mesentery	1	0.10%	1	0	0	1	0	0	0	0	0	1	0	0
Respiratory System	**184**	**14.80%**	**162**	**22**	**111**	**73**	**1**	**48**	**10**	**41**	**62**	**0**	**0**	**0**
Nasal Cavity, Middle Ear & Sinuses	2	0.20%	1	1	2	0	0	1	0	0	0	0	0	0
Larynx	11	0.90%	10	1	8	3	0	4	1	1	4	0	0	0
Lung & Bronchus	171	13.80%	151	20	101	70	1	43	9	40	58	0	0	0
Soft Tissue	**12**	**1.00%**	**9**	**3**	**5**	**7**	**0**	**2**	**3**	**1**	**0**	**1**	**2**	**0**
Soft Tissue (including Heart)	12	1.00%	9	3	5	7	0	2	3	1	0	1	2	0
Skin excluding Basal & Squamous	**73**	**5.90%**	**49**	**24**	**46**	**27**	**10**	**29**	**4**	**5**	**1**	**0**	**0**	**0**
Melanoma - Skin	69	5.60%	46	23	42	27	10	28	4	3	1	0	0	0
Other Nonepithelial Skin	4	0.30%	3	1	4	0	0	1	0	2	0	0	0	0
Breast	**219**	**17.60%**	**192**	**27**	**0**	**219**	**31**	**78**	**53**	**18**	**8**	**0**	**4**	**0**
Breast	219	17.60%	192	27	0	219	31	78	53	18	8	0	4	0
Female Genital System	**79**	**6.40%**	**64**	**15**	**0**	**79**	**9**	**22**	**4**	**15**	**7**	**6**	**0**	**1**
Cervix Uteri	2	0.20%	2	0	0	2	0	0	0	2	0	0	0	0
Corpus and Uterus, NOS	46	3.70%	35	11	0	46	2	17	3	4	3	5	0	1
Ovary	21	1.70%	18	3	0	21	0	4	0	9	4	1	0	0
Vagina	1	0.10%	1	0	0	1	0	0	1	0	0	0	0	0
Vulva	9	0.70%	8	1	0	9	7	1	0	0	0	0	0	0
Male Genital System	**123**	**9.90%**	**109**	**14**	**123**	**0**	**0**	**4**	**95**	**6**	**4**	**0**	**0**	**0**
Prostate	117	9.40%	104	13	117	0	0	0	94	6	4	0	0	0
Testis	5	0.40%	4	1	5	0	0	4	0	0	0	0	0	0
Penis	1	0.10%	1	0	1	0	0	0	1	0	0	0	0	0
Urinary System	**80**	**6.40%**	**50**	**30**	**53**	**27**	**19**	**15**	**5**	**4**	**6**	**1**	**0**	**0**
Urinary Bladder	59	4.80%	31	28	43	16	19	4	3	1	3	1	0	0
Kidney & Renal Pelvis	20	1.60%	18	2	9	11	0	10	2	3	3	0	0	0
Other Urinary Organs	1	0.10%	1	0	1	0	0	1	0	0	0	0	0	0
Eye & Orbit	**1**	**0.10%**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Eye & Orbit	1	0.10%	0	1	1	0	0	0	0	0	0	0	0	0
Brain & Other Nervous System	**32**	**2.60%**	**30**	**2**	**15**	**17**	**0**	**0**	**0**	**0**	**0**	**30**	**0**	**0**
Brain	18	1.40%	18	0	12	6	0	0	0	0	0	18	0	0
Benign Brain/CNS Tumors	14	1.10%	12	2	3	11	0	0	0	0	0	12	0	0
Endocrine System	**44**	**3.50%**	**42**	**2**	**12**	**32**	**0**	**24**	**3**	**4**	**2**	**7**	**2**	**0**
Thyroid	36	2.90%	35	1	9	27	0	24	3	4	2	0	2	0
Other Endocrine (including Thymus)	8	0.60%	7	1	3	5	0	0	0	0	0	7	0	0
Lymphomas	**51**	**4.10%**	**34**	**17**	**31**	**20**	**0**	**9**	**5**	**10**	**7**	**0**	**3**	**0**
Hodgkin Lymphoma	8	0.60%	4	4	4	4	0	0	2	2	0	0	0	0
Non-Hodgkin Lymphoma	43	3.50%	30	13	27	16	0	9	3	8	7	0	3	0
Myeloma	**35**	**2.80%**	**18**	**17**	**15**	**20**	**0**	**0**	**0**	**0**	**0**	**18**	**0**	**0**
Multiple Myeloma	35	2.80%	18	17	15	20	0	0	0	0	0	18	0	0
Leukemias	**44**	**3.50%**	**15**	**29**	**32**	**12**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**0**
Lymphocytic Leukemia	32	2.60%	3	29	25	7	0	0	0	0	0	3	0	0
Myeloid & Monocytic Leukemia	11	0.90%	11	0	7	4	0	0	0	0	0	11	0	0
Other Leukemia	1	0.10%	1	0	0	1	0	0	0	0	0	1	0	0
Mesothelioma	**14**	**1.10%**	**9**	**5**	**11**	**3**	**0**	**1**	**3**	**2**	**1**	**1**	**1**	**0**
Mesothelioma	14	1.10%	9	5	11	3	0	1	3	2	1	1	1	0
III-Defined/Unspecified	**45**	**3.60%**	**25**	**20**	**21**	**24**	**0**	**0**	**0**	**0**	**0**	**25**	**0**	**0**
Ill-Defined and Unspecified Sites	45	3.60%	25	20	21	24	0	0	0	0	0	25	0	0
Total	**1,242**		**985**	**257**	**591**	**651**	**74**	**267**	**215**	**141**	**152**	**110**	**25**	**1**

2005 Cancer Incidence in Leading Sites

RRMC

% of All Male Cases	% of All Female Cases
PROSTATE 20%	BREAST 34%
LUNG 17%	LUNG 11%
COLON/RECTUM 10%	COLON/RECTUM 8%
MELANOMA 7%	UTERUS 7%
BLADDER/URINARY TRACT 7%	THYROID 4%

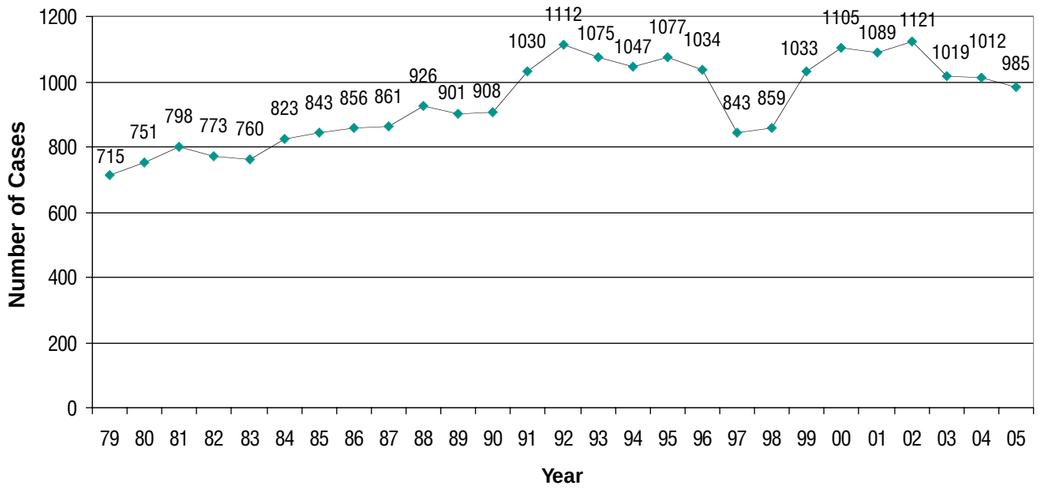
Note: The above cases account for 62% of all Riverside cases in 2005.

AMERICAN CANCER SOCIETY*

% of All Male Cases	% of All Female Cases
PROSTATE 33%	BREAST 31%
LUNG 13%	LUNG 12%
COLON/RECTUM 10%	COLON/RECTUM 11%
BLADDER/URINARY TRACT 6%	UTERUS 6%
MELANOMA 5%	NON HODGKINS LYMPHOMA 4%

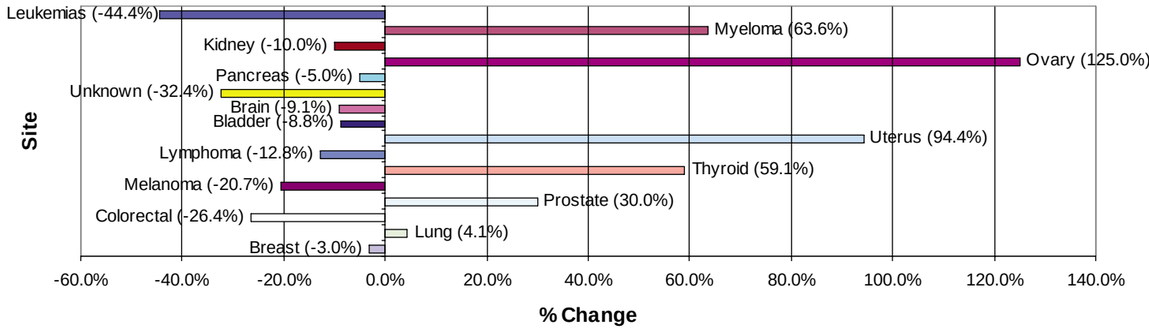
Note: The above cases account for 65% of all American Cancer Society estimated cases in 2005.

