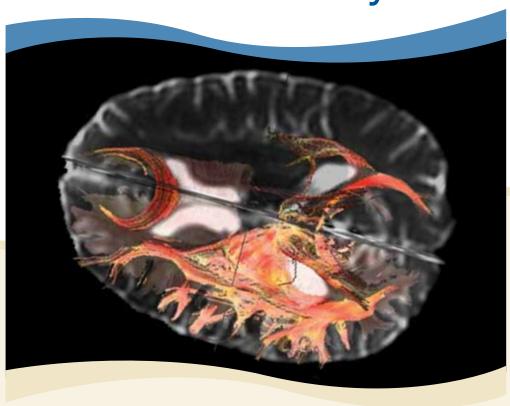
Legacy Cancer Institute

Annual Report 2011
Brain and Central Nervous System Cancers



Legacy Cancer Institute



Contents

Medical Director's report1
Comprehensive cancer services
Legacy Cancer Institute overview: Highlights from 2011
Legacy Health 2011 site analysis: Adult brain/CNS
Legacy Health 2011 site analysis: Pediatric neuro-oncology
Cancer data management
Adult gliomas: Molecular markers serve as adjuncts to histopathology in diagnosis and treatment
Current trends in neuro-imaging
Neurosurgery and brain tumors
Role of stereotactic radiosurgery in patients with brain metastasis $\dots 18$
Role of chemotherapy in brain tumor treatment
Role of rehabilitation in neuro-oncology
Cancer Liaison Physician report: Cancer program practice profile reports 21
Quality and process improvements
Cancer clinical research
Community involvement
Professional education activities
Publications
Legacy Cancer Institute Network Cancer Committee members28

Legacy Cancer Institute benefits from the generous participation of individuals and organizations that are also dedicated to finding cures for cancer, helping the less fortunate receive care and improving treatment, equipment and facilities at each of our medical centers. To learn how you can support Legacy Cancer Institute, please contact the Office of Philanthropy at 503-415-4700 or visit www.legacyhealth.org/giving.

To the head of the class...

By Nathalie Johnson, M.D., FACS, medical director, Legacy Cancer Institute and Legacy Breast Health Centers

Where does the time go? I can't believe another year has gone by already, and it's time to update



you on all the new and exciting things occurring at Legacy Cancer Institute. As you read through our annual report, I think the multifaceted, yet still patient-centered programs that continue to evolve will impress you. The

level of physician and staff competence, commitment and accomplishment is amazing. This is truly the backbone on which we continue to grow and flourish with our mission ever in mind: "Our legacy is good health, for our people, our patients, our communities and our world. Above all, we will do the right thing."

This year we want to bring particular focus to our brain and central nervous system (CNS) program and the unique dedication, skill, technology and research that have long been its hallmarks. We were the first in the region to bring a technology that allowed stereotactic radiosurgery — Novalis — for brain lesions. We also have the capability for treatment of non-CNS areas. Novalis has served us very well, but in this day of rapidly changing technology, it doesn't take long until it is time to "upgrade." In 2012, we will bring in a new Gamma Knife technology that will allow our radiation oncologists and neurosurgeons to combine their efforts to treat primary and secondary brain lesions more aggressively and accurately. This we hope will translate into longer and better quality of life for our patients.

I must also pause to recognize the physicians. Jefferson Chen, M.D., Ph.D., FAANS, FACS, FCCM, has been a champion of research in the arena of brain tumors and has brought numerous clinical trials to Legacy Cancer Institute that have improved care for our patients and inspired our team to higher performance in all arenas of patient care. Andrew Kee, M.D., has also played a pivotal role at the Institute with leadership, compassion and deep knowledge in the treatment of brain tumors for both adult and pediatric patients. Finally, for CNS oncology at Legacy Cancer Institute, our cancer social worker, Wendy Talbot, LCSW, OSW-C, brings her unique skills in facilitating care for our patients, and her passion keeps us focused on the whole person, not just their brain.

As we speak about all arenas of our patients' care, it is a natural lead in to the growth of our integrative services that encompass all phases of treatment: from the diagnosis of cancer to survivorship and, in some cases, symptom management and palliation. We have given extra attention to patients living with metastatic disease. As awareness rises, these patients face many issues that can be unique to them. To enrich their quantity and quality of life, we have focused on providing not only therapeutic and clinical research advantages, but also on improving the spiritual, emotional and social care offered. We are really working to operationalize this concept so we can always provide what is, at times, even more important than a new drug or radiation device. This helps the patient and family where they spend most of their time, at home. You will see new and exciting programs on therapeutic touch and multidisciplinary team outreach — all with the Triple Aim at the core: better service and higher quality with contained cost.

We hope as you flip or scroll through the pages of our report, you will see all these precepts identified. We are certain you will agree that Legacy Cancer Institute is at the head of the class.

Comprehensive cancer services

For more information about our services, please visit legacyhealth.org/cancer.

Cancer care and treatment

Cancer care conferences/tumor boards

Cancer Care Unit

Cancer data management/cancer registry

Cancer screening and prevention

Cancer Rehabilitation Services

Day Treatment/Infusion Clinics

End-of-life care/Legacy Hospice/

Legacy Hopewell House Hospice

Interventional radiology

Legacy Breast Health Centers

Legacy Cancer Healing Center

Legacy Genetics Services

Pain management

Palliative care program

Radiation oncology

Surgical oncology

Wound and ostomy care

Cancer programs and specialty areas

Autologous stem cell transplant program

Bladder cancer

Blood cancers

Brain and central nervous system cancers

Breast cancer services

Children's cancer and blood disorders program

Colorectal cancer services

Esophageal cancer

Gynecologic cancers

Head and neck cancer

Hepatobiliary and pancreatic cancer program

Kidney cancer

Lung cancer

Prostate cancer

Stomach cancer

Clinical trials and research

Current clinical trials

Oncology clinical research

Tumor bank

Support services — Adult

American Cancer Society Gift Closet

Cancer support groups and classes

Green Gables guest house

Oncology nurse navigator/American Cancer

Society patient navigator

Survivorship

Volunteer program

Support services — Pediatric

Child Life Therapy

Family Lantern Lounge

Family Wellness Center

Music Rx® Program

Pediatric development and rehabilitation

Ronald McDonald House

School program

Survivorship Services

Legacy Cancer Institute overview: Highlights from 2011

By Jefferson W. Chen, M.D., Ph.D., FAANS, FACS, FCCM, neurosurgeon, chair, Network Cancer Committee

The goal of this report is to recognize the outstanding work in cancer care and research that is being done at Legacy Health. We honor the



fortitude of cancer patients in general and in this issue pay tribute to patients with brain tumors and brain cancers. It has been my privilege to chair the Legacy Network Cancer Committee and to work with all of the members to further

build on a previous exceptional year in which Legacy was honored with the ACS CoC Outstanding Achievement Award.

The clinical programs continue to be robust, particularly the Children's Cancer and Blood Disorders Program, and our breast, colorectal, prostate and hepatobiliary programs. The brain tumor program has joined these other programs (and is now in the top seven analytic sites) with increased emphasis on the multispecialty conference, case reviews, treatment options and clinics. The survivorship program and the support group programs provide broader dimensions and directions to cancer care beyond the traditional surgical, radiation and oncology modes.

Community and professional outreach events continue to be key in Legacy Health's impact on our region. This year was highlighted by the participation in many community events, including the Breast Cancer Issues Conference, Cancer Survivors' Day, the Woodburn Community Health Fair, Worship in Pink breast cancer awareness program, the Rosa Parks Community Health Fair in North Portland, and the Light the Night walk for leukemia and lymphoma.

In terms of professional education, Legacy Cancer Institute offered a full-day CME event, the 7th Annual Pacific Northwest Excellence in Breast and Gynecologic Care Conference, which attracted more than 160 participants, including physicians and allied health care providers.

Highlights included the role of the fallopian tube in relationship to ovarian cancer, fertility options for women with breast and/or gynecologic cancer, triple negative breast cancer treatment and the research surrounding completion axillary dissection, among other topics. Henry T. Lynch, M.D., presented his work on endometrial carcinoma in Lynch syndrome.

Legacy Cancer Institute hosted the 28th Annual Seminars in Radiation Oncology Conference. More than 80 participants attended talks on the impact of reconstruction with radiation therapy, breast brachytherapy, hypofractionation and the role of acupuncture for symptom management.

Also offered in 2011 was the Northwest Marrow Transplant Program Stem Cell Transplant (SCT) Conference, covering transplants for multiple myeloma, chronic leukemia and challenges in long-term survivorship for SCT patients.

Clinical trials are a cornerstone for advancement in the care of cancer patients. Legacy Health is active in a range of clinical trials. The interface with the restructured Legacy Research Institute has allowed for increased access for our patients. The trials are rigorously reviewed by the Legacy Institutional Review Board, as well as other review boards to ensure the protection of patient rights and safety. Legacy patients are involved in cooperative group trials via the NCI (National Cancer Institute), as well as numerous high-quality, phase III multi-center industry-sponsored clinical trials.

Legacy Health encourages innovation and translational research by its staff, and there are several single institutional trials such as the 5-ALA fluorescence trial to help with brain tumor resections (see Research section, page 24).

An overall increase in participation in clinical trials by Legacy cancer patients has been noted: 327 patients or 13.6 percent were enrolled in clinical trials in 2010 compared to 350 patients or 16.5 percent in 2011.

Improved survival in the major cancers, including breast, colorectal, prostate, ovarian and head and neck cancers, has been demonstrated in recent years. Much of this has been attributed to adjuvant chemotherapy, such as that for stage III colon cancer after the 1989 recommendation and the approval in the 1990s of the use of paclitaxel for the use of stage III/IV ovarian cancer. However, despite the improved and increased options for systemic chemotherapeutic agents, the vast majority have poor penetration across the bloodbrain barrier. Thus, they are largely ineffective for brain metastases. Neurosurgical extrication of these metastatic brain cancers is very effective if solitary; however, the role of adjuvant brain radiation, either stereotactic, e.g., Novalis or Gamma Knife, or whole brain, is critical (see the radiation oncology section, page 18). The role of newer chemotherapeutic agents that have better passage across the blood-brain barrier has also improved control of these tumors (see the neuro-oncology section, page 20).

