

# Legacy Cancer Institute Annual Report 2020 Lung Cancer Detection and Treatment



Legacy Cancer Institute



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*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 [legacyhealth.org/giving](https://legacyhealth.org/giving).*

## Take a Deep Breath: Lung Cancer Screening During the Pandemic

By Nathalie Johnson, MD, FACS; breast surgical oncologist; medical director, Legacy Cancer Institute and Legacy Breast Health Centers

The year 2020 and leading into 2021 has been trying to say the least. We have focused on respiratory problems around COVID-19, but follow me first



back in time and then into the future to look at lung cancer management at the Legacy Cancer Institute.

In 2012, we launched the first lung cancer screening program in Oregon under the leadership of pulmonologist Dr. Jordan Fein, and in partnership with radiologist and colleague, Dr. Philip Baker. We were convinced it was the right thing to offer screening to chronic smokers as a way to intervene early in lung cancer and ultimately offer more cures. Legacy's lung cancer screening program also served as a pilot for a radiology tracking program, PenRad, to be sure that patients and providers received reminders for screening follow-ups. Our nurse practitioners worked with patients entering the screening pathway on education and navigated patients with positive results. Fast forward to today, we see acceptance of lung screening as the standard of care for those at risk. By those at risk, we mean people ages 50-80 who have more than a 20-pack year smoking history. The U.S. Preventive Taskforce updated its recommendation to include annual screening in the patient population.

Our program that began so many years ago has expanded from Legacy Good Samaritan Medical Center to Legacy Meridian Park Medical Center (Tualatin) and will very shortly begin a screening program at Legacy Salmon Creek Medical Center (Vancouver) and Legacy Mount Hood Medical Center (Gresham). When current smokers are screened,

it is an opportunity to really focus on smoking cessation. If they have a lung nodule found, even if it doesn't turn out to be cancer, it provides what we call a "teachable moment". It is a window of time when the message of smoking cessation is ready to be both heard and received. As part of our program, we also offer ongoing smoking cessation classes and support. In this report, we share data on the growth of these programs.

Not only has there been growth and improvements in screening, but our ability to biopsy small lesions without surgical intervention using new technologies is impressive. In addition, genomic evaluation of tumor and targeted therapies has continued to expand, and we are keeping pace with the latest therapies. Our multidisciplinary approach and wraparound services support both treatment and recovery.

As we emerge from the pandemic, we need to get all patients back on track with cancer screening. Interestingly, our lung cancer screening rates maintained pre-pandemic levels, unlike screening for breast, colon or cervical cancer. However, we need to get the message out that cancer did not take a break because of the pandemic and early detection leads to better outcomes and cures. So, as our technologists instruct us during these screening exams: "Take a deep breath, stop breathing and now breathe!"

We had a brief hiatus, but it's time to press on with the work of stopping cancer in its tracks. It's a multimodal attack requiring early detection and personalized targeted treatment. It truly takes a village.

## Comprehensive cancer services

For more information about our services, please visit [legacyhealth.org/cancer](https://legacyhealth.org/cancer).

### Cancer care and treatment

- Cancer care conferences/tumor boards
- Cancer care inpatient unit
- Cancer data management/cancer registry
- Cancer rehabilitation services
- Cancer screening and prevention
- Interventional radiology
- Legacy Breast Health Centers
- Legacy Cancer Healing Center
- Legacy Genetics Services
- Legacy Hospice
- Legacy Medical Group–Colon and Rectal Surgery
- Legacy Medical Group–Gynecologic Oncology
- Legacy Medical Group–Pulmonary
- Legacy Medical Group–Radiation Oncology
- Legacy Medical Group–Reconstructive Surgery
- Legacy Medical Group–Surgical Oncology
- Legacy Pain Management Centers
- Legacy Palliative Care Services
- OHSU Knight-Legacy Health Cancer Collaborative Pathology
- Wound and ostomy care

### Cancer programs and specialty areas

- Autologous stem cell transplant program
- Bladder cancer
- Blood cancers
- Brain and spinal tumors
- Breast cancer services
- Children’s cancer and blood disorders program
- Colorectal cancer
- Esophageal cancer
- Gynecologic cancers
- Oral, head and neck cancer
- Hepatobiliary and pancreatic cancer
- Kidney cancer
- Lung cancer
- Melanoma
- Prostate cancer
- Stomach cancer

### Clinical trials and research

- Oncology clinical research
- Tumor bank

### Support services — adult

- American Cancer Society Gift Closet
- Cancer support groups and classes
- Cancer survivorship
- Expressive arts therapy
- Green Gables Guest House
- Integrative care and symptom management
- Lymphedema management
- Nutrition
- Oncology nurse navigation
- Pharmacy navigator
- Oncology psychology services
- Oncology social work
- Stress management
- 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 and KITE Clinic
- Volunteer program

## Legacy Cancer Institute Overview: Highlights from 2020

By Paul Tseng, MD, MBA, FACS; gynecologic oncology oncologist; chair, Integrated Network Cancer Committee, Legacy Cancer Institute

A patient of mine had a prayer book. In a prayer book, you put forward your hope, you ask, and you wait. The response could be yes, no, or not at all. We all had a prayer book in 2020.