RRMC Cancer Registry Data Base 1979-2005

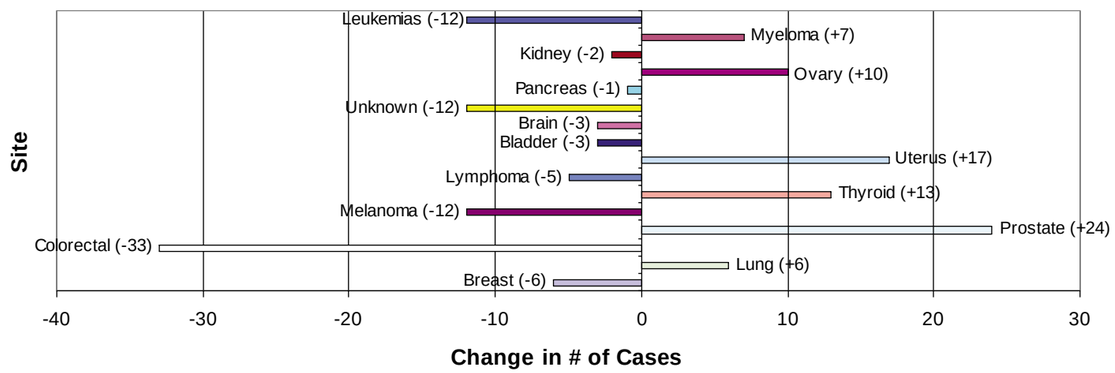


*NOTE: These are analytic cases ONLY (diagnosed and/or treated here during the first course of treatment). In previous years, this graph contained ALL CASES. Please note the change.

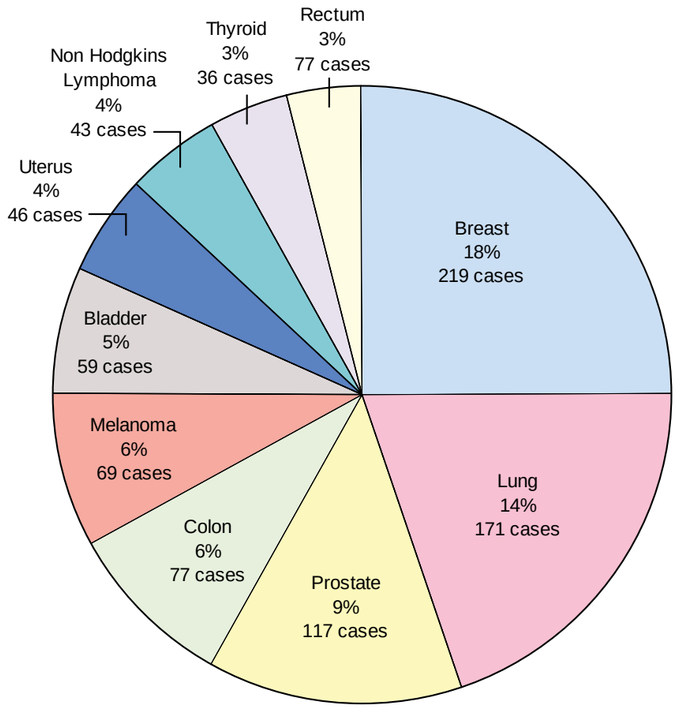
Analytic Cases: % Change 2004-2005
(Diagnosed and /or Treated at RRMC)



Analytic Cases: # Change 2004-2005
(Diagnosed and /or Treated at RRMC)



RRMC 2005 Top 10 Cancer Sites
(Accounting for 72% of Total Cases)



Breast Cancer at Riverside Regional Medical Center

Breast Imaging Services

Curtis Stoldt, DO
Peninsula Radiological Associates

One of the keys to successful care and treatment of patients with breast cancer is early diagnosis. The key to early diagnosis is a team of experienced and highly trained health care professionals who are dedicated to maximizing the advanced technologies available to facilitate the early diagnosis of breast cancer. Riverside has such a team of breast cancer diagnosis professionals at the **Riverside Diagnostic and Breast Imaging Center at Oyster Point.**

This team and facility have the distinction of being one of only two fully accredited American College of Radiology (ACR) Breast Imaging Centers in the State of Virginia. All mammography facilities must be ACR accredited by law. Currently, ACR accreditation for Stereotactic Guided Breast Biopsy and Breast Ultrasound Imaging and Ultrasound Guided Core Biopsy are not required, but elective. The staff at the Breast Imaging Center has elected to meet the rigorous accreditation process and maintain the highest standards established by the ACR.

The **Stereotactic Biopsy Program** at Riverside has been an ACR Certified program for nearly 10 years. It is one of seven certified facilities in the state of Virginia, and is the only certified Stereotactic Biopsy facility on the Peninsula. The **Breast Ultrasound Program** at Riverside has been ACR certified for 3 years. It is one of only four facilities ACR Certified in the State of Virginia and again, the only ACR Certified Breast Ultrasound/Ultrasound guided biopsy program on the Peninsula. The accreditation standards address personnel training, experience, continuing medical education, and individual provider certification as well as equipment technology, maintenance and quality of images.

The RDC Oyster Point Breast Imaging Center is excited to add **Breast MRI** to its array of breast imaging modalities. Though not a new technology, breast MRI has been slow to become a routine breast imaging modality because of slow development of consistent and reliable imaging protocols and techniques. Recently, there have been exciting developments in MRI technologies. These include the development of powerful software programs, which aid in the organization and interpretation of the more the 1500 breast MRI images generated with each breast MRI.

Riverside is now using the DynaCAD™ digital imaging workstation from INVIVO. The DynaCAD™ system has an extensive set of computer-aided detection (CAD) tools for performing real-time imaging analysis and biopsy procedure planning. DynaCAD™ provides radiologists with a comprehensive set of automatic image processing tools to improve and increase diagnostic confidence for identifying difficult to identify breast cancers and to facilitate MRI guided minimally invasive breast biopsy procedures.

Finally, thanks to a highly focused ad hoc committee of physicians, nurses, technologists and administrative personnel, the road from screening or diagnostic mammogram to final diagnosis of breast cancer and initiation of treatment has been smoothly paved, with the time from mammogram to treatment shortened to less than half of the time needed previously. Improvements are continuing. One of the most exciting programs to develop along with this initiative is the **Riverside Breast Cancer Patient Navigator Program**. This innovative program empowers the patient and her navigator to proceed from diagnosis through treatment quickly and efficiently by coordinating the patient's care and access to all treatment modalities.

acr™ ACCREDITED FACILITY

"We are proud to be the only fully ACR accredited Breast Imaging Facility in Southeastern Virginia."

Patient Navigator

Yuvonne Pike, M.Ed.
Breast Cancer Patient Navigator

Shock. Fear. Hope. Uncertainty. Numbness. These are but a few of the feelings familiar to many who have had to hear the words, "You have breast cancer." In 2005, more than 180 people at Riverside Regional Medical Center, mostly women, were diagnosed with this disease and entered a new world of powerful and often devastating emotions. Coupled with the emotional intensity of just receiving the diagnosis are often financial issues catapulted to the foreground by the need to pay for treatment. Further, time needed to receive treatments and their effects can significantly alter a person's ability to work, reducing needed income. These short and long-term absences and stresses created by inadequate or no health insurance only serve to further exacerbate financial worries. Family and other social relationships can be strained as the patient struggles with decisions regarding whether and how to share news about the diagnosis and associated feelings. Roles within the family are often reversed (perhaps with the breadwinner unable to continue fulfilling that role) and the traditional caregiver becomes, by necessity, the one who needs extra care. While many promising advances in diagnosis and treatment have been made available through extensive breast cancer research, these are often delivered in what can seem like a complex maze in the modern healthcare system. Now the patient must accomplish a variety of often unfamiliar and anxiety-provoking tests at a number of different locations. Multiple medical specialists need to be seen, and a fast-growing body of new information must be absorbed. Numerous appointments have to be made and coordinated. All of these factors are enough to tax the strongest person and overwhelm almost anyone.

A difficult picture for sure, but this year Riverside took a definitive step to help address the challenges faced by breast cancer patients who are diagnosed and/or treated in our system. In the Fall of 2005, the Breast Cancer Navigation Program was established and made available to patients at no cost. The Patient Navigator has extensive experience working with oncology patients and their loved ones and a good understanding of the medical, psychological, and financial aspects of care. The goal is a simple one: to encounter the patient and her/his caregivers early after diagnosis and to become part of the healthcare team providing support and a central point of contact no matter where in the system the patient goes for care. The Navigator partners with the patient to walk through the care process, anticipating and addressing concerns related to treatment and a continued sense of well-being. Barriers to timely and effective care are identified and resources to assist in removing these are explored and accessed. Education, emotional support and counseling, coordination of services, and the identification of community resources are crucial tools used to help empower the patient and her supporters to communicate need more effectively to the healthcare team and complete treatment in the most successful way possible. The Patient Navigator, informed by patient and family experiences and concerns, works with the healthcare team and the health system to continually help identify ways to streamline the care process and make care delivery as efficient and patient-friendly as possible. It is anticipated that more than 100 patients will use Navigation support in the first year of the Program and Riverside Cancer Services plans to make Navigation Programs available for other cancer diagnoses as well in the near future.