The multispecialty approach is key to providing the best care for our cancer patients. Not only does this involve tumor boards and conferences, but also a commitment to both clinical and basic/translational research. Attention to the social, emotional, spiritual and physical needs of cancer patients is vital to helping them and their families through these difficult times. Legacy Cancer Institute is committed to providing the best clinical and non-clinical services. Our host of services — including patient navigators, support group meetings, survivorship, cancer rehabilitation, genetic screening and hospice — are embraced by Legacy Cancer Institute and funded by Legacy Health.

Legacy Health 2011 site analysis: Adult brain/CNS

By Jefferson W. Chen, M.D., Ph.D., FAANS, FACS, FCCM, neurosurgeon

The treatment of tumors of the brain and spine has evolved in recent years with the rapid expansion of new techniques for diagnosis, surgical excision, molecular characterization and the applications of adjuvant therapy. Legacy Cancer Institute treats a wide variety of pathologies. An examination of the Legacy Health adult primary site table for 2011 (Table 1, page 6) reveals that the number of CNS tumors has been fairly constant over the last few years. These tumors are treated at all of the Legacy sites. Tumors of the CNS are among the top seven primary sites for Legacy Health and nationally, according to American Cancer Society estimates found in Table 2 (page 7). The total numbers for brain and spine tumors represented in Table 3 (page 7) are largely adult primary brain tumors. Metastatic brain tumors are distinctly different because of the treatment paradigms. These are also seen and treated by the Legacy Cancer Institute. These metastatic tumors

are seen with increasing frequency, particularly as patients are demonstrating longer survival from their systemic diseases (see the article by Andrew Kee, M.D., on page 18).

The primary brain tumors are represented in the brain cancer histology distribution in Table 4 (page 8). The benign brain tumors, such as the meningioma, represent about a third of our cases (see Table 5 on page 8) and are treated most often by surgical excision followed by surveillance MRIs to watch for any recurrence. Primary gliomas are tumors that originate from the brain tissue itself and represent a large category treated by Legacy. The prognosis with the most common primary brain tumor of adulthood, the glioblastoma multiforme (GBM), is dismal. Nationally, survival is in the one- to two-year range from the time of the initial diagnosis. Unfortunately, these tumors affect patients of all ages, with most being in the 40-70 year range (see Table 6 on page 8). There is

no gender predilection in the brain tumor population (see Table 7 on page 9).

Since 2005, the accepted treatment for GBM has been maximal surgical resection followed by concurrent radiation and chemotherapy^{1,2}. The recent evolution of the field has involved advances in technology to diagnose and plan the surgery (see Dr. Kaplan's report on page 16), increase the extent of resection (see neurosurgery report on page 17), and involve patients in clinical trials using new drug therapies or vaccines (see research section on page 24).

As demonstrated in the 2011 analysis of the first-course treatment (Table 8, page 9) as well as the tabulation of these patients that had their treatment in the Legacy system, the majority had their first course and subsequent adjuvant treatment with Legacy providers (see Table 9 on page 9). The Legacy Cancer Institute is unique in encompassing Legacy-employed groups and private-based physicians. This is particularly important with the treatment of the GBM where treatment is truly multispecialty, including the involvement of neurosurgery, radiation oncology, medical oncology and research (both clinical and translational).

The five-year survival data for both Legacy Health and the CoC for 2003-05 (see Table 10 on page 9) demonstrates poor survival, with Legacy being about 6 percent higher than the CoC at five years. These outcomes are likely due to newer treatment paradigms and participation in the clinical trials. These numbers are difficult to interpret because they include all CNS malignancies. This time frame also preceded the widespread institution of the treatment with Temodar (temozolomide) and radiation therapy. Preliminary analysis of more recent time frames suggests improved survival. The addition of Avastin (bevacizumab), a monoclonal antibody directed against the VEGF (vascular endothelial growth factor), with the accelerated FDA approval (2009) for its use in brain tumors, certainly will change the survival data.3,4

We have entered the era of tailored therapy for the treatment of the malignant gliomas. The

molecular characteristics of these tumors have been explored and certain profiles have been shown to be more or less amenable to treatment. For example, the identification that one-third of patients have the EGFR (epidermal growth factor receptor) mutation has opened up clinical trials for the development of vaccines against this mutation. The methylation status of key genes in these tumors can be determined via neuropathologic analysis of tumor specimens. The O(6)methylguanine-DNA methyltransferase (MGMT) gene encodes a DNA repair enzyme that can diminish the effects of alkylating chemotherapy, e.g., Temodar. If this gene is methylated (and thus turned off), the repair enzyme is thus turned off and the gliomas are more susceptible to the Temodar. The MGMT status is used in predicting response to standard treatments and tailoring treatment to optimize tumor killing.5,6 For example, if a poor response to Temodar is predicted, one might proceed with more aggressive surgical resection and the use of Avastin.

Through the coordinated efforts of neurosurgery, medical oncology and radiation oncology, the optimal treatment for patients with brain tumors is fashioned. Monthly and ad hoc multispecialty conferences are held to review the patient cases. Input from neuroradiology, neuropathology and research departments allows us to offer not only the standard of care therapy but also participation in Phase 1, 2 and 3 research trials.

- 1. Stupp R, Mason WP, van den Bent MJ, et al. Radiotherapy plus concomitant and adjuvant temozolomide for glioblastoma. *The New England Journal of Medicine* 2005;352:987-96.
- 2. Stupp R, Weber DC. The role of radio- and chemotherapy in glioblastoma. *Onkologie* 2005;28:315-7.
- 3. Cohen MH, Shen YL, Keegan P, Pazdur R. FDA drug approval summary: bevacizumab (Avastin) as treatment of recurrent glioblastoma multiforme. *The Oncologist* 2009;14:1131-8.
- 4. Moustakas A, Kreisl TN. New treatment options in the management of glioblastoma multiforme: a focus on bevacizumab. *OncoTargets and Therapy* 2010;3:27-38.
- 5. Nakada M, Furuta T, Hayashi Y, Minamoto T, Hamada J. The strategy for enhancing temozolomide against malignant glioma. *Frontiers in Oncology* 2012;2:98.
- 6. Ohka F, Natsume A, Wakabayashi T. Current trends in targeted therapies for glioblastoma multiforme. *Neurology Research International* 2012;2012:878425.

TABLE 1 Legacy H	ealth 2	011 adul	t prima	ary sites	(>18 ye	ars; 97.5	percent	of Legacy	analyt	ic cases a	re adult	s)
	Ema	nuel	Good Samaritan		Merid	Meridian Park		Mount Hood	Salmon Creek		Legacy Health	
Primary site	Patient count	Percentage of total	Patient count	Percentage of total	Patient count	Percentage of total	Patient count	Percentage of total	Patient count	Percentage of total	Patient count	Percentage of total
Ampulla of vater	_	_	1	0.1%	_	_	_	_	_	_	1	0.0%
Anus/anal canal	_	_	3	0.3%	5	1.1%	_	_	2	_	10	0.4%
Bladder	26	8.3%	14	1.4%	34	7.6%	18	7.6%	17	5.4%	109	4.7%
Bone/connective tissue	0	_	5	0.5%	3	0.7%	_	_	1	0.3%	9	0.4%
Brain/CNS	30	9.6%	14	1.4%	7	1.6%	12	5.1%	21	6.7%	84	3.6%
Breast	1	0.3%	313	30.4%	79	17.6%	62	26.3%	58	18.4%	513	21.9%
Cervix uteri	_	_	6	0.6%	_	_	1	0.4%	1	0.3%	8	0.3%
Colon	7	2.2%	48	4.7%	40	8.9%	12	5.1%	22	7.0%	129	5.5%
Corpus uteri	7	2.2%	74	7.2%	10	2.2%	3	1.3%	6	1.9%	100	4.3%
Endocrine	3	1.0%	_	_	2	0.4%	2	0.8%	2	0.6%	9	0.4%
Esophagus	_		5	0.5%	3	0.7%	1	0.4%	2	0.6%	11	0.5%
Fallopian tube	_	_	2	0.2%	_	_	_		_	-	2	0.1%
Gallbladder	_		3	0.3%	3	0.7%	2	0.8%		_	8	0.3%
Hodgkin's lymphoma	19	6.1%	3	0.3%	14	3.1%	10	4.2%	_	_	46	2.0%
Kidney	11	3.5%	39	3.8%	21	4.7%	1	0.4%	11	3.5%	83	3.5%
Larynx	3	1.0%		3.070	1	0.2%	1	0.4%	3	1.0%	8	0.3%
Leukemia	2	0.6%	11	1.1%	2	0.4%	1	0.4%	3	1.0%	19	0.8%
Lip/oral cavity	30	9.6%	1	0.1%	3	0.7%	1	0.4%	3	1.0%	38	1.6%
Liver/bile ducts	7	2.2%	11	1.1%	3 14	3.1%	4	1.7%	5	1.6%	41	1.7%
	20	6.4%	108	10.5%	59	13.1%	31	13.1%	36	11.4%	254	10.8%
Lung		0.4%					31	15.1%			31	
Lymphoma-NH	0	1.00/	11	1.1%	2	0.4%	_	2.00/	18	5.7%		1.3%
Melanoma	3	1.0%	14	1.4%	9	2.0%	9	3.8%	8	2.5%	43	1.8%
Mesothelioma	_	-	1	0.1%	_		_			_	1	0.0%
Multiple myeloma	4	1.3%	6	0.6%	5	1.1%	3	1.3%	_	-	18	0.8%
Pharynx	2	0.6%	_	_	2	0.4%	1	0.4%	3	1.0%	8	0.3%
Other site	5	1.6%	12	1.2%	9	2.0%	8	3.4%	8	2.5%	42	1.8%
Ovary	1	0.3%	21	2.0%	2	0.4%	2	0.8%	2	0.6%	28	1.2%
Pancreas	3	1.0%	15	1.5%	15	3.3%	8	3.4%	3	1.0%	44	1.9%
Penis	1	0.3%	1	0.1%		_	_	_		_	2	0.1%
Prostate	71	22.7%	211	20.5%	65	14.4%	22	9.3%	42	13.3%	411	17.5%
Rectum/rectosigmoid	2	0.6%	29	2.8%	10	2.2%	8	3.4%	6	1.9%	55	2.3%
Renal pelvis/ureter	3	1.0%	3	0.3%	6	1.3%	_	_	3	1.0%	15	0.6%
Salivary gland	3	1.0%	_	_	1	0.2%		_	2	0.6%	6	0.3%
Small intestine	1	0.3%	5	0.5%	4	0.9%	4	1.7%	2	0.6%	16	0.7%
Stomach	4	1.3%	6	0.6%	4	0.9%		_	5	1.6%	19	0.8%
Testis	4	1.3%	3	0.3%	3	0.7%	_	_	_	_	10	0.4%
Thyroid	35	11.2%	11	1.1%	7	1.6%	4	1.7%	17	5.4%	74	3.2%
Unknown primary	4	1.3%	12	1.2%	5	1.1%	4	1.7%	3	1.0%	28	1.2%
Urethra	1	0.3%	_	_	_	_	_	_	_	_	1	0.0%
Vagina	_	_	3	0.3%	_	_	_	_	_	_	3	0.1%
Vulva	_	_	5	0.5%	1	0.2%	1	0.4%	_	_	7	0.3%
Grand total	313	100%	1030	100%	450	100%	236	100%	315	100%	2344	100%