**We asked for strength** — for ourselves and for each other.

Over the course of such a year, the collective resiliency at Legacy Cancer Institute (LCI) never shined as bright. As chair of the 2020 LCI Integrated

Network Cancer Committee (INCC), I was witness to members of the committee working tirelessly to ensure that the necessary safety, leadership, structure, processes and personnel were in place to deliver the high-quality, patient-centered care we are steadfastly committed to.

**We adapted in the face of hardship** — LCI advanced our technology to meet our patient's needs. We were tasked to radically reimagine how to deliver healthcare. In response, telehealth was operationalized at LCI to help protect patients, staff and our communities. For in-person care, we implemented COVID-19 testing protocols, as well as social distancing and risk reduction practices across the Legacy Health system. LCI maintained safety, continued to provide optimal care, and adapted when and where it was necessary.

**We transformed in the face of disruption** — LCI collaborated across disciplines to keep learning from each other, and to keep giving back to our patients. In response to the pandemic, all Legacy cancer care conferences were transitioned from in-person to virtual. The swift transition required an immediate and collaborative approach from our numerous multidisciplinary care teams, information technology, clinical oncology research, continuing medical education and cancer data management. The virtual conferences supported the timely care of our patients and brought added efficiencies to the process. These transformative process changes will benefit our effectiveness going forward.

**We remained resilient** — Amidst the raging pandemic, we continued to create better avenues for the lifelong health of our patients. LCI developed a new cancer survivorship program; with a team tasked with developing a program that meets the unique needs of survivors in our communities. The team included multidisciplinary representation from physicians, nursing, social work, nutrition, patient navigation, and physical therapy/rehabilitation. To support the emotional well-being of our cancer survivors, we hosted virtual classes and wellness events to offer patients additional options for cancer support and to build community.

**We reflected on how to be better citizens** — LCI recognized the disparities in representation and inequalities facing our patients at national and local levels. The long-term and immediate negative impacts of bias are well known. I believe Legacy Health is trying to understand these impacts, and most importantly, to be aware of the history of discrimination and bias. With continued collaboration with our fellow health care providers, I am confident we will work together to bridge the gap in health disparities.

**We remain grateful** — At Legacy we are humbled by how our patients and communities have entrusted us to provide care in one of life's most challenging moments. Standing up with grit and determination to face COVID-19 and cancer has taught us how strong we can be. I am inspired by how Legacy Cancer Institute serves our patients and our community.

## Legacy Health 2020 Cancer Site Analysis: Lung Cancer

By Jordan Fein, MD; pulmonologist; medical director, lung cancer screening program, Legacy Medical Group–Pulmonary

Recent data from the National Cancer Institute (NCI) shows that 6% of men and women will develop a new lung/bronchus cancer each year. It is the leading cause of cancer death in the United States, with more than 131,000 deaths annually. Legacy Cancer Institute (LCI) is a leader in lung cancer care and management within our communities and is recognized nationally for outstanding outcomes and patient-centered care.



In 2019, Legacy diagnosed and/or treated 356 analytic lung cancer cases, making lung the second largest cancer site at LCI (the most recent cancer registry data available). The top six cancer sites remain breast, lung/bronchus, prostate, colorectal, urinary bladder and corpus uteri (see Table 1, Legacy top six cancer sites comparison). Lung/bronchus cancer represented 10% of Legacy’s total reportable cancer cases, which is consistent with the most recent data published by Oregon, Washington and the American Cancer Society. Legacy’s 2019 reportable cancer case volume is provided in Table 2, by medical facility, tumor site and in aggregate.

**Table 1, Legacy top six cancer sites comparisons**

Cancer Site	Legacy Health 2019*		Oregon State 2018*		Washington State 2017*		American Cancer Society*	
	n=	% of Total	n=	% of Total	n=	% of Total	n=	% of Total
Breast	910	26%	3,620	17%	7,252	17%	276,480	15%
Lung/bronchus	356	10%	2,630	12%	4,385	10%	228,820	13%
Prostate	351	10%	2,385	11%	4,394	10%	191,930	11%
Colon/rectum	271	8%	1,610	8%	2,964	7%	147,930	8%
Urinary bladder	180	5%	1,033	5%	1,768	4%	81,400	5%
Corpus uteri	166	5%	828	4%	1,171	3%	65,620	4%
<b>Total top six cancer sites</b>	<b>2,234</b>	<b>63%</b>	<b>12,106</b>	<b>57%</b>	<b>21,934</b>	<b>52%</b>	<b>992,200</b>	<b>55%</b>
<b>Total reportable cases</b>	<b>3,525</b>		<b>21,406</b>		<b>42,042</b>		<b>1,806,590</b>	

\*Most current date available, American Cancer Society (ACS) Facts and Figures 2020 (estimated cases)

**Table 2, Legacy Health 2019 Primary Cancer Sites by Body System — All Ages**

Primary Site	Emanuel		Good Samaritan		Meridian Park		Mount Hood		Salmon Creek		Silverton		Legacy Health	
	N=	%	N=	%	N=	%	N=	%	N=	%	N=	%	N=	%
Oral Cavity and Pharynx