Surgeon

Michael Peyser, MD
Hampton Roads Surgical Specialists

The diagnosis of breast cancer is suspected when a patient presents with an abnormal breast imaging study or with a palpable breast mass. A complete physical examination is performed, and a family history is acquired for breast cancer and other malignancies. Suspicious lesions presenting on mammogram are first biopsied in order to obtain a tissue diagnosis of malignancy. This can prove very helpful for future surgical planning and may eliminate additional procedures. Biopsies can be accomplished by a *Stereotactic Core Biopsy* device, which essentially is a machine which combines mammography, computer aided targeting and biopsy by a needle gun. Other methods include *ultrasound* and *magnetic resonance imaging* assisted core biopsies. In addition, the palpable mass itself can be biopsied in the office setting by a hand-held device. The patient and the physician should not overlook the possibility of breast cancer in those who are young, who present with a normal mammogram, or who present with a self-discovered breast mass.

Surgery is the mainstay of treatment and helps to provide for local and regional control. In order to better understand the techniques of breast surgery, it is helpful to divide the operation into two procedures, which can be done at the same time: surgery of the breast and of the axillary lymph nodes. The procedures generally include one of the following: a *modified radical mastectomy* which means removal of the breast and the ipsilateral axillary lymph nodes, and *breast conservation* which is the removal of part of the breast and a noncontiguous lymph node dissection. The advent of sentinel lymph node mapping and biopsy has allowed the patient to avoid the morbidity of a complete axillary lymph node dissection.

A diagnosis of breast cancer does not obligate a patient to a mastectomy. Often, breast conservation surgery is an acceptable and preferred alternative. Radical mastectomies were once considered the standard of care for those with breast cancer. This was an extensive operation, which removed the breast and underlying pectoralis muscle as well as the lymph nodes. It was later understood that the muscle could be spared and this procedure was called a *modified radical mastectomy*. Beginning in the 1960's, a series of six prospective, randomized trials were undertaken that evaluated the overall survival rates for patients with breast cancer who had either modified radical mastectomies or breast conservation surgery, lymph node dissection, and adjuvant radiation therapy. Survival rates were noted to be similar among the two groups. Five additional trials also demonstrated that overall survival was similar for those patients who had breast conservation surgery with and without adjuvant radiation therapy. But local regional recurrence was higher for those who did not receive radiation. Therefore, those patients who are candidates for breast conservation surgery should typically receive *postoperative radiation* as part of their treatment planning. In addition, for those patients who undergo mastectomy, immediate *breast reconstruction* is an option, and this necessitates coordination with the plastic surgeon. Some patients are candidates for a skin-sparing mastectomy. This technique removes the breast tissue and nipple-areola complex while sparing the majority of the overlying skin and can improve post-reconstruction cosmesis.

Axillary lymph node dissection is a way to understand if the cancer has spread to the lymph nodes and is considered the standard of care for those patients with breast cancer. It was noted that patients with early stage breast cancers who underwent axillary lymph node dissections had a low incidence of lymph node metastases, and maybe these patients could have been spared this morbid procedure. Complications associated with this surgery include lymphedema, paresthesias of the upper arm, decrease in shoulder mobility, nerve injury and pain. *Sentinel lymph node mapping* is a technique previously applied for the detection of first order draining lymph nodes from a melanoma, and subsequent biopsy to determine if metastatic melanoma was present in the sentinel lymph node. This has also been utilized for breast cancer patients and can be combined with either a mastectomy or breast conservation surgery.

Patients typically undergo preoperative injection of a *radiolabelled tracer*, and intraoperative injection of *blue dye*. The combination of the two allow for identification and biopsy of the axillary *sentinel lymph node* with a very low false negative rate. The pathologist examines the lymph node while the patient is under anesthesia. If the lymph node has no evidence of cancer, then the procedure is terminated. If the lymph node contains metastatic cancer, then a completion axillary lymph node dissection is performed. Drains are placed in the axilla, and these are removed when the output is minimal. Sometimes, these patients also require physical therapy to control arm edema and increase range of mobility.

The future of breast cancer surgery includes both new techniques for diagnoses and operative treatment. Some of these include the use of *ductal lavage* whereby nipple fluid is aspirated and tested for malignant cells. However, a recent article from the **Journal of the National Cancer Institute** (October, 2004) indicates that this technique has a low sensitivity and additional evaluation is necessary to understand its role for screening high and low risk woman. *Mammary ductoscopy* is another office-based procedure whereby the physician inserts a small endoscope within the nipple duct for direct observation and biopsy of breast tissue and aspiration of fluid. It is being evaluated as a method to provide an early diagnosis of malignancy and help guide ductal excision surgery. This technique is still in its infancy and more data is necessary. The surgical treatment of early breast cancer involves less invasive procedures such as ablation by cryotherapy or heat therapy. Again, more data is necessary before such techniques can be widely applied.

Unfortunately, breast cancer is a common disease. The diagnosis and surgical management of these patients should be meticulous. It is important to understand that breast conservation surgery may be an option, and that breast reconstruction after mastectomy can usually be considered after discussion with the plastic surgeon. The use of sentinel lymph node mapping and biopsy has proven very effective in staging the axilla. There are always options for treatment, although it is important to adhere to *national guidelines* and observing benchmark indicators of care.

Pathologist

Michael Schwartz, MD
Peninsula Pathology Associates

The breast is host to a spectrum of benign and malignant diseases. Medical advances during the last few decades have changed and refined the diagnosis of breast diseases considerably, and their treatment has thus become increasingly sophisticated and complex. In order to obtain optimal results, a multidisciplinary treatment approach to the breast is necessary, involving close cooperation and communication between radiologists, surgeons, pathologists, oncologists, oncoradiologists, nurses, technicians and data managers.

The primary role of the surgical pathologist is to diagnose disease and then transmit all relevant information effectively so that it can be used to properly guide patient management. Tissues received in the pathology lab related to the breast include excisional biopsy, lumpectomy, mastectomy, sentinel lymph node biopsy, axillary dissection, stereotactic core biopsy and fine needle aspiration specimens.

Fine needle aspiration (FNA) cytology can be used in the diagnosis of breast lesions and in the triage of patients for management purposes. For example, patients and clinicians may be reassured by a benign diagnosis and the patient can then reenter her routine screening program, while an atypical diagnosis in the setting of benign clinical findings would suggest a more frequent screening interval and careful follow-up with early excisional biopsy if concern for a malignant process exists. Patients with suspicious or malignant diagnoses require excision of the lesion aspirated. FNA cytology of palpable lesions is very successful, with insufficient rates of less than 10%. False positive rates vary between 0.04-4% and false negative rates range from 3-15%, depending on the study. Most false negatives are due to sampling errors rather than interpretation errors. These should be detected if clinical, radiologic and pathologic correlation (so called "triple test") is conducted for each case. FNA cytology of non-palpable breast lesions is less successful due to high insufficiency rates, which approach 33% and may be as high as 46% for mammographic calcifications. Limitations of FNA include the problem of insufficient material, technical issues involved in the optimal preparation of slides and inability to distinguish invasive from in situ carcinoma. Therefore, large core needle biopsy is now preferred to FNA at most centers because of its ability to better characterize benign and malignant lesions.

Whatever surgical specimen is submitted, it is the pathologist's role to diagnose the presence (or absence) of disease based on the gross evaluation of the specimen followed by microscopic review of hematoxylin and eosin stained slides. Of critical importance is evaluation for a benign versus malignant process. Some of the more common benign lesions diagnosed include usual type of ductal epithelial hyperplasia, sclerosing adenosis, papillomas, fibroadenoma, radial scar/complex sclerosing lesion and fibrocystic change with or without apocrine metaplasia. Even though these processes are benign, it is important to precisely characterize them as some are associated with an increased risk for the subsequent development of breast cancer. For example, moderate or florid ductal epithelial hyperplasia of usual type, sclerosing adenosis and solitary papilloma have a mildly increased risk (1.5-2.0 times), while those with atypical ductal hyperplasia and atypical lobular hyperplasia are at moderately increased the relative risk (4.0-5.0 times) for the subsequent development of invasive breast cancer. If malignant, it is important to include all relevant prognostic and predictive factors. Prognostic factors provide information about clinical outcome at the time of diagnosis and include tumor size and lymph node status while predictive factors provide information about the response to a specific type of therapy, for example estrogen receptor, progesterone receptor and Her2 neu status. Prognostic and predictive factors recommended for reporting by The College of American Pathologists and required by The American College of Surgeons for invasive breast cancers include: histiologic type and grade, tumor size, hormone receptor status, skin/chest wall involvement, lymph node status and lymphovascular space invasion.