TABLE 2 Top seven sites 2011							
			Per	centage of t	otal		
Primary site	Legacy Emanuel	Legacy Good Samaritan	Legacy Meridian Park	Legacy Mount Hood	Legacy Salmon Creek	Legacy Health	American Cancer Society*
Breast	1	313	79	62	58	513	232,620
Prostate	71	211	65	22	42	411	240,890
Lung	20	108	59	31	36	254	221,130
Colon/rectum	9	77	50	20	28	184	141,210
Bladder	26	14	34	18	17	109	69,250
Brain/CNS	47	14	7	12	21	101	22,340
Corpus uteri	7	74	10	3	6	100	46,470
Total top seven sites	181	811	304	168	208	1672	973,910
Percentage of total analytic cases	8%	34%	13%	7%	9%	70%	58%

^{*}American Cancer Society 2011 estimated U.S. cancer cases

TABLE 3 2011 adult brain and CNS cancer cases by primary site at diagnosis						
Primary site	Total	Percentage of total				
Brain NOS	3	3.57%				
Brain, overlapping lesion	6	7.14%				
Cauda equina	1	1.19%				
Cerebellum, NOS	4	4.76%				
Cranial nerve, NOS	1	1.19%				
Frontal lobe	14	16.67%				
Meninges, cerebral	18	21.43%				
Meninges, NOS	11	13.10%				
Meninges, spinal	3	3.57%				
Nerve, acoustic	5	5.95%				
Occipital lobe	1	1.19%				
Parietal lobe	4	4.76%				
Spinal cord	2	2.38%				
Temporal lobe	9	10.71%				
Ventricle	2	2.38%				
Total	84	100%				

TABLE 4 2011 adult brain diagnoses by histology						
	Total	Percentage of total				
Astrocytoma, anaplastic	3	7.0%				
Atypical meningioma	1	2.3%				
Cavernous hemangioma	2	4.7%				
Choroid plexus papilloma	1	2.3%				
Desmoplastic nodular medulloblastoma	1	2.3%				
Fibrillary astrocytoma	2	4.7%				
Gemistocytic astrocytoma	1	2.3%				
Glioblastoma	24	55.8%				
Hemangioma	1	2.3%				
Mixed glioma	2	4.7%				
Neoplasm, uncertain behavior	1	2.3%				
Neoplasm, malignant	1	2.3%				
Oligodendroglioma	3	7.0%				
Total	43	100%				

TABLE 5 2011 adult CNS diagnoses by histology					
	Total	Percentage of total			
Atypical meningioma	1	2.44%			
Carcinoma in situ	1	2.44%			
Embryonal rhabdomyosarcoma	1	2.44%			
Fibrous meningioma	2	4.88%			
Meningioma	25	60.98%			
Neurilemoma, NOS	8	19.51%			
Transitional meningioma	3	7.32%			
Total	41	100%			

TABLE 6 2011 adult brain and CNS cancer cases by age at diagnosis						
Age	Brain	CNS	All brain/CNS cancers	Percentage		
18–19		_	_	0%		
20-29	5	_	5	6.0%		
30-39	4	5	9	10.7%		
40-49	8	3	11	13.1%		
50-59	6	10	16	19.0%		
60-69	10	8	18	21.4%		
70-79	7	6	13	15.5%		
80-89	2	5	7	8.3%		
90-99	1	4	5	6.0%		
Total	43	41	84	100%		

TABLE 7 2011 adult brain and CNS cancer diagnoses by gender						
	Brain	Percentage of total	CNS	Percentage of total		
Male	22	51.2%	12	29.3%		
Female	21	48.8%	29	70.7%		
Total	43	100%	41	100%		

TABLE 8 2011 adult brain and CNS first course treatment					
Treatment combination	Total				
Surgery	28				
Radiation	7				
Chemotherapy	_				
Surgery + radiation	3				
Surgery + chemotherapy	4				
Radiation + chemotherapy	_				
Surgery + radiation + chemotherapy	21				
Treated (75%)	63				
Not treated (25%)	21				

TABLE 9 2011 adult brain and CNS cases — Class of Case (CoC)						
Class of Case (CoC)	Brain	Percentage of total	CNS	Percentage of total		
CoC 00: Diagnosed at Legacy; all of first course treatment or the decision not to treat was done elsewhere.	4	9.3%	2	5%		
CoC 10–14: Diagnosed at Legacy or in a staff physician's office; all or part of first course treatment or the decision not to treat was done at Legacy.	38	88.4%	27	66%		
CoC 20–22: Diagnosed elsewhere; and all or part of first course treatment was done at Legacy.	1	2.3%	12	29%		
Total	43	100%	41	100%		

TABLE 10 Five-year survival data — adult brain and CNS malignancies							
Observed five-year survival, NCDB data, 2002–05 diagnoses*							
	0 year	1 year	2 year	3 year	4 year	5 year	
Legacy Health	100%	47.7%	37.8%	33.6%	31.3%	30.1%	
CoC (1372 programs)	100%	51.7%	35.5%	29.5%	26.4%	24.2%	

^{*}Most current data available from the NCDB

Legacy Health 2011 site analysis: Pediatric neuro-oncology

By Faith C. Galderisi, D.O., children's cancer and blood disorders, neuro-oncology, Randall Children's Hospital

Central nervous system (CNS) tumors are the most common solid tumors of childhood, second only to leukemia and lymphoma in overall cancer incidence



in the pediatric age range. However, cancer in childhood is not a common entity; only 1 in 7,000 children age 0 to 14 will be newly diagnosed with cancer in the United States each year. CNS tumors account for nearly 20 percent of these

cases. The Children's Cancer and Blood Disorders
Program at Randall Children's Hospital at Legacy
Emanuel diagnoses approximately 60 new cases of
childhood cancer each year (Table 11, page 12). The
Brain and Spinal Cord Tumor Program, a component
of the Children's Cancer Program, often exceeds
these average percentages of the number of CNS
tumors evaluated and treated annually.

General facts and statistics about pediatric brain tumors

- 3,000 to 4,000 children are diagnosed with brain tumors annually in the U.S.
- Every day, nine children in the U.S. are diagnosed with a brain tumor.
- There are 130 different types of brain tumors, making diagnosis and treatment complicated.
- Pediatric brain tumors are distinct from adult tumors and treatment approaches often differ.
- Children under 5 years of age have the highest incidence of brain tumors, comprising one-third of all pediatric brain tumor cases.
- Pediatric brain tumors are the leading cause of cancer-related deaths in children 18 and under, accounting for 24 percent of cancer-related deaths in 1997 among persons up to age 19.
- Combined five-year survival rates have increased slowly in the past 10–20 years and are now between 60 and 70 percent.

- Outcomes range from curable, as in cerebellar astrocytoma, to uniformly fatal, as in pontine glioma.
- Improving future outcomes will only come about through cooperative investigation into the causes of brain tumors and targeted individualized treatments.
- Although many children will survive, they are often left with long-term side effects .
- Enhancing the quality of life for brain tumor survivors requires access to high-quality specialty care, well-planned clinical trials, consistent follow-up care and comprehensive rehabilitative services.

Brain and Spinal Cord Tumor Program at Randall Children's Hospital facts and statistics for 2011

- There were 17 new neuro-oncology cases presented to our program in 2011, accounting for 28 percent of new oncology cases for the year (Table 11, page 12).
- These 17 new cases comprised 12 different histologies (Table 12, page 12).
- Of the 17 cases diagnosed in 2011, 17.6 percent of the patients were under the age of 5 years, and 88 percent were under the age of 13 (Table 13, page 12).
- The five-year survival rate for children diagnosed with CNS tumors from 2003 to 2005 is 76.5 percent (Table 14, page 12).
- Our pediatric neuro-oncology team consists of many experts dedicated to offering personalized management and treatment, while applying the newest information and up-to-date treatment.
- Our team is led by a board-certified pediatric neuro-oncologist, an APHON-certified pediatric neuro-oncology nurse and a neuro-oncology pediatric nurse practitioner, who is dedicated to

managing late affects and long-term follow-up needs. Our comprehensive multidisciplinary team also includes pediatric neurosurgeons, a radiation oncologist, a neuropsychologist, pediatric neurologists, pediatric endocrinologists and pediatric physiatrists, as well as dedicated social work, nutrition, rehabilitation and school support.

- The team of pediatric specialists at the Randall Children's Hospital provides complete, multidisciplinary therapy for children with tumors of the brain and spinal cord (Table 15, page 12).
- The Brain and Spinal Cord Tumor Program team holds a monthly multidisciplinary meeting to discuss the complex needs of each child's care, as well as a bimonthly tumor board to discuss specific cases and review scans, biopsies and other studies.

Current management and future direction

Surgery is generally the initial constituent of brain tumor management, providing a basis for determining histology and reducing tumor volume, except in lesions with a pathognomonic MRI appearance and infiltrative growth, such as diffuse intrinsic pontine gliomas. The extent of surgical resection affects prognosis for most childhood brain tumors. The addition of chemotherapy and irradiation has led to improvement in progression-free and overall survival in various tumors, such as metastatic medulloblastoma. For other tumor types, such as low-grade gliomas, administration of chemotherapy has permitted us to delay radiation administration or to refine radiation, both of which decrease potential late effects of treatment.

Advances in imaging techniques, surgical technology, radiation delivery and risk-adapted chemotherapy have improved outcomes for most children. Despite these advances, significant opportunities exist for improvement in the treatment of childhood brain tumors.

The primary areas of research in the diagnosis and treatment of childhood CNS tumors are focused on molecular phenotyping, biologically directed therapy, and clinical trials designed to maximize efficacy and minimize sequelae of conventional chemotherapy and radiation. Newer

technologies, such as gene, protein and chromosome arrays, are expected to lead to improved classification and refinement in molecular characterization of these lesions. The ultimate goal is to identify effective molecular agents, and to tailor and risk-stratify therapy according to more specific biological features rather than only histopathology.

The Brain and Spinal Cord Tumor Program at Randall Children's Hospital is proud to be a part of these rapid advances. We are a member of the Children's Oncology Group, a worldwide cooperative clinical trial group supported by the National Cancer Institute (NCI) and fashioned with the mission of studying childhood cancers. Through this close-knit network we participate in Phase II and Phase III clinical trials, providing our brain tumor patients with access to leading treatment and therapies.

Fortunately, every aspect of care is readily available to us at Legacy Health: state-of-the-art technology in pathology, cytogenetics and molecular diagnostics, as well as radiation oncology, pediatric neurosurgery and superb inpatient and outpatient rehabilitation.

Conclusion

The treatment of childhood CNS tumors is complex due to diversity of pathology, difficulty of surgical removal, global impact of treatment and disease itself, the rapidly developing child, and variability in response to treatment. For this reason, quality management of these patients requires a multidisciplinary effort with pediatric subspecialists in oncology, neurosurgery and radiation oncology. Additionally, active participation of other specialists, such as physiatrists, neurologists, endocrinologists, neuropsychologists, audiologists, neuro-ophthalmologists, child life specialists, social workers and dietitians, is necessary to provide optimal care for these patients. All are available to us at Legacy Health.

It is a privilege to care for these children, and all the members of Brain and Spinal Cord Tumor Program continue to strive to meet the highest expectations, providing expert family-centered medical care.

TABLE 11 Legacy Health 2011 pediatric primary sites						
Primary site	Patient count	Percent of total				
Bone/connective tissue	8	13.3%				
Brain/CNS	17	28.3%				
Endocrine	1	1.7%				
Hodgkin's lymphoma	2	3.3%				
Kidney	3	5.0%				
Leukemia	13	21.7%				
Liver/bile ducts	2	3.3%				
Non-Hodgkin's lymphoma	7	11.7%				
Other site	1	1.7%				
Ovary	1	1.7%				
Thyroid	5	8.3%				
Total	60	100%				

TABLE 12 Brain tumors in children, 2011*					
	National figures [†]	Randall Children's Hospital			
Brainstem glioma	10-20%	_			
Cerebellar astrocytoma	10-20%	12%			
Choroid plexus tumor	1–4%	6%			
Craniopharyngioma	6-9%	_			
Ependymoma	5-10%	_			
High-grade supra- tentorial astrocytoma	10-15%	12%			
Low-grade supra- tentorial astrocytoma	15–25%	6%			
Medulloblastoma	10-20%	18%			
Pineal region and germ cell tumor	3–7%	12%			
Other	12–16%	34%			
Total		100			

^{*}Approximate incidence of common CNS tumors in children nationally compared to Randall Children's Hospital. †Source of national figures: Pizzo and Poplack, 5th edition

TABLE 13 2011 pediatric brain and CNS cancer cases by age at diagnosis								
Age	Brain	CNS All brain/CNS cancers		Percentage				
0-3	3	_	3	17.6%				
4-6	_	_	_	_				
7–9	5	1	6	35.3%				
10-12	6	_	6	35.3%				
13–17	_	2	2	11.8%				
Total	14	3	17	100%				

TABLE 14 Five-year survival data — pediatric brain malignancies							
Observed five-year survival, 2003–05 diagnoses							
	0 year	1 year	2 year	3 year	4 year	5 year	
Legacy Health (n=40)	100%	87.5%	82.2%	76.5%	76.5%	76.5%	

TABLE 15 2011 pediatric brain and CNS first course treatment				
Treatment combination	Total			
Surgery	7			
Radiation	_			
Chemotherapy	1			
Surgery + radiation	_			
Surgery + chemotherapy	2			
Radiation + chemotherapy	1			
Surgery + radiation + chemotherapy	5			
Treated (94%)	16			
Not treated (6%)	1			

Cancer data management

By Mindy Ansteth, B.S., CTR, manager, Legacy Cancer Data Management

Cancer data management (CDM) is a required component of all cancer programs accredited by the American College of Surgeons (ACS) Commission on Cancer (CoC) and is an essential element of Legacy Cancer Institute. To maintain and ensure Network Cancer Program status, our department is responsible for:

- Case finding and accessioning all Legacy
 Health cancer cases into the centralized registry
 database
- Conducting lifetime follow-up for all cancer patients diagnosed and/or receiving first course treatment at Legacy Health
- Submitting data to the National Cancer Database (NCDB), Oregon State Cancer Registry (OSCaR) and Washington State Cancer Registry (WSCR)
- Supporting and coordinating general and sitespecific cancer conferences
- Performing regular quality monitoring of registry data
- Representing the CDM department on the Network Cancer Committee and Cancer Quality Council
- Facilitating the Cancer Data Management Quality Council
- Fulfilling data requests for cancer program administration, physicians and research
- Reporting data at various Legacy Cancer Institute program development meetings
- Communicating with the American College of Surgeons (ACS) about survey expectations

The CDM department is staffed by five Certified Tumor Registrars (CTR) and four Cancer Registrars located throughout the five Legacy Health medical centers. Our team of cancer data experts captures a complete summary of the history, diagnosis, treatment and disease status for every

cancer patient initially diagnosed and/or receiving first course of treatment at a Legacy Health medical center.

The data collected by the Cancer Data Management department is used for quality improvement initiatives, outcomes analysis and cancer research. This includes tumor site quality dashboards to measure our compliance with evidence-based clinical practice guidelines endorsed by the ACS CoC and the National Accreditation Program for Breast Centers (NAPBC).

As an approved ACS CoC Network Cancer program, data collected by CDM is reported to the NCDB, which contributes to studies of cancer incidence, treatment and outcomes nationally. Data is also reported to the Oregon State Cancer Registry (OSCaR) and Washington State Cancer Registry (WSCR) where the data is integrated into population-based data systems used to study trends of cancer incidence, diagnosis, treatment patterns, survival rates and possible cancer clusters within the states of Oregon and Washington.

The CDM staff is required to attend educational conferences and webinars to remain current on the strict guidelines of data entry prescribed by the Commission on Cancer (CoC) and the North American Association of Central Cancer Registries (NAACCR). Each year, the CDM team also attends various educational seminars and webinars to stay abreast of the latest advancements in cancer diagnosis and treatment.

2011 accomplishments

The Cancer Data Management team exhibited excellent performance in 2011, with accomplishments including:

- Accessioning 2,404 new cases into the registry database
- Following more than 28,000 patients during the year and maintaining a 93 percent follow-up rate for patients diagnosed in the last five years,

and a 90 percent follow-up rate for all patients followed since the Cancer Program Reference Date in 1997

- Submitting all cases error-free to the NCDB Call For Data
- Reporting 2,049 cases to the OSCaR and 210 cases to the WSCR
- Reviewing 244 abstracts for quality and accuracy through physician quality abstract review
- Reviewing 246 pathology reports to ensure adherence to the College of American Pathologists (CAPS) protocols
- Coordinating and supporting 308 cancer conferences, where 1,411 patients were presented with staging discussed for 98 percent of cases:
- 122 breast care conferences
- 9 central nervous system conferences
- 26 gastrointestinal conferences
- 56 general cancer conferences
- 18 gynecology conferences
- 11 head and neck conferences
- 24 pediatric conferences
- 30 thoracic conferences
- 12 prostate/urology conferences
- Responding to 143 data requests from cancer program administration, physicians and requests for research
- Preparing for Rapid Quality Reporting System (RQRS) enrollment in 2012
- Attending the National Cancer Registrars Association (NCRA) conference in Orlando, Fla.
- Attending the OSCaR/OCRA and WSTRA Fall Workshops
- Training three new CDM staff members with preparations for CTR certification



Cancer Data Management staff includes, from left, front row: Melania Tolan-Hudson, RHIT, cancer registrar, Legacy Good Samaritan Medical Center; Janel McNally, CTR, Legacy Salmon Creek Medical Center. From left, back row: Mindy Ansteth, B.S., CTR, manager, Cancer Data Management; Lorraine Colwell, cancer registrar, Legacy Mount Hood Medical Center; Katie Fulcher, RHIT, cancer registrar, Legacy Meridian Park Medical Center; Dawn Cox, CTR, Legacy Good Samaritan Medical Center; Kathleen Mayer, CTR, Legacy Meridian Park Medical Center; Catherine Telford, CTR, Legacy Emanuel Medical Center: Leslie Griffith, cancer registrar, Legacy Emanuel Medical Center.

Adult gliomas: Molecular markers serve as adjuncts to histopathology in diagnosis and treatment

By Catherine Miles, M.D., anatomic and clinical pathologist, Legacy Laboratory Services

Gliomas are the most common primary CNS tumors in adults. There are several histological types and malignancy grades. Traditionally the



diagnosis of such tumors has been made by standard histopathology, often with very small tissue samples. The diagnoses have a profound impact on patient treatment plans that often include chemo- and radiation therapy.

In the last 15 years, molecular markers have been identified that serve as adjuncts to traditional histopathology in managing adult gliomas. Some markers help with diagnosis and classification while others estimate response to therapy and/or prognosis. Most of the molecular markers can be elicited from paraffin-embedded tissue by FISH, PCR or IHC.

At Legacy Health, pathologists regularly participate in the Multidisciplinary CNS Tumor Board. Histopathology and molecular markers are routinely incorporated into patient treatment regimens and are used for enrollment in clinical trials. A few of the molecular markers are reviewed here:

1p/19q loss

1p/19q deletions are seen in 80–90 percent of grade II and 50–70 percent of grade III oligodendrogliomas. The deletions are also found in 20–30 percent of mixed oligoastrocytomas. The deletions separate out a distinct subgroup of patients with more favorable responses to chemotherapy and improved survival times compared to patients with other types of gliomas. The testing can be performed by PCR or FISH on paraffin-embedded tissue and is "standard of care" in the treatment of pure oligodendrogliomas and mixed oligoastrocytomas. Detection of 1p/19q loss can also be used to make the appropriate

diagnosis in challenging cases with small biopsy samples in which the differential diagnosis includes other types of gliomas that typically lack the 1p/19q deletion versus oligodendrogliomas.