If the tissue is malignant, it is paramount to determine if the cancer is in situ, e.g. ductal carcinoma in situ (DCIS) or lobular carcinoma in situ (LCIS), or invasive with the potential to metastasize and result in the death of the patient. The introduction of mammographic screening in the 1980's has led to a marked change in the types of breast cancers detected. Prior to screening, less than 5% of carcinomas were diagnosed as carcinoma in situ, whereas after mammographic screening about 30% of all newly diagnosed cancers are in situ. The most frequent mammographic presentation of DCIS is microcalcifications. The term DCIS encompasses a heterogeneous group of lesions and is defined as "a proliferation of neoplastic epithelial cells confined to mammary ducts and lobules without light microscopic evidence of invasion through the basement membrane into the surrounding stroma." These lesions vary in regard to their mode of presentation, their histologic appearance and their biologic significance. The results of the NSABP B-17 study were the first to demonstrate in the setting of a prospective, randomized clinical trial that the addition of radiation after excision for DCIS significantly reduces the rate of local recurrence when compared with excision alone. Similar results have recently been reported from the EORTC 10853 trial. The results of these randomized trials have been interpreted as indicating that all patients with DCIS who undergo breast-conserving treatment require radiation therapy. However, two important questions have not yet been adequately addressed: first, can we identify a subset of patients with DCIS in whom radiotherapy can be safely omitted? And, second, at the other end of the spectrum, can we identify a subset of patients who are best served by mastectomy? The results of numerous pathologic, mammographic and non-randomized prospective and retrospective studies have provided some answers to these questions. In particular, the results of these studies suggest that consideration of factors such as histologic features, the distribution of the lesion in the breast, the size or extent of the lesion, and the adequacy of the excision appear to be important in the selection of the optimal therapy and in predicting the risk of local recurrence or progression to invasive carcinoma. Although no one system of classification for DCIS has achieved universal acceptance, the final pathology report should therefore comment on the following items: architectural patterns present, nuclear grade, necrosis if present, status of the microscope margins, size/extent of the lesion and the relationship between microcalcifications and the DCIS. The estrogen and progesterone receptor status of the DICS is also typically reported.

If the tumor is invasive, one of the major tasks of the pathologist is to determine its histologic type. Invasive (infiltrating) ductal carcinoma is the single largest category, accounting for approximately 75-80% of all invasive breast carcinomas. Invasive lobular carcinoma comprises approximately 8%, while the special types of breast carcinomas e.g. tubular, colloid (mucinous), medullary, adenoid cystic, cribriform carcinoma, metaplastic carcinoma and other much rarer forms, account for the remainder. Histologic grade using the Bloom Richardson scoring system modified by Elston and Ellis allows the pathologist to predict the aggressiveness of the tumor. A combination of features are evaluated using a 1-3 point scale including the extent of open tubule formation, the degree of nuclear pleomorphism and the mitotic rate. In the review by Elston and Ellis of 1,830 cases of invasive carcinoma, they found a highly significant correlation between grade and prognosis, with recurrent-free interval and overall survival being worse in those patients with poorly differentiated (high-grade) tumors compared to those with well-differentiated (low-grade) tumors. Other authors have shown similar results. A corollary is that for a given tumor size, there is an increased tendency to use chemotherapy for high-grade histology and less of a tendency for low-grade histology. Good correlation between grade and prognosis has not only been reported for invasive ductal carcinoma, but also for invasive lobular carcinoma. Certain histologic types, most notably tubular, colloid, cribriform and adenoid cystic carcinoma, are associated with a particularly favorable outcome in most studies.

The size of the invasive cancer is also a strong independent prognostic factor. Women with T1a (not more than 0.5 cm) and T1b (not more than 1.0 cm) tumors typically have a long-term survival greater than 90%, while those with T3 tumors (greater than 5.0 cm) have a long-term survival on the order of 20%. Therefore, the determination of size also plays a major role in clinical decision-making. Since the prognosis of invasive carcinomas under 1.0 cm is so favorable, chemotherapy is usually not considered unless there are other poor prognostic features. For tumors greater than 5.0 cm, mastectomy is considered along with possible chest wall radiation and neoadjuvant therapy regimens.

The presence or absence of lymphovascular space invasion is also typically reported. Studies have shown that lymphovascular invasion correlates with regional lymph node status, early recurrence in lymph node negative patients, and also predicts for local recurrence after breast conservation therapy and for flap recurrence after mastectomy. It is also a predictor for long-term survival independent of lymph node status. This is the least reproducible prognostic factor amongst pathologists, accounting for the considerable variation in its reported frequency (20-54%).

The specimen evaluation must also include an assessment of margins, as it too plays a critical role in patient decision-making. Most surgeons have a low threshold for re-excision of close or focally positive margins on initial biopsy. Proper specimen margin orientation requiring close communication between the surgeon and pathologist is therefore critical, and may allow for focal rather than global re-excisions when the margin status is in doubt. With current radiation techniques, 2-3 mm margins for invasive and in situ carcinomas appear sufficient to achieve a less than 5% local recurrence rate.

Involvement of axillary lymph nodes is the single most important prognostic factor for patients with invasive breast cancer and tumor size is closely correlated with the probability of lymph node metastasis. For example, a 1.0 cm carcinoma has an approximately 10% chance of lymph node

metastasis, while for a 5.0 cm carcinoma the risk approaches 50%. Both disease free and overall survival decrease as the number of positive nodes increases. For clinically node negative patients, the sentinel lymph node biopsy has become the standard of care for axillary staging. The detection of sentinel lymph node metastasis is dependent on a number of factors, including the size of the metastasis, the size of the lymph node and the number of sections examined. The addition of keratin immunohistochemistry has resulted in the detection of an even greater numbers of small metastases. While the clinical significance of metastatic isolated tumor cells (not greater than 0.2 mm) in the sentinel lymph node is not known, several studies have shown that the presence of micrometastasis (greater than 0.2 mm but not greater than 2.0 mm) detected by serial sectioning and/or immunohistochemistry is associated with a small but significant decrease in disease free and/or overall survival. Current AJCC lymph node classification categories are designed to facilitate the accrual of data to address the question of the significance of isolated tumor cells. The difficulty in detecting these isolated tumor cells and micrometastasis have stirred debate about the role of frozen section analysis of sentinel lymph node biopsies (false negative rates are on the order of 20%); nevertheless, frozen section evaluation typically allows for the intraoperative detection of macrometastases (greater than 2.0 mm) enabling for subsequent completion axillary dissection by the surgeon and avoidance of a second operation.

In order to identify patients who are likely to respond to tamoxifen, aromatase inhibitors or Herceptin, ancillary studies for estrogen/progesterone receptor and Her 2-neu are performed by the pathology laboratory on all malignant breast cancers (Her 2-neu only on invasive carcinomas). Estrogen and progesterone receptor evaluation is based on quantitative, standardized immunohistochemistry results using an automated cellular imaging system. This system has been shown to provide reproducible quantitative results using a standardized scoring methodology that reduces intra-observer variability. In addition, all newly diagnosed invasive breast cancers now undergo fluorescent in situ hybridization (FISH) analysis for Her 2-neu gene amplification status, which can then be used as a predictor for response to various agents, including Herceptin.

By establishing a diagnosis, the pathologist becomes an integral part of the multidisciplinary team involved in the treatment of patients with diseases of the breast. It is the pathologist's role to organize the diagnostic information in a manner in which it can be communicated to the other members of the team in a clear and precise way. To achieve this, a synoptic report is added to the traditional textual diagnosis of all malignancies in order to insure that all relevant prognostic/predictive information of the lesion is included. This formatted template insures consistency in the information reported, increases the accuracy of its extraction and provides the foundation for adoption of evidence based protocols and comprehensive analysis of outcome information. This in turn, ultimately leads to an improvement in the quality of breast care.

Radiation Oncologist

Lori Gillespie, MD
Peninsula Radiation Oncology

According to the American Cancer Society Facts and Figures, breast cancer accounted for the second most common cause of cancer death after lung cancer this year. Breast cancer was the most frequently diagnosed cancer in women in 2006 with 213,000 new cases in the United States.

Breast cancer treatment today often includes breast conservation management with lumpectomy (removal of the tumor with negative margins) and sentinel lymph node biopsy (mapping and removal of the lymph nodes draining the involved area of the breast). Breast conservation includes radiation therapy treating the involved breast and occasionally the regional lymphatics.

Today, external beam radiation uses x-ray beams generated by linear accelerators to target the breast using CT scan guidance. External beam radiation is a daily treatment (Monday through Friday) and lasts for approximately 6-1/2 weeks. Most patients spend about 15 to 20 minutes per day in our Radiation Oncology department.

Partial breast irradiation is an alternative to whole breast treatment using MammoSite,. This type of treatment utilizes a fluid filled balloon placed in the lumpectomy cavity after the final pathology results are known. There are several very strict criteria for eligibility such as tumor size of less than 3-cm, involvement in less than three axillary lymph nodes and pathologically negative tumor margins. MammoSite, uses a High Dose Rate Iridium 192 radiation source placed into the balloon center for ten (10) total treatments twice a day, six (6) hours apart for five (5) treatment days. Due to several other technical treatment factors, it is only appropriate for a small select subset of patients.

Occasionally, radiation is required in patients after a mastectomy for larger (greater than 5-cm) tumors, multiple positive (greater than 4) lymph nodes and close or positive margins. More recent data has demonstrated the benefit of regional radiation in post mastectomy patients with 1 to 3 positive lymph nodes.

Radiation side effects are limited to the irradiated regions only. Most commonly, patients will develop skin erythema/redness corresponding to the treatment fields. Much less commonly (less than 2%) patients may develop a pneumonitis, inflammation of the irradiated underlying strip of lung. Other possible side effects include arm edema/swelling with the incidence directly related to the number of lymph nodes removed.