Isocitrate dehydrogenase (IDH) mutations

IDH1 and IDH2 somatic gene mutations are identified at high frequency in grades II and III diffuse gliomas (up to 83 percent) and in secondary glioblastomas (up to 86 percent). The mutations are rarely identified in primary glioblastomas (0.05 percent). The role of the IDH gene mutation as a prognostic indicator is still being defined. However, identification of the IDH1/2 mutations in biopsies by IHC can help the pathologist make the diagnosis of glioma in diagnostically challenging samples in which the differential diagnosis is a reactive process with gliosis versus a glioma.

Methylguanine-DNA-methyltransferase (MGMT) methylation status

Temozolomide, an alkylating chemotherapy agent, is the standard treatment for malignant gliomas. However, the cellular DNA repair mechanism MGMT interferes with its cytotoxic effects. Several studies have shown longer survival of patients treated with temozolomide in which the MGMT promoter gene is down-regulated leading to reduced concentrations of MGMT, compared to patients with normal MGMT levels. MGMT is not used as a basis for therapy because patients with normal MGMT levels still show a survival benefit when treated with temozolomide, even though the benefit is less than that seen in patients with reduced levels. MGMT methylation status does provide useful prognostic information that patients and oncologists often desire. The information may also be useful with future therapies and clinical trials.

Epidermal growth factor receptor (EGFR)

EGFR is one of many growth factor receptors that is up-regulated in gliomas with gene amplification seen in 60 percent of glioblastomas. Studies that examine the use of EGFR-targeted drugs in the treatment of malignant gliomas have yielded mixed results, and more studies are currently

underway. EGFR studies are currently used to establish a histopathologic diagnosis when small or less than optimal biopsy is obtained. The presence of EGFR-positive infiltrating tumor cells with the appropriate neuroimaging features can be highly supportive of the diagnosis of glioblastoma.

Current trends in neuro-imaging

By Andrew W. Kaplan, M.D., diagnostic and neuro-radiologist

There has been a significant evolution in recent years with respect to the role of neuro-imaging in the clinical management of patients with CNS



malignancies and other intracranial disorders. This change has been driven by exciting new technical advances that have enabled the addition of functional and physiological parameters to the standard repertoire of anatomic infor-

mation routinely provided by MRI. Functional magnetic resonance imaging (fMRI), MR spectroscopy (MRS), delineation of white matter tracts (diffusion tensor imaging and 3-D fiber tractography), diffusion-weighted imaging (DWI), and MRI perfusion techniques are entering the clinical mainstream. These are currently routinely used at Legacy Emanuel Medical Center in both the preoperative evaluation, as well as post-treatment follow-up of patients with intracranial disorders.

Advanced neuro-imaging techniques were initially introduced at Legacy Emanuel Medical Center with the acquisition in 2006 of a high-field 3 Tesla MRI scanner to complement the existing 1.5 T unit. This enabled higher resolution structural imaging of the brain, as well as provided a more robust platform for MR spectroscopy. Diffusion tensor and 3-D fiber tract white matter imaging were also introduced at that time. We now have several years of clinical experience with preoperative fMRI, which was introduced in 2008.

Functional MRI and white-matter tract imaging play complementary roles in current state-of-the-art pre-surgical planning. This combination of techniques provides for comprehensive mapping of language, sensorimotor and visual function by delineating eloquent cortex and white-matter tracts. This non-invasive mapping approach can provide valuable information to the neurosurgeon in planning the optimal surgical approach to a lesion, pre-operative risk assessment, size of needed craniotomy and determination of the extent of safe lesion resection or biopsy.

Acquired structural and physiologic information can be integrated with the image-guided navigation system available to the neurosurgeon in the operating room. MR perfusion and MR spectroscopy can add additional physiologic and metabolic information, which can be useful in the preoperative assessment of the nature of an intracranial lesion. These techniques can also be of use in helping to distinguish evolving post-treatment changes from recurrent tumor on imaging follow-up. Perfusion imaging may also play a role in helping detect early response to chemotherapeutic and immunotherapy agents. Ongoing technical advances in physiologic and functional techniques will likely result in a continued evolution of the role of neuro-imaging in the clinical management of patients with both benign and malignant intracranial disease.

Neurosurgery and brain tumors

By Jefferson W. Chen, M.D., Ph.D., FAANS, FACS, FCCM, neurosurgeon

In the 10 years since I did a report for the 2001 Legacy Cancer Institute annual report, there have been technological advances that have improved



the neurosurgeon's ability to safely and more effectively remove brain tumors. Neuronavigation techniques are routinely used to extricate skull base tumors, pituitary tumors, metastatic brain tumors and primary gliomas.

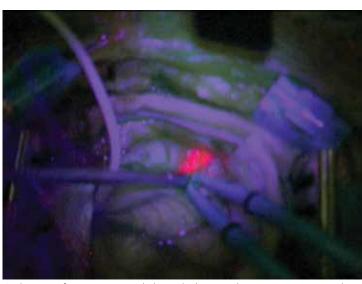
The identification of the safest corridor of attack to preserve normal function is key to improving outcome with all of these brain tumors. New MRI imaging modalities allow the identification of eloquent brain regions (areas that control speech and language), as well as the fiber tracks that connect these regions (see Dr. Kaplan's neuroradiology article on page 16).

National and international clinical trials have demonstrated that extent of resection is important in the long-term outcome of patients with high-grade gliomas. To this end, we have implemented additional techniques to help maximize the resection at the same time that normal neu-

rological function is preserved. Intraoperative neuromonitoring with corticography and EMGs in conjunction with awake anesthetic techniques are used routinely at Legacy Emanuel Medical Center. Furthermore, unique to Emanuel was the early implementation of the 5-ALA fluorescent labeling of gliomas. We obtained a special permit from the FDA and were able to offer the 5-ALA to 30 patients. This compound, a photoporphyrin derivative, is consumed by the patient prior to surgery. At the time of surgery, a special ultraviolet lamp in the microscope causes the tumor to fluoresce pink (see image at right). This improved delineation of the tumor allows for a more thorough resection.

Despite the improved technology that enables a safer and more complete tumor resection, the high-grade glioma (glioblastoma multiforme) is infiltrative in nature with a mean survival of 12–18 months. The improvements in longevity are largely attributable to radiation and chemotherapy. Malignant gliomas are treated in a multispecialty fashion. In addition to the Temodar (temozolomide) chemotherapy (see Dr. Look's article on page 19) and radiotherapy (see Dr. Kee's article on page 18), Legacy is involved in multicenter trials with new vaccines, chemotherapeutic agents and radiation paradigms for these malignant gliomas and other brain tumors (see Leslie Sorenson's article on page 24).

The Neurosurgery Department continues its efforts to study the molecular mechanisms of gliomas with a focus on the role of lysosomes, autophagy and apoptosis in the basic research laboratory. Donations from appreciative patients, their families and Legacy staff have allowed the continuation of these studies. The goal is to develop translational research paradigms for brain tumors.



At the time of surgery, a special ultraviolet lamp in the microscope causes the tumor to fluoresce pink.

Role of stereotactic radiosurgery in patients with brain metastasis

By Andrew Kee, M.D., radiation oncologist, Legacy Cancer Institute

With Legacy's commitment to purchase the Gamma Knife Perfexion as our next generation stereotactic radiosurgery (SRS) platform, I would



like to take this opportunity to summarize the advances in radiotherapy for our patients stricken with brain metastasis.

Radiosurgery was first described by a Swedish neurosurgeon, Lars Leksell, who treated both benign

and malignant tumors beginning in the late 1960s. This form of radiation therapy uses highly conformal radiation beams generated from linear accelerator or radioactive cobalt to treat distinct, clearly defined targets in the brain. The use of radiosurgery has now proliferated to treat hundreds of thousands of patients worldwide.

Approximately 20–40 percent of all patients diagnosed with malignancy will eventually have secondary brain tumors. Current advances in systemic therapy have improved survival but leave tumors untreated in the brain due to the bloodbrain barrier. In addition, advances in imaging with MRI have led to an increase in discovery of small brain metastasis.

In patients with a single brain metastasis, a survival benefit was seen for those who received SRS with whole brain radiotherapy (WBRT). In prospective trials, the addition of WBRT has been shown to reduce risk of brain recurrence by approximately 30 percent. Although WBRT has been widely used since the early days of modern radiotherapy and is appropriate for many patients with multiple brain metastasis today, there have been questions about whether WBRT should be used in the approximately half of the brain metastasis patients who have only one to three lesions. Despite the fact WBRT reduces brain recurrence, this therapy has not been shown in prospective trials to have an overall

survival benefit. In addition, a detailed neurocognitive test (Hopkins Verbal Learning Test) revealed a more frequent decline at four months when WBRT was used up front versus when delayed.

For most lesions under 3 cm, SRS will provide local control comparable to that of microsurgery in the range of 80–90 percent at one year. In comparison, the median length of local control with WBRT alone appears be in the range of 5–6 months. Thus, patients with limited brain metastasis, good performance status and systemically controlled disease are at a high risk of recurrence or progression of known intracranial disease simply by surviving longer than historical averages after receiving WBRT.

In some patients, due to mass effect, size or for purposes of diagnosis, surgical resection will be necessary. Adjuvant WBRT, which will reduce local recurrence in the operative cavity from 46–59 percent to 10–28 percent, is given in addition to reduce the rate of recurrence outside the operative cavity. An emerging therapy in postoperative patients is the utilization of SRS to treat the operative cavity. As previously noted, cognitive decline combined with the longer treatment course (2–3 weeks) with WBRT has cavity SRS becoming the preferred therapy in many patients.

There continues to be unanswered questions regarding the role of SRS as a definitive treatment or in the postoperative setting. The use of tumor bed SRS is increasing without a single published peer-reviewed prospective series. Also, the impact of WBRT on neurocognitive function is still not clearly elucidated. Thus, clinicians are encouraged to participate in ongoing phase III trials open here at Legacy. Intergroup trial N107C is a randomization between WBRT vs. surgical bed SRS. The second trial, N0574, is a randomization between SRS plus WBRT vs. SRS alone in the definitive treatment of brain metastasis.

Role of chemotherapy in brain tumor treatment

By Regan Look, M.D., medical oncologist

Moving your arm to pick up that morning cup of coffee is a complex interaction between neurons in your brain that coordinate activa-



tion of muscles in your arm. How does this happen? This effortless action is accomplished through millions of nerve cells, neurons and glial cells, which are interwoven extremely tightly, communicating seamlessly with

your muscles in a finely orchestrated flurry of neurotransmitters. Our brain is a masterpiece of development. Areas of the brain become specialized, each developing specific cerebral pathways that perform specific functions. For example, the occipital region of the brain processes photons that stimulate the retina at the rear of our eyes and form an image that allows us to perceive the world in its glorious colors.

Glial cells were once thought to be cells that supported the neurons. More recently, they are believed to communicate with themselves. neurons and blood vessels, through a basic ingredient — calcium. Our brain consists of about 90 percent glial cells and 10 percent neurons. Imagine one type of glial cell, an astrocyte, becoming aberrant through acquired genetic defects. Specific changes can lead to uninterrupted growth, a brain tumor. This smooth and streamlined connectivity between our brain fibers now becomes irregular, and an inchoate mass develops. Common presenting symptoms include headaches, seizures or a focal neurologic deficit, leading to difficulty with picking up that morning cup of coffee. Glioblastoma mulitforme (GBM), the highest grade of astrocytoma, makes up about 60 percent of all astrocytic brain tumors, equating to approximately two to three cases per 100,000 people per year. More than one-half do not survive 12-15 months and just 3-5 percent survive three years.

Delicate removal of the GBM involves the expertise of a neurosurgeon. Being awake during "stealth guidance" surgery allows for the best chance of having a gross total resection without loss of neurocognitive function. However, the glial cells of tumor and normal tissues are interdigitated, and microscopic removal is difficult to achieve.

Adjunctive therapy is required. Prior standard therapies included combination chemotherapeutic agents and concurrent radiation therapy, often resulting in gastrointestinal distress and generalized weakness. Substitution with a newer alkylator agent, Temodar (temozolomide), has allowed for better tolerance of treatment with first-line therapy. However, newer approaches to attack the mechanisms of abnormal growth are needed to improve survival, a survival rate that has not changed in many years.

Various genetic mutations have been characterized that may play a role in this glial cell proliferation. A small part of chromosome 10 has a specific function, removing methyl groups on the O6 position of the amino acid guanine. With this function, the glial cells maintain their vital DNA repair mechanism and survive. When this is silenced, alkylator agents can wreak havoc by damaging DNA. No mechanisms for repair. No growth. Detecting the level of methylguanine-DNA methyltransferase gene (MGMT) can indicate an individual's responsiveness to temozolomide.

Another specific mutation seen in approximately 50 percent of malignant glial cells and not on normal cells involves the epidermal growth factor receptor. Normal binding by a specific ligand will activate normal cellular mechanisms and growth. When this receptor is mutated, specifically variant III, cellular activity is turned on permanently. Nullifying this pathway could stop the growth. Currently, we are involved with a vaccine trial where serial injections using altered EGFRVIII proteins, with standard therapy, allow

the individual to create a specific immunologic response and develop specific antibodies toward this receptor.

Knowing the intricate communication that occurs within the tumor cells has allowed researchers to develop new means to stop this unrelenting proliferation. Medications that inhibit

these pathways are actively being pursued, including blocking vascular endothelial growth-factor receptors, histone deacetylases and tyrosine kinases, in first- and second-line therapies. With these efforts, progress has been made to lengthen survival and to provide as many days as we can to have that morning cup of coffee.

Role of rehabilitation in neuro-oncology

By Karen Garrett, P.T., CLT-LANA; Cara Schmitt, M.S., CCC-SLP; and Ashley Spencer, OTR/L, Legacy Rehabilitation Services

Rehabilitation specialists are essential members of the treatment team for brain and CNS patients and receive referrals from acute care to inpatient rehabilitation to outpatient services. The incidence of CNS tumors is relatively low compared with other cancers, but they can cause significant functional impairments, and more than 80 percent of central nervous system tumor patients exhibit rehabilitative needs. In addition to primary CNS tumors, many of the common primary cancer sites such as breast and lung cancer metastasize to the brain and spinal cord. The most common neurological complications are cognitive deficits, weakness and visual-perceptual deficits (Vargo, M. J Phys Med Rehabil 2011; 90(suppl):S50-S62).

Many of the same evaluation tools and interventions used with stroke, traumatic brain injury and spinal cord injury can be applied to the neuro-oncologic patient. Some of the differences include an uncertain prognosis, changing medical status and side effects related to medical treatments. Despite these differences, studies support rehabilitation for functional improvement similar to non-neoplastic disease with increased independence of 36 percent (Formica et al. *Integrative Cancer Therapies* 10(2) 119-126, 2011).

After surgery, patients may present with focal neurological deficits, increased intracranial pressure and seizures. Acute care rehabilitation specialists can assess a patient's strength, balance, functional mobility, swallowing function and

safety, and make recommendations for equipment and a safe discharge plan.

In addition to decreased strength, other common ongoing impairments that benefit from continued therapy in the outpatient setting include impaired balance, gait and coordination; impaired vision, speech and language deficits; cognitive impairment, cancer-related fatigue and pain.

Balance deficits can result from the tumor itself, as a complication from the medical treatment or a combination of both. Standardized screening tools for balance assessment such as the Berg Balance Scale, Timed Up and Go, and Functional Reach are used. Treatment can include working on maintaining center of gravity over base of support and challenging various postural control systems (visual, somatosensory, vestibular and cognitive).

Physical therapy services at Legacy Good Samaritan also provides a wheelchair-seating clinic that performs seating assessments, as well as pressure mapping, working closely with the referring physician, insurance and durable medical equipment supplier.

Patients may experience dysarthria, making it difficult to communicate needs, or impaired language skills in the areas of understanding or speaking. Difficulty speaking may include wordfinding errors or reduced sentence production. Reading and writing may also be affected.

Patients may exhibit cognitive deficits such as short-term memory loss, confusion and difficulty

concentrating. Perceived personality changes may be attributed to cognitive deficits such as lack of attention, emotional lability, impulsivity or lack of initiation. A speech pathology referral can be helpful for diet modifications, oral motor exercises, swallowing exercises, speech/language therapy, cognitive therapy and implementation of strategies into a home-management program.

Occupational therapists strive to restore, reinforce and enhance activities of daily living. Vision therapy is a specialized field of occupational therapy offered at Legacy that assists patients who experience visual disorders. Vision therapy focuses on improving visual perception, eye-hand coordination and visual motor integration so a patient can engage more independently in activities of daily living. Occupational therapists screen, evaluate and provide patients with compensatory strategies

to visually scan his or her environment in order to successfully complete necessary and desired occupations.

Legacy Health also offers a Brain Tumor Support Group that is held at Legacy Good Samaritan. The support group provides education and support for individuals and their adult family members who are coping with diagnosis, treatment and recovery from a primary brain tumor. Presentations and open discussions are facilitated by an oncology-certified social worker.

Therapists who work with the neuro-oncologic patient must be flexible, adjusting therapy treatment around medical treatments such as chemotherapy and radiation in order to achieve the best outcome. Rehabilitation expertise in the areas of function and mobility can greatly improve the quality of life in all phases of treatment.

Cancer Liaison Physician Report: Cancer program practice profile reports

By R. Bryan Bell, M.D., DDS, FACS, head and neck/oral and maxillofacial surgeon

As Legacy Health's American College of Surgeon's cancer liaison physician, my primary role is to monitor and interpret Legacy Cancer Institute's



performance using the National Cancer Database (NCDB) data to continually evaluate and improve the quality of cancer care at Legacy Health. I am proud to serve in this position and pleased to report that Legacy

Health provides cancer treatment outcomes that are among the best in the nation.

According to the Commission on Cancer's (CoC) Cancer Programs Practice Profile Reports (CP3R) (Table 16, page 22), Legacy Health outperforms other CoC programs in Oregon and all CoC programs nationally with regards to performance rates for virtually all select measures

in tumor sites such as breast, colon and rectum. For example, when evaluating whether or not Tamoxifen or third-generation aromatase inhibitor is considered or administered within one year of diagnosis for women with AJCC T1c NoMo or Stage II or III ERA and/or PRA positive breast cancer, Legacy Health as a system has consistently achieved performance rates between 93–98 percent, in contrast to other Oregon CoC programs (89 percent) and all CoC programs (77 percent). Such a commitment to quality patient care is a testament to the excellent leadership of Legacy's site-specific medical directors and physician staff.

Occasionally, leadership will identify areas where the system does not meet expectations for priority CoC standards. When this occurs, the cancer liaison physician works with cancer services leadership and site-specific medical directors to improve performance. For example,

TABLE 16 Legacy Cancer Institute — Cancer Program Practice Profile Reports (CP3R) breast, colon and rectal cancers: 2006–2010 diagnoses

Select breast and colorectal measures estimated performance rates

		2006	2007	2008	2009	2010	Oregon CoC programs	All CoC programs
Breast	Radiation therapy is administered within one year (365 days) of diagnosis for women under age 70 receiving breast conserving surgery for breast cancer. [BCS/RT]	91.1%	98.1%	99.3%	95.6%	91.8%*	92.1%	84.7%
	Combination chemotherapy is considered or administered within four months (120 days) of diagnosis for women under 70 with AJCC T1c N0 M0, or Stage II or III ERA and PRA negative breast cancer. [MAC]	88.6%	100%	100%	100%	100%	96.8%	87.3%
	Tamoxifen or third generation aromatase inhibitor is consid- ered or administered within one year (365 days) of diagnosis for women with AJCC T1c N0 M0, or Stage II or III ERA and/or PRA positive breast cancer. [HT]	95.7%	93.2%	98.3%	97.5%	98.3%	88.9%	76.9%
Colon	Adjuvant chemotherapy is considered or administered within four months (120 days) of diagnosis for patients under the age of 80 with AJCC Stage III (lymph node positive) colon cancer. [ACT]	100%	100%	100%	100%	100%	94.1%	87%
	At least 12 regional lymph nodes are removed and patho- logically examined for resected colon cancer. [12RLN]	46.4%	78.8%	80%	87.4%	92.8%	88.1%	86.4%
Rectum	Radiation therapy is considered or administered within six months (180 days) of diagnosis for patients under the age of 80 with clinical or pathologic AJCC T4N0M0 or Stage III receiving surgical resection for rectal cancer. [Rec/RT]	100%	100%	100%	100%	100%	88.6%	87.2%

^{*}Seven of eight patients refused radiation treatment.

in 2005, it was recognized that inadequate numbers of regional lymph nodes were either being removed or pathologically examined for resected colon cancer (only 39 percent of patients had at least 12 lymph nodes examined). Since this was a priority for the CoC, systematic changes were implemented and an educational process was completed that has since resulted in profound performance improvement in that category,

which exceeds local and national measures (93 percent).