Breast cancer patients with metastatic disease may also benefit from radiation therapy especially in the setting of bone or brain involvement.

Riverside Radiation Oncologists work closely with the Surgeons and Medical Oncologists to coordinate the start of treatment and especially the timing of chemotherapy. This team approach gives patients the best chance for excellent results.

Medical Oncologist

Kimberly Schlesinger, MD
Peninsula Cancer Institute

The statistics are daunting – 1 in 10 American women will be diagnosed with breast cancer during her lifetime. Many of these will be detected by routine screening mammograms, while other will be discovered during physical exams or by patients themselves. Of the 213,000 new cases expected in 2006, each patient's story will be different – and as we move further into the 21st century, researchers and clinicians appreciate that the differences do not end there.

Since the mid-1960's, physicians and scientists have separated breast cancers into essentially 2 large subgroups: those that express hormone receptors for estrogen and progesterone (ER+/PR+) and those that do not (ER-/PR-).* This important difference impacts systemic (medical) treatment options regardless of the stage of the cancer or age of the patient. In addition to possible chemotherapy, ER+ tumors can be treated with drugs that block or suppress estrogen in the patient's body – thus cutting off the "fuel supply" for estrogen hungry cells. Since these receptors are not present on ER- tumors, cutting of the estrogen will not be of benefit and these particular drugs are not offered (although chemotherapy may still be appropriate and beneficial.)

The late 1980's ushered in what was to become a new era in breast cancer management with the discovery of the HER-2/neu protein. Acting as a growth factor or trigger for breast cancer cell proliferation, an "anti-HER-2/neu" drug was designed to block its actions. At the time, trastuzumab stood separate from other breast cancer therapies as neither an anti-estrogen (as would be used in ER+ tumors) nor chemotherapy because it is an antibody specifically directed against the HER-2/neu protein. Binding to this growth trigger, it disrupts the protein's ability to promote further growth. Initially used in patients for whom breast cancer had metastasized, recent landmark trials proved it to reduce recurrence and prolong disease free survival in appropriate women whose disease was localized to the breast or lymph nodes. It quickly became standard of care in the adjuvant or "post-surgical" management of appropriate patients (in conjunction with chemotherapy), in addition to retaining its use in metastatic disease.

Suddenly, there were no longer 2 types (ER+ or ER-) of breast cancers, but at least 4 (ER+/HER-2+; ER+/HER-2 -; ER-/HER-2+; ER-/HER-2-). Adding further intrigue is growing evidence that certain anti-estrogens and even chemotherapies may have different effects on these various breast cancer subtypes, such that HER-2/neu + tumors may respond more favorably to a class of agents known as anthracyclines and may act in synergy with another class, the taxanes. In addition, one recent large chemotherapy trial set up to examine a different time frame for administration of the drugs (every 14 versus every 21 days) may suggest different degrees of benefit according to ER. Thought leaders in the field are using this information to design subsequent clinical trials to explore this hypothesis. These findings have obvious implications at the bedside as patients and physicians work to define optimal and individual treatment plans.

Delving even further into the molecular level, researchers have identified a plethora of genetic mutations that may occur in breast cancer cells. In addition to being possible therapeutic targets, these changes may indicate the level of aggressiveness and aid in guiding treatment options. One commercially available test, Oncotype DX, is the first of its generation, examining 21 different genes expressed in a particular breast cancer. Its use is currently limited to those patients whose breast cancer is localized, whose lymph nodes are negative and whose tumors are ER+ (although several studies are underway to define its use in other subgroups). Results of the test stratify patients into low, intermediate, or high risk of recurrence. High-risk patients appear to benefit the most from chemotherapy while low risk patients appear to benefit from anti-estrogen therapy alone. This data, in addition to personal and family history, physical exam, and patient preference, can aid in personalizing adjuvant treatment options. Although acceptance and application of the Oncotype DX test and data varies according to physician perspective, it has been a wonderful addition to the breast cancer management armamentarium.

For many women and men, their breast cancer story involves having surgical removal of the tumor prior to receiving systemic (medical) or radiation therapy. However, there are others for whom "up-front" or neoadjuvant systemic therapy offers the opportunity for better cosmetic results or less invasive surgery. Typically limited to patients with large, bulky tumors, many recent studies have better defined the manner in which neoadjuvant therapy may be given. Combinations of chemotherapy, trastuzumab, and anti-estrogen therapies are all options that have been explored, typically with excellent results in terms of reducing the size of the cancer prior to removing it. Patients often require further systemic and/or radiation therapy subsequent to surgery, but for the appropriate patient, neoadjuvant therapy is yet another option in an individual's evolving cancer story.

Yet the story continues beyond the last chemotherapy session or pill – and for some women even precedes the diagnosis of breast cancer. Research into the genetics of breast cancer has yielded several gene mutations that may render families more likely to develop breast and other types of cancers. Women and men may be screened for mutations in genes such as chromosome 17 (BRCA1), chromosome 13 (BRCA2), p53 (Li-Fraumeni), and others. Mutations in these genes place affected individuals at higher risk for breast cancer, breast cancer recurrence, ovarian cancer (BRCA1 & BRCA2), prostate cancer, and others. For patients who have completed therapy for breast or ovarian cancer, discovering their BRCA status may impact decisions regarding future screening techniques and even prophylactic surgical removal of breasts or ovaries. BRCA positive patients who have not been affected by breast cancer may elect preventative treatments with anti-estrogens or prophylactic surgeries. BRCA mutations are uncommon in the general population; it is important to remember that the vast majority of breast cancers are sporadic – unrelated to one's family history. In order to determine whether a particular patient is appropriate for this specialized testing, an extensive family history and pre- and post-counseling session is required.

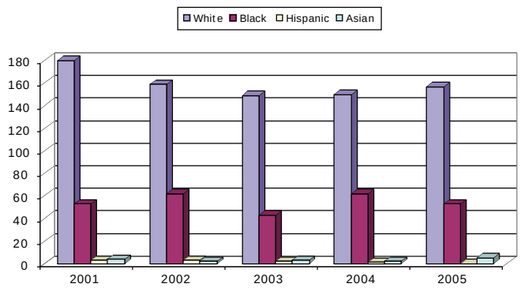
Beyond the surgical and medical management of breast cancer, our colleagues in radiation oncology also offer many exciting options for local control. Most recent is the use of partial breast irradiation ("Mammosite") as opposed to traditional whole breast irradiation in certain well-selected women following surgical resection of the tumor. This novel technique utilizes several days of a surgically placed indwelling catheter but dramatically reduces the length of time a patient receives radiation therapy. For the appropriate patient, this is yet another exciting option for disease management.

For millions of women and men across the nation and around the world, breast cancer is an unwelcome intruder. Although it may leave its mark upon the body of those affected, the spirit often arises triumphant. Armed with advances in the surgical, medical, and radiation fields, the fight against breast cancer can now assume a more individual, tailored approach. This offers patients and families more treatment options, more opportunity for involvement, and most importantly, more hope.

Footnote:
*Although tumors ER+ tumors are often PR+ (and ER-tumors are often PR-) variable expression does occur. Tumors that are ER- /PR+ or ER+/PR- are treated as ER+. For simplicity's sake, our discussion will be limited to the expression of ER without regard to PR status.

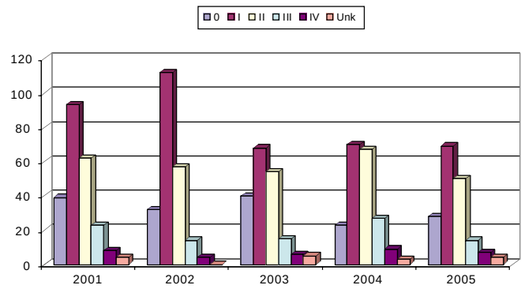
Riverside Cancer Registry Data

Breast Cancer Cases 2001-2005 by Race



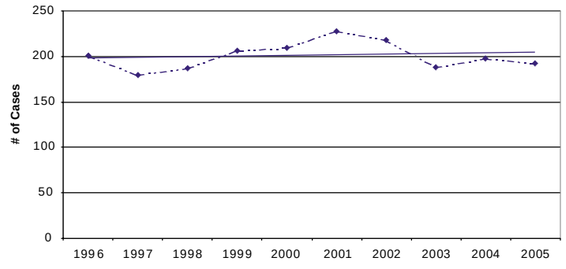
From 2001 to 2005, breast cancer among whites had the highest incidence followed by African Americans and Asians. This reflects the demographic make-up of the community.

Breast Cancer Cases 2001-2005 by Stage of Cancer



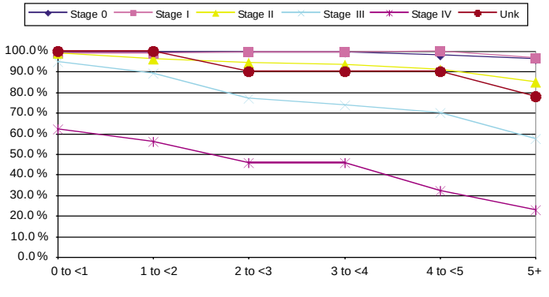
Stage 0 breast cancers increased from 2004 to 2005, while Stage II, III, and IV breast cancers all decreased. This is a significant achievement as an early-stage disease is much more curable than the latter stages. This could be indicative of a quality screening process as more patients are being diagnosed at early stages.

Breast Cancer Cases 1996-2005



Although the number of annual breast cases has fluctuated between 1996 and 2005, there has been a slight upward trend of cases diagnosed and/or treated at Riverside Regional Medical Center.

Breast Cancer Five Year Adjusted Survival Rates 1996-2001



According to the American Cancer Society's 2006 Facts and Figures, the 5-year relative survival for localized (stages 0 and I) breast cancer resides at 98%. Five-year survival for regional breast cancer is 81% (stages 2 and 3) and for distant metastases, it is 26% (stage IV). The 5-year survival rates for breast cancer at RRMC are comparable to all of these national 5-year survival rates.

Brain Tumors at Riverside Regional Medical Center

Neurologist

Thomas Reagan, MD
Hampton Roads Neurology

Before discussing the role of a neurologist in the diagnosis and management of brain tumors, a few general comments about the scope of the problem might be helpful. **Brain tumor** is a general term that is used to include any tumor growing inside the skull, whether or not it arises in the brain itself. The first clinically relevant distinction that needs to be made is between **primary** and **metastatic** brain tumors.

Metastatic brain tumors spread to the brain from cancer in other organs and are, by definition, malignant. They are 5 to 10 times more common than primary brain tumors. Brain metastases occur in about 15% of cancer patients. Lung and breast cancers are the most common solid tumors that metastasize to the brain. Melanoma, testicular and renal carcinoma have the greatest propensity to metastasize to the brain, but their relative rarity explains the low incidence in large series of patients with brain metastases.

Primary brain tumors are considered those that arise from either the substance of the brain, the coverings of the brain (meninges), or associated structures such as the pituitary gland and cranial nerves. The overall annual incidence of primary brain tumors in the general population is about 11 cases per 100,000 persons. Although there are over 30 different types of primary brain tumors recognized by pathologists, most fall into just a few major categories. About 25% are benign tumors arising from the covering of the brain called **meningiomas**. These are usually surgically curable tumors. About 35% are highly malignant tumors in the substance of the brain called **malignant astrocytomas** or **glioblastomas**. These cannot be cured surgically and their treatment presents a continuing challenge. Pituitary tumors, technically not brain tumors at all, account for another 10% and the remaining 30% are divided among the numerous other tumor types, most of which have treatment options and prognoses somewhere between curable meningiomas and rapidly fatal glioblastomas.

The symptoms caused by a brain tumor are related to two factors, the location of the tumor and its size. Symptoms related to location reflect the function of the affected part of the brain. For example, tumors located in or on the motor part of the brain will cause weakness of the opposite side of the body. Tumors located in the back of the brain (occipital lobes) will cause visual disturbances while those in the frontal lobes may cause changes in personality as the first symptom. Any tumor located superficially enough to affect the cortex of the brain can cause seizures and a seizure is often the first symptom of a brain tumor. More than half of brain tumor patients will have a seizure at some time in their illness.

If a tumor reaches a sufficient size it will raise the pressure inside the skull. The symptoms that result from this are headache, nausea, and vomiting. Blurred vision and decreased mental acuity, even to the point of coma, will follow as the pressure continues to increase. Fortunately, since the general availability of sophisticated imaging studies (CT and MRI scanning) beginning in the 1970s, tumors rarely progress to that point before being diagnosed. Although brain tumor is generally considered a “surgical” disease, medical neurologists play an important role in the diagnosis and management of patients with this disorder. Because of the nature of the symptoms that these tumors cause, a neurologist is often the first physician consulted by the patient or by his primary care physician.

A neurologist will first obtain a detailed medical history, focusing on the nature of the neurologic symptom and its course over time. Progressive worsening of a symptom over time is what first raises the possibility of a tumor. History taking will be followed by a neurological examination, testing all of the functions of the brain in an orderly fashion. This will include tests of cognition, vision, balance, strength, coordination, reflexes and sensation. The purpose of this is to confirm the presence of the dysfunction complained of and to localize it to a particular area of the brain.

Following the initial clinical examination the neurologist will obtain and review images of the brain (MRI or CT) to confirm, localize, and characterize any lesions that might correlate with the patients’ symptoms or abnormalities on examination. Other studies might be obtained such as an electroencephalogram (EEG) if there has been a suggestion of seizures, or tests for systemic cancer if the images suggest metastatic disease. Once the probability of a tumor is established, the patient will be referred to a neurosurgeon for either a biopsy or an attempt at removal of the tumor, depending on the suspected type.

After surgery has been completed and the diagnosis confirmed, a medical neurologist may again enter the picture as the patients’ primary medical contact. The increasing involvement of neurologists in the management of patients with brain and other nervous system tumors and their complications has given rise to the subspecialty of **neuro-oncology**. In addition to managing common problems in these patients such as seizures and headaches, neurologists interested in this area are involved in the administration of chemotherapeutic drugs, many of which are currently under investigation for patients with malignant brain tumors. In addition a neurologist is uniquely trained to monitor subtle changes in neurological status that may signal a tumor recurrence, a new neurological problem, or a complication from some other form of therapy a patient might be receiving such as radiation or chemotherapy.

Radiologist

Thomas Pincus, MD
Peninsula Radiological Associates

Diagnostic imaging plays an important role in the diagnosis, treatment planning, and post operative care of brain tumors. Symptoms caused by a brain tumor such as headache, personality changes, visual changes, or seizures prompt a physician to recommend diagnostic imaging tests to evaluate the underlying cause. Two modalities, Computed Assisted Tomography (CAT scan or CT), and Magnetic Resonance Imaging (MRI) provide the majority of diagnostic imaging of the brain and skull. Angiography may also be utilized in certain cases, particularly if the tumor has a large blood supply or originates from blood vessels.

CT scans use x-ray images from different angles around the patient with computer assistance to join the images for a complete cross sectional view of the body. CT scans are not only used for the evaluation of brain tumors, but are commonly used for the evaluation of stroke, bleeding, and trauma. Brain tumors may be found unexpectedly while evaluating these other problems. CT is a modality, which is widely available, fast, and performed with little discomfort to the patient. It readily detects problems caused by brain tumors such as bleeding, pressure on the brain, and bone involvement. It can also help to characterize certain types of tumors based on their characteristics such as calcification, cyst formation, or bleeding.

Newer techniques in CT allow tumors to be viewed from multiple angles and even in 3-dimensions. CT angiography can evaluate blood flow to the tumors as well. CT also allows precise biopsies of tumors to be performed with less risk to normal brain tissue. These factors aid in the treatment planning for tumors.

CT does cause some radiation exposure. The effective dose of a CT scan of the head is about 2 milliSievert (mSv), approximately the general background radiation over an eight month period. Most tumors require evaluation with an iodinated contrast, which sometimes can cause an allergic reaction. Simple pre-medications can be given to prevent reactions if a patient has a history of contrast reactions.

MRI is commonly used in the evaluation of tumors, as well as stroke and other disorders of the nervous system. It uses radiofrequency waves and a strong magnetic field to excite protons in the nuclei of hydrogen atoms of water. The MR image can be obtained and viewed from any angle and shows exquisite detail in differences in water content so that different tissues of the same structure, such as grey and white matter of the brain, can be distinguished. Different characteristics of tumor tissue can be analyzed, as well as problems caused by the tumor such as swelling, bleeding, or pressure on the adjacent normal brain structures. Newer techniques in MRI can evaluate metabolic differences in tissues, helping to identify viable tumor tissue. MRI can also be used to guide biopsies of tumors similar to CT. This knowledge aids in the treatment planning and follow up care of brain tumors.

MRI provides greater detail of brain tumors and the surrounding brain structures than CT. No radiation risk is involved. The procedure is painless, but takes a longer time than CT. A typical exam is between 20 to 45 minutes, with multiple different types of images obtained. Because of the strong magnetic field, some implanted devices such as pacemakers cannot undergo MRI scanning. Most metal plates and rods used in orthopedic surgery and most new aneurysm clips are able to undergo MRI scan-

ning. All patients are required to fill out a screening sheet to ensure the exam is safe for them.

Angiography of the brain and skull may be used to evaluate blood flow to tumors or to evaluate tumors of the blood vessels. Angiography can also be used to aid in pre-operative treatment of tumors by embolizing or blocking the blood supply to the tumor. In most cases, CT and MRI angiography are performed instead of routine angiography because they are less invasive and carry less risk.

Radiologists have been specifically trained in providing and interpreting medical images. The radiologist directs medical imaging with the assistance of technologists, physicists, and nurses. Once the images are obtained, the radiologist analyzes the images and collaborates with other physicians involved in the patient's care regarding the specific characteristics of the tumor, treatment planning, and the need for follow up imaging to evaluate treatment progress.

Neurosurgeon

James Lesnick, MD
Hampton Roads Neurosurgical and Spine Specialists

Neurosurgery plays a central role in the treatment of brain tumors, both benign and malignant. These tumors cause harm by either compressing or replacing critical brain tissue, or by increasing intracranial pressure due either to growth or blockage of the cerebrospinal fluid system. It is estimated that over 18,000 primary malignant brain tumors and as many as 170,000 metastatic (secondary) brain tumors will be diagnosed in the US in 2006. Meningioma, acoustic neuroma (vestibular schwanoma), and pituitary adenoma are the most common benign tumors affecting the brain, its vascular supply, and the cranial nerves, and have a collective incidence of up to 17 tumors per 100,000 people. Not all of these tumors are operable, but surgery can be curative in the case of benign tumors. The success rate in achieving local control of metastatic tumors is good and patient survival depends more upon the progression of their systemic disease. Unfortunately, little progress has been made in treating malignant astrocytomas and glioblastomas, the most malignant forms of primary brain tumors. While surgery has the potential to double the length of survival in these patients when combined with radiation therapy, treatment remains palliative and patients succumb from progression of the cancer within the brain.

The primary goal of neurosurgery is to obtain tissue for diagnosis and relieve the pressure effect of the tumor. Surgery can also assist by placing devices that deliver chemotherapy or radiation directly to the tumor bed or spinal fluid pathways. The operating microscope and recent advances in endoscopic surgery and computer-assisted image guidance have improved safety and shortened recovery time. Complete tumor removal is performed whenever possible, but success is dependent upon tumor location. When the tumor encases critical vascular or neurologic structures or is located in high-risk areas such as the basal ganglia, brainstem, or cavernous sinus, surgery may be inadvisable or be limited to biopsy or partial resection. Surgery can also be impractical when a cancer patient has multiple metastases rather than a single tumor within the brain. Half of all patients with metastatic cancer to the brain have a single lesion, 20% have two lesions, and 30% have three or more.

Stereotactic radiosurgery (SRS) may be offered to patients as an alternative to conventional open surgery by craniotomy and has had perhaps the most significant impact of any treatment in the past 20 years. In this treatment, a highly focused beam of radiation is applied from many different directions, passing harmlessly through normal tissue but summing to a lethal dose at the chosen target. Even complex target shapes can be treated with knifelike precision. Conventional surgery remains the most effective and immediate method of tumor removal, especially for large tumors and those associated with significant swelling. However, medical studies have shown that SRS can be as effective as conventional surgery in many cases with a higher level of safety, faster recovery, and lower cost. SRS may also allow treatment of tumors considered inoperable by conventional means. Nevertheless, treatment remains limited by critical nearby structures such as the optic nerves and brainstem, and by tumor size, and treatment dose must be reduced after a patient has received whole brain radiation therapy.

The GammaKnife® was the first of several devices now available for performing intracranial SRS. Over 400,000 patients have undergone treatment and more than 2000 studies have been published demonstrating it to be the most accurate and effective means of performing intracranial SRS. Treatment is performed as an outpatient and patients return to normal activity the next day. Accuracy is achieved by the use of a frame, attached to the patient's head under local anesthesia with sedation, used to connect the patient to the GammaKnife® unit.

The treatment of brain metastases has become one of the most common GammaKnife® applications. Studies have shown its effectiveness to be comparable to surgery when added to conventional radiation therapy and to be superior to radiation therapy alone. The success rate of local tumor control in the brain is consistently greater than 80%. It is effective in treating even radioresistant tumors such as metastatic renal cell carcinoma or melanoma. Evidence suggests that GammaKnife® radiosurgery applied to the treatment of multiple metastases produces results similar to those obtained in treating solitary metastases with conventional surgery. Finally, SRS may become an alternative to conventional whole-brain radiation therapy. While whole-brain treatment reduces the rate of recurrent cancer, there is a cost of potential neurotoxicity, especially late cognitive loss as patients survive longer following treatment. The alternative of repeated SRS for newly discovered metastases in patients followed with serial MRI scans has yet to be studied in a prospective randomized trial.

The neurosurgeon today has an expanded collection of tools, which can be applied to individualize treatment. The patient today has reason for new hope and will continue to be the beneficiary of further technological progress and clinical research.

Pathologist

Thomas Reagan, MD
Hampton Roads Neurology

Brain tumor, as pointed out in a previous section, is a general term that is used to include any tumor occurring inside the skull, whether or not it arises in the brain itself. Like tumors anywhere in the body, brain tumors may be considered either benign or malignant. Benign "brain tumors" most commonly arise from the coverings of the brain (**meningiomas**) or from the nerves inside the skull (**Schwannomas**), rather than from the brain itself and can usually be cured with surgical removal. Malignant brain tumors are also divided into two major groups, primary and metastatic. **Metastatic brain tumors** are those that have spread to the brain in patients with cancer in other organs.

Primary brain tumors originate in one of the cell types that make up the normal brain. In this group of tumors, the distinction between benign and malignant is of limited clinical value since complete surgical removal is rarely possible without damaging normal brain function. Rather than being called benign or malignant, these tumors are usually assigned a grade from 1 to 4 by the pathologist, grade 1 being the most slowly growing and grade 4 the most aggressive, **Neurons**, the primary functional cells of the nervous system, rarely give rise to tumors in adults. However, primitive precursor cells of neurons are the origin of a significant percentage of brain tumors in children. **Astrocytes** are the major supporting and repairing cells of the brain and are the origin of most primary brain tumors called **astrocytomas**. The most aggressive are the grade 4 astrocytomas, sometimes called **glioblastoma multiforme,** which has an extremely poor prognosis. Other supporting cells of the brain such as ependymal cells that line the cavities of the brain, oligdenroglial cells that form the myelin of the brain, and blood vessels all give rise to a variety of tumors. Overall there are over 30 recognized varieties of primary brain tumors that a pathologist must distinguish.

Thus, the pathologist plays a central role in the diagnosis of brain tumors. Clinical examination and imaging can lead to a high degree of suspicion of a brain tumor and even to a fairly confident guess as to its nature. However, ultimately it is the role of the pathologist to determine whether the suspect lesion is a tumor or some other process, like an infection, that can mimic a tumor clinically and on imaging studies. If it is a tumor he must decide what to call it based on the classification scheme mentioned above. This will be the determining factor in all further treatment decisions including the value of additional surgery, or the need for post-operative radiation or chemotherapy.

Although arriving at a correct diagnosis may sound like a simple matter, is often quite complicated and requires the employment of an array of sophisticated techniques of tissue analysis. Unless the neurosurgeon is very confident that he is dealing with a benign and surgically curable lesion, most tumor biopsies are done through a small hole in the skull using a needle like instrument guided by previously obtained imaging studies. This procedure is called a **stereotactic biopsy** and the amount of tissue obtained is usually very small. In this type of operation, multiple biopsies are usually taken, beginning at the edge of the suspected lesion. Typically the first, or even the first several biopsies are examined by the pathologist using frozen sections while the patient is still in the operating room. The

procedure of freezing, cutting thin sections, and staining the tissue takes only a few minutes and the surgeon will usually wait for the report from the pathologist before proceeding further. If the tissue does not reveal a definite diagnosis, additional biopsies and frozen sections are obtained. Once the pathologist is confident that the biopsies are from within a tumor, even though the type of tumor may be indefinite, additional biopsies are obtained and placed in a fixative solution for more definitive studies.

The pathologist must then work with the fixed tissue to arrive at a final diagnosis and may need to apply a number of techniques depending on the complexity of the case. In the simplest cases the diagnosis can be ascertained by looking through a microscope at thin sections of the fixed tissue stained with "routine" dyes (e. g. hematoxylin and eosin). Routine staining will usually reveal the basic nature of the tumor. However sometimes different tumor types may look similar in stained sections, especially when dealing with the tiny fragments. In those cases additional special staining methods may be necessary. The pathologist has a large array of special stains that will sort out almost any difficult diagnostic situation. Many of these are based on antibodies to unique tissue components that can be labeled and then reacted with the tissue sections to determine if that component is present. This technique is called **immunohistochemistry**.

Beyond that, if the diagnosis is still questionable, **electron microscopy** can be employed. It is an expensive and time-consuming technique that allows us to look at cells magnified thousands of times but may, on rare occasions, be necessary to discern the nature of cells not revealed at the light microscopic level.

Finally, even more sophisticated studies at the sub-cellular level such as analyzing the chromosomes contained in the tumor cells **(cytogenetics**) are becoming meaningful in some situations. For example, it has been found that some patients with a particular type of brain tumor (oligodendroglioma) have deletions of parts of two chromosomes in their tumor cells. These patients have a much better outlook and response to treatment than patients with identical tumors but without the cytogenetic abnormality. It is likely that in the future molecular and genetic analysis may have increasing significance both in diagnosis and therapy of brain tumors.

Medical Oncologist

Guy Tillinghast, MD
Peninsula Cancer Institute

Ideally, the treatment of brain tumors should involve a multidisciplinary team including neurologists, neuroradiologists, neurosurgeons, neuropathologists, radiation therapists, and oncologists. Following surgery or radiation, the oncologist becomes the first line of care for the patient: from coordinating follow-up chemotherapy if needed, to monitoring the patient's response to surgery or radiation, even to coordinating gene testing to determine the appropriate course of treatment. Oncologists provide a wide range of services that include on-going supportive care and long-term follow-up.

Brain tumors tend to fall into two very general catagories: A **primary brain tumor** is one that originates in the brain. A **metastatic brain tumor** is one that derives from a cancer located elsewhere in the body, e.g. breast cancer or lung cancer. Currently, the main methods of treatment for primary brain tumors are **surgery** and **radiation**, with **chemotherapy** having only occasional use—most commonly to enhance the effectiveness of radiation. The treatment for metastatic brain tumors is similar to that of primary brain tumors, but much more complex in that it must be carefully coordinated with the treatment of the primary cancer (breast cancer or lung cancer).

There are brain tumors in which only **surgery** (including **radiosurgery**, such as gamma knife surgery) is used, including craniopharyngioma, meningioma, glomus body tumor, acoustic neuroma (vestibular schwannoma), and chordoma. **Radiation** may be used if there are portions of a brain tumor that could not be removed surgically or if the brain tumor is completely inoperable. The remaining brain tumors (except central nervous system lymphoma and germ cell tumors) are treated with a combination of surgery and radiation. Astrocytomas, medulloblastomas, oligodendrogliomas, and ependymomas fall into this group.

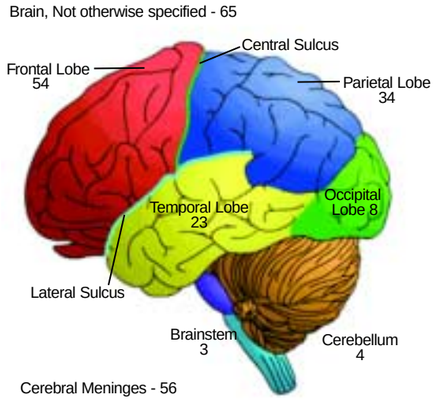
Chemotherapy is the main method of treatment in central nervous system lymphoma and in germ cell tumors within the brain, (e.g. testicular cancer that arises in the brain, resulting from residual testicular cells left over from the embryonic stage becoming cancerous). Chemotherapy also has been shown to have an impact on survival in the glial-derived tumors (such as astrocytoma and oligodendroglioma) and the primitive neuroectodermal tumors (such as medulloblastoma), when used as a follow-up to radiation or surgery. In addition, **gene testing** is available to assist the oncologist with chemotherapy decision-making. For example, patients with a particular gene in their brain tumor could be resistant to chemotherapy, and therefore other treatment should be pursued. However, in patients with oligodendroglioma, gene testing usually shows a loss of certain chromosomal regions in their brain tumor, which predicts a sensitivity/responsiveness to chemotherapy. Patients with medulloblastoma should undergo an magnetic resonance image of their spine as well as additional evaluation to determine who should receive chemotherapy in addition to radiation.

While the treatment for some brain tumors is relatively straight forward, some tumors are more complex and therefore require considerable clinical judgment and thorough discussion among the members of the multidisciplinary team. For example, oligodendrogliomas are highly variable tumors, with some that are fast growing (high grade) and others that grow very slowly. A policy of "watch and wait" can sometimes be considered after surgery, with either a second surgery or radiation added at the time of recurrence.

In coordination with the other specialists, the oncologist orders the follow-up **Magnetic Resonance Imaging** (MRI) scans, usually every three months, in an effort to monitor the status of the brain tumor. In the first three months after radiation, brain tumors may appear to worsen, due to the fact that radiation disrupts the blood/brain barrier, and some swelling may occur. In this case, the oncologist typically prescribes steroids to help reduce the swelling and continues to carefully monitor the tumor.

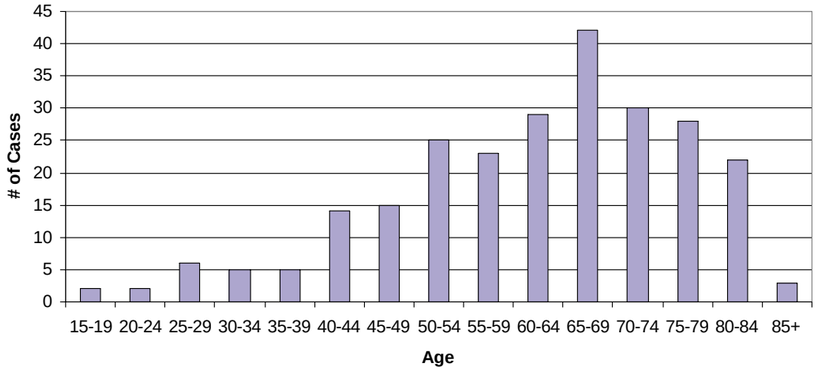
In addition to relying on current treatments for primary brain tumors, the oncologist also continually researches opportunities for patients to participate in **clinical trials**, if the patient's situation makes him/her a good candidate. Clinical trials typically involve variations in the standard treatment of brain tumors and can provide a better opportunity to reduce or eliminate the tumor. The oncologist coordinates the activities of the other members of the multidisciplinary team in this endeavor. Therefore, it is important for the oncologist to be well-versed in the basics of cancer biology to discern the most promising therapies.

1996-2005
Bening and Malignant Brain Tumors by Location



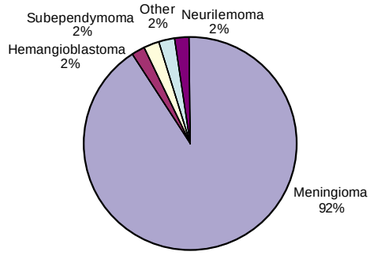
The figure left illustrates the number of brain tumors (both benign and malignant) found in each of the lobes of the brain between the years of 1996-2005. The lobe is listed, followed by the number of cases. The majority of the benign brain tumors at Riverside Regional Medical Center are found in the meninges (56 cases) surrounding the brain, while most malignant tumors are located in the frontal (54 cases), parietal (34 cases), and temporal (23 cases) lobes. Additionally, 56 tumors were classified as Brain, Not Otherwise Specified as the specific lobe of origin was not identified.

1996-2005 Brain Tumors - Benign + Malignant - Age at Diagnosis

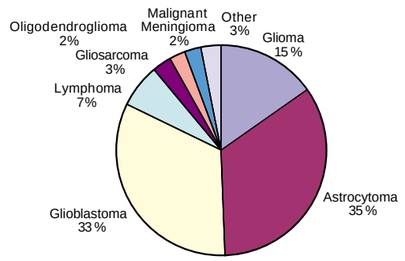


As the graph suggests, the majority of brain tumors are diagnosed between 60 and 75. However, there are some outliers in which patients are diagnosed and/or treated at young age.

1996-2005 Benign Brain Tumors Histology

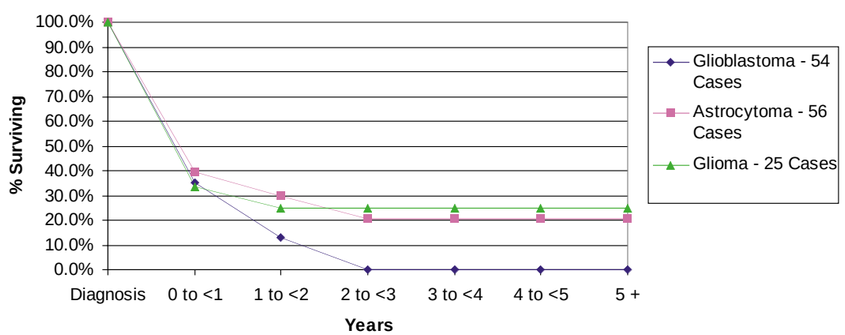


1996-2005 Malignant Brain Tumors Histology



As the graph suggests, the majority of brain tumors are diagnosed between 60 and 75. However, there are some outliers in which patients are diagnosed and/or treated at young age.

1996-2005 5-Year Survival Top 3 Malignant Brain Tumor Histologies



Of the top 3 malignant brain tumors diagnosed/ treated at Riverside from 1996 to 2005, glioblas- tomas appear to have the worst prognosis as 0% of patients lived three years past diagnosis. Gliomas and astrocytomas have a 5-year survival residing between 20 and 30%.

Glossary of Terms

Accession

The addition of new cancer cases to the Riverside Cancer Registry.
Each patient is assigned a separate and permanent accession number.

Class of Case

Analytic: The determination of a patient's diagnosis and treatment status at first admission to Riverside Regional Medical Center.

Non-Analytic: Any case first diagnosed and/or receiving all or part of the first course of treatment at Riverside (Class 0, 1, 2).

Any case diagnosed prior to RRMC's reference date (1/1/79), or diagnosed elsewhere and receiving the first course of treatment at that facility, or diagnosed at autopsy (Class3, 4, 5).

Stage of Disease

A process by which the extent of disease at the time of diagnosis is rated according to a recognized system of classification. This process allows morbidity, mortality and treatment efficacy to be reviewed across similar categories of patients.

Summary Stage: General stating system to categorize most cancer sites.
In situ - Non invasive cancer. Also termed pre- invasive, non-filtrating, or Stage 0. A cancer in this category has not spread beyond the immediate area of diagnosis.
Local - Tumor confined to tissue of origin of origin.
Regional - Tumor that has spread directly to adjacent organs or tissues and/or to regional lymph nodes, but has spread no further.
Distant - Tumor that has spread to parts of the body remote from the organ of origin.
Unknown - Stage cannot be determined.

TNM Staging: The American Joint Commission on Cancer Staging System is used at RRMC and is based on assessment of three components:
T - Extent of primary tumor.
N - Extent of regional lymph node metastasis.
M - Absence or presence of distant metastasis.

Age of Patient

Analytic cases: Age is recorded in completed years at time of diagnosis.
Non-Analytic cases: Age is recorded as patient's age when first entered into RRMC Cancer Registry.

Notes