Hospital comparison benchmark reports (HCBR) and survival reports are also used to assess Legacy's performance as compared to data from other hospitals from our region and across the country. Again, I am pleased to report that Legacy Health meets or exceeds benchmark survival outcomes at most tumor sites across the system.

The CoC has a long-standing history with the American Cancer Society that dates back to the creation of both organizations more than 90 years ago. In accordance with that tradition, Legacy's patient navigator Daniel Osborn, BSW, has been appointed the American Cancer Society liaison. Dan works alongside Legacy's nurse navigators to help connect Legacy cancer patients with American Cancer Society resources, including financial arrangements, transportation, assistance with

job-related and family concerns, lodging (from outside Portland), community support such as therapy, classes and groups, Legacy's cancer support services and medically approved literature about cancer.

The American College of Surgeons and the American Cancer Society will continue to work with Legacy Cancer Institute moving forward to ensure the highest quality cancer care is delivered to patients whom it is our privilege to serve.

Quality and process improvements

By Amy Carl, B.S., CPHQ, quality improvement specialist, Legacy Cancer Institute and Legacy Hospice

Under the leadership of our Cancer Quality Council chair, Bryan Bell, M.D., DDS, FACS, the Legacy Cancer Institute continued its longstanding com-



mitment to quality and process improvement in 2011.

Each tumor-focused program — breast, colorectal, prostate and thoracic — uses a dashboard to monitor compliance with quality of care best practice.

The breast dashboard monitors various indicators, including mammography call-back rates, the frequency of stereotactic or core needle biopsy before surgical treatment, pathology turnaround times and the number of patients that are followed by a nurse navigator. In 2011, the Legacy Cancer Institute met or exceeded the national benchmark for all breast quality indicators.

A quality study to review the outcomes of patients who underwent breast brachytherapy was completed in 2011. Retrospectively reviewed were 294 advanced partial breast irradiation patient charts from 2003 to December 2011. Two-year follow-up recurrence was 2.8 percent in 248 patients, with 2.4 percent total recurrence in seven patients. Two-year follow-up distant metastases were 3.8 percent. The tumor registry will continue to collect outcome data in this patient population.

The colorectal dashboard has several quality indicators as well, including harvesting at least 12 lymph nodes in surgical cases, the completeness of pathology reports and negative surgical margins for rectal cases. In addition, we track appropriate referrals to genetic services. In 2011, Legacy met or exceeded national benchmarks and averages.

Legacy Colorectal Cancer Center also participates in the Surgical Care Outcomes and Assessment Project (SCOAP), a Washington state surgical quality care initiative. Compliance with several best practices, such as glucose management and appropriate DVT prophylaxis, is monitored. Each surgeon reviews his/her own compliance with these quality indicators. Then they can compare personal results to Legacy Good Samaritan's compliance. SCOAP results show an improvement in glucose management and fewer postoperative complications, such as patients returning to the operating room and fewer infections in hospitalized patients. The Enhanced Recovery after Surgery (ERAS) process improvement project resulted in further favorable outcomes for colorectal surgery patients. Following the implementation of ERAS, pilot data shows that patients had shorter lengths of stay, used fewer narcotics, were on a pain pump for less time and had fewer post-operative complications, such as ileus.

The prostate dashboard includes several indicators that compare open and robotic prostatectomy. In 2011, although robotic prostatectomy volumes were much higher than open prostatectomy, patients in both populations were hospitalized almost the same amount of time. In addition, our positive surgical margins were below the national average. Legacy Cancer Institute was 100 percent compliant documenting pretreatment evaluation in prostate cancer patients. Patients are extremely satisfied with the preoperative prostatectomy class offered at Legacy Good Samaritan. In 2011, 100 percent of the class satisfaction survey respondents reported that they found the information useful and that they would recommend the class to others.

The thoracic dashboard was developed in late 2011. Its indicators include pathology report and staging completeness, how often lymph nodes are harvested in surgical cases, timeliness of treatment, and how many patients are being

followed by a nurse navigator. Again, Legacy met or exceeded national averages and benchmarks in each indicator.

Legacy Hospice implemented a checklist to improve safety processes when administering methadone as its primary process improvement project. The checklist was based on evidence-based practices specific to methadone administration. Completing QTc calculations improved from 31 percent to 100 percent, and PARQ documentation improved from 22 percent to 100 percent in 2011. Both indicators were added to the Legacy Hospice quality plan for ongoing monitoring.

Several other quality studies and process improvements were begun or completed in 2011, making it a busy and productive year of quality and process improvement. In fulfilling Legacy Health's mission statement, Legacy Cancer Institute's commitment to quality of care and patient safety will continue to be a priority.

Cancer clinical research

By Leslie Sorenson, manager, Legacy Cancer Clinical Research

The American Cancer Society's Cancer Facts and Figures estimated that 22,340 people in the United States will be diagnosed with a brain tumor or other nervous system cancer in 2011. These types of tumors rarely spread to other areas of the body but can often spread throughout the brain tissue causing damage that is disabling and sometimes fatal to the patient. Several types of treatment are available to patients, including surgery, chemotherapy, radiation therapy and targeted therapy.

Legacy Oncology Clinical Research has been fortunate to offer clinical trials for both newly diagnosed and recurrent brain tumors.

A surgical trial using an oral drug, 5-ALA (aminolevulinic acid), to enhance visualization and aid resection of malignant glial tumors was recently completed at Legacy under an

FDA IND. Using 5-ALA, neurosurgeons are able to visualize malignant cells under ultraviolet light. These malignant cells glow bright red, similar in appearance to embers in a fire, which allows the surgeon to differentiate malignant cells from normal cells.

Legacy has also expanded the number of treatment trials for low- and high-grade brain tumors as well as trials for recurrent and metastatic brain tumors. Radiation Oncology at Legacy Good Samaritan received membership with Radiation Therapy Oncology Group (RTOG) in 2011, allowing for greater access to treatment trials for Legacy patients. The application for membership to RTOG will expand with Legacy Mount Hood and Legacy Salmon Creek medical centers applying in 2012.

We continue to see many positive changes as the NCI moves forward with the consolidation from nine to four cooperative groups. We are hopeful that this will allow for expanded and more efficient access to cancer clinical trials for Legacy patients and the community.

Legacy Health is proud to offer oncology clinical trials in collaboration with physicians, cooperative groups, the National Cancer Institute and industry sponsors. These collaborations give Legacy Health the opportunity to provide the most advanced treatment options to you and our community.



The cancer clinical research staff, from left: Aaron White, CRC-II, oncology clinical research; Lisa Hansen, R.N., M.S., AOCN, Autologous Stem Cell Transplant Program; Leslie Sorenson, manager, oncology clinical research; Erin Davis, CRC-II, oncology clinical research; Cindy Werhane, R.N., BSN, OCN, Autologous Stem Cell Transplant Program; Samantha Hancock, R.N., BSN, oncology clinical research nurse coordinator; and Crystal Turner, CRC-II, oncology clinical research.

Community involvement 2011

Participation in community events

January

Brides against Breast Cancer (N.W. Portland)

March

Breast Cancer Issues (Komen for the Cure)

Men's Health Fair (Men's Health Project) — cancer prevention, colorectal cancer

Woodburn Community Health Fair — cancer prevention, breast health/awareness

May

Making Strides Walk (with the American Cancer Society)

June

Cancer Survivors Day (city-wide event)

July

Concerts in the Park — National Marrow Donor Program information booth (N.W. Portland)

September

Heroes Gala and Wall of Courage (Children's Cancer Association)

Race for the Cure and Komen Health Expo (Komen for the Cure)

Rosa Parks Community Health Fair — cancer prevention, breast health

October

"Light the Night" Walk (Leukemia & Lymphoma Society)

Public educational talks and activities

Presentations to various support groups; topics included survivorship, nutrition, peripheral neuropathy

Quarterly

Mind over Menopause

January

Meals that Heal (community location)

March

Colorectal Cancer: Preventable, Treatable, Beatable! (Legacy Good Samaritan)

April, September

Transitions: Moving beyond Cancer Treatment (Legacy Good Samaritan) — six-week series

April, July

Nutrition for Patients with MDS (Legacy Good Samaritan)

October

Breast Cancer Awareness Month and Dress in Pink Day (Legacy Meridian Park)

Worship in Pink (breast cancer screening and early detection awareness), congregation activities, Community Celebration (Legacy Emanuel)

Screening events

May — Skin cancer screening (with Providence and OHSU) held at OHSU

Ongoing — Low-cost screening mammograms, in conjunction with Oregon Breast and Cervical Cancer Program and Komen Foundation, at Legacy Emanuel, Legacy Good Samaritan, Legacy Meridian Park, Legacy Mount Hood and Legacy Medical Group—St. Helens

Ongoing support groups, education and movement classes

Support groups

Brain Tumor Support Group

Breast Cancer Support Groups

Grief Support Groups

Gynecological Cancer Support Group

Head & Neck Cancer Support Group

Lung Cancer Support Group

Lymphedema Support Group

Myelodysplastic Syndrome Support Group

Prostate Cancer Support Group

Surviving Cancer Together Support Groups

Educational classes

Continence after Prostatectomy

Expressions of Healing

Felting workshop

Gardening Workshop for Individuals with Cancer

Journal to the Self

KIDZ in the Discovery Zone — art workshop

Meditation for Cancer Patients

Movement classes

Chi gong

Mindful Morning Movement

Mind over Menopause

Nia Mind/Body Exercise

T'ai Chi for Healing

Walking for Health

Yoga for Individuals with Cancer

Oregon Partnership for Cancer Control

The Oregon Partnership for Cancer Control is a statewide collaboration of individuals and organizations with a commitment to reducing the burden of cancer in our state. Legacy Cancer

Institute continues to be involved, represented by Selma Annala, co-chair of the coordinating committee; Charlyn Wilson, chair of the Colorectal Health Task Force; and Reza Antoszewska and Terry Wagie on the Survivorship Task Force.

Professional education activities

Conferences and courses

February

28th Annual Seminar for Radiation Oncology Professionals

March

Breast Cancer Issues: Physicians Best Practices

April

Stem Cell Transplantation: Achieving Best Outcomes for Our Patients

July

Technological Advances in Head and Neck Oncology and Cranio-Maxillofacial Surgery

October

7th Annual Pacific N.W. Excellence in Gynecological and Breast Cancer Care

November

Chemotherapy and Biotherapy Course for Pediatrics (APHON)

Grand Rounds (CME)

Legacy Good Samaritan oncology

Acupuncture Anesthesia in Oncology Surgery: Case study

Cancer Cytogenetics

Colorectal Cancer: Nutrition, Prevention, Screening Endocrine Resistant HR+ Metastatic Breast Cancer

Endometrial Cancer Treatment

Kidney Cancer: Current Diagnosis and Treatments Multidisciplinary Treatment of Hepatocellular Carcinoma

Paradigm Shift in Oropharyngeal Carcinoma Treatment

Radiobiology of Hypofractionation Skin Cancer: What's New and What's Blu? Treatment for Metastatic Brain Tumors What Can Your Thoracic Surgeon Do For You?

Legacy Good Samaritan integrative oncology

Acupuncture in Oncology Care

Soy and Breast Cancer; Mushrooms in Cancer Treatment Transition from Curative to End of Life Care

Legacy Meridian Park oncology

Cytogenics of Solid Tumors Hepatocellular Carcinoma

Medical

Legacy Emanuel: What's New in Colorectal Cancer? Legacy Meridian Park PCP Forum: Non-small Cell Lung Cancer

Legacy Salmon Creek: Facts and Controversies in Breast Cancer Treatment

"Lunch and Learn" presentations

Educational talks given on-site at primary care and specialty clinics in the Legacy system and the Portland area, on topics of:

Cancer genetics

Hepatocellular carcinoma

Cancer patient care conferences (tumor boards)

Brain/CNS tumors (Legacy Emanuel)

Breast care (Legacy Good Samaritan, Legacy Meridian Park)

Gastrointestinal tumors (Legacy Good Samaritan, Legacy Meridian Park)

General cancer conference (Legacy Salmon Creek, Legacy Meridian Park, Legacy Mount Hood)

Gynecological cancers (Legacy Good Samaritan)

Head and neck tumors (Legacy Emanuel)

Metastatic breast care (Legacy Good Samaritan)

Pediatric oncology (Legacy Emanuel)

Radiology/pathology correlation for breast cancer cases (Legacy Good Samaritan)

Thoracic tumors (Legacy Good Samaritan, Legacy Meridian Park)

Urologic/prostate tumors (Legacy Good Samaritan)

2011 Publications

Bell RB, Weimer KA, Dierks EJ, Buehler M, Lubek JE. Computer planning and intraoperative navigation for palatomaxillary and mandibular reconstruction with fibular free flaps. *J Oral Maxillofac Surg.* 2011 Mar;69(3):724-32.

Gregoire C, Adler D, Madey S, Bell RB. Basosquamous carcinoma involving the anterior skull base: a neglected tumor treated using intraoperative navigation as a guide to achieve safe resection margins. *J Oral Maxillofac Surg.* 2011 Jan;69(1):230-6.

Han, E, Johnson, N.M., DelaMelena, T., Glissmeyer, M. Steinbock, K. Alternative Therapy Used as

Primary Treatment for Breast Cancer Negatively Impacts Outcomes. *Ann Surg Oncol.* 2011 Vol 18 (4): 912-916

Rieder E, Spaun GO, Khajanchee YS, Martinec DV, Arnold BN, Smith Sehdev AE, Swanstrom LL, Whiteford MH. A natural orifice transrectal approach for oncologic resection of the rectosigmoid: an experimental study and comparison with conventional laparoscopy. *Surg Endosc.* 2011 Oct;25(10):3357-63.

Rieder E, Swanstrom LL. Advances in cancer surgery: natural orifice surgery (NOTES) for oncological diseases. *Surg Oncol.* 2011 Sep;20(3):211-8.

Legacy Cancer Institute Network Cancer Committee members 2011

Chris Alexander, R.N., manager, Medical Oncology Unit, Legacy Meridian Park Medical Center Selma Annala, R.T., CLC, supervisor, Legacy Cancer Healing Center

Mindy Ansteth, B.S., CTR, manager, Legacy Cancer Data Management

Reza Antoszewska, ANP-C, Legacy Cancer Healing Center/Survivorship Program, Legacy Good Samaritan Medical Center

Jason Bauer, M.D., RVT, interventional radiologist R. Bryan Bell, M.D., DDS, FACS, head and neck surgeon, cancer liaison physician

Diane Buelt, director, Clinical and Support Services, Legacy Salmon Creek Medical Center

Amy Carl, B.S., CPHQ, quality improvement specialist, Legacy Cancer Institute and Legacy Hospice Jefferson W. Chen, M.D., Ph.D., FAANS, FACS, FCCM, neurosurgeon, Cancer Committee chair

Andrew Cox, M.D., diagnostic radiologist

Kelly Doherty, manager, Radiation Oncology, Legacy Emanuel Medical Center and Legacy Good Samaritan Medical Center

Barbara Farmer, R.N., manager, Legacy Hospice Joseph Frankhouse, M.D., FACS, colorectal surgeon, medical director, Legacy Colorectal Cancer Center Julie Goodwin, director, Clinical and Support Services, Legacy Meridian Park Medical Center Leah Grotzinger, Pharm.D., pharmacist, Legacy Emanuel Medical Center and Legacy Good Samaritan Medical Center

Lisa Hansen, R.N., AOCN, coordinator, Autologous Stem Cell Transplant Program

Kate Jaramillo, M.Div., BCC, chaplain

Kathleen Johnson, manager, Rehabilitation and Radiation Oncology, Legacy Mount Hood Medical Center

Nathalie Johnson, M.D., FACS, breast surgeon, medical director, Legacy Cancer Institute and Legacy Breast Health Centers

Michael Kaempf, M.D., FACS, urological surgeon Andrew Kee, M.D., radiation oncologist

Laurie Kennedy, manager, Rehabilitation and Radiation Oncology, Legacy Salmon Creek Medical Center

Leah Kiesow, MBA, CTR, manager, Cancer Data Management

Pamela Kilmurray, director, Legacy Cancer Institute, Rehabilitation, Stroke and Hospice services

Misa Lee, M.D., radiation oncologist

Katherine Leonard, Ph.D., psychologist

Richard Lex, R.N., manager, Legacy Cancer Institute, Legacy Good Samaritan Medical Center

Regan Look, M.D., medical oncologist

Bruce Lowe, M.D., urological surgeon

Legacy Health Network Cancer Committee Members 2011, continued

Janel McNally, CTR, Cancer Data Management, Legacy Salmon Creek Medical Center

Anthony Melaragno, M.D., Chief Administrative Officer, Legacy Good Samaritan Medical Center

Christen Moore, MSW, Legacy Good Samaritan Medical Center

Linda Nguyen, R.D., dietitian, Legacy Good Samaritan Medical Center

Janice Olson, M.D., medical director, Children's Cancer and Blood Disorders Program

Dan Osborn, BSW, patient care navigator, American Cancer Society

Kevin Oyama, M.D., pathologist

Alexandra Penney, R.N., manager, Medical Oncology, Legacy Salmon Creek Medical Center

Marci Reed, R.D., dietitian, Legacy Cancer Institute Kelly Rice, Pharm.D., BCOP, oncology clinical pharmacist, Legacy Good Samaritan Medical Center Mark Schray, M.D., radiation oncologist, medical

director, Legacy Radiation Oncology Spencer Shao, M.D., medical oncologist

Deborah Shardy, M.D., Children's Cancer and Blood
Disorders program

Ann Smith-Sehdev, M.D., pathologist

Leslie Sorenson, manager, Cancer Clinical Research

Wendy Talbot, MSW, OSW-C

Catherine Telford, CTR, Cancer Data Management, Legacy Emanuel Medical Center

Paul Tseng, M.D., FACS, gynecologic oncologist and pelvic surgeon

Anthony Van Ho, M.D., medical oncologist

Terry Wagie, R.N., M.S., clinical nurse specialist, Legacy Cancer Institute

Jianzhou Wang, M.D., pathologist

Devon Webster, M.D., medical oncologist

Craig Weintz, manager, Legacy Hopewell House Hospice

Gail Weisgerber, manager, Legacy Rehabilitation Services, Legacy Good Samaritan Medical Center Robin Weisshaar, manager, Social Services, Legacy

Good Samaritan Medical Center and Legacy

Meridian Park Medical Center

Amanda Wheeler, M.D., breast surgeon

Jocelyn White, M.D., FAAHPM, FACP, FAAPP, medical director, Legacy Palliative Care and Legacy Hospice Mark Whiteford, M.D., FACS, colorectal surgeon Charlyn Wilson, R.N., program coordinator, Legacy Cancer Institute

William Winter, III, M.D., gynecologic oncologist and pelvic surgeon

Subcommittees of the Network Cancer Committee

Breast Health Center Meeting (Legacy Meridian Park Medical Center)

Breast Health Steering Committee (Legacy Health)
Breast Program Leadership Group (Legacy Good
Samaritan Medical Center)

Breast Program Steering Committee (Legacy Salmon Creek Medical Center)

Cancer Data Management Quality Meeting Cancer Services Quality Advisory Council

Colorectal Cancer Program at Legacy Good Samaritan Medical Center

Colorectal Cancer Program at Legacy Meridian Park Medical Center

Hepatobiliary/Pancreatic Program Committee Hospice Quality (QAPI)

Integrative Cancer Care Advisory Committee

Legacy Cancer Healing Center— Integrative Cancer Quality Committee

Oncology Clinical Research Meeting

Prostate Executive Program Planning Committee

Prostate Program Development

Public/Professional Education Council

Radiation Oncology Quality Council

Thoracic Program Development Meeting (Legacy Good Samaritan Medical Center)

Legacy Cancer Institute

503-413-8050 www.legacyhealth.org/cancer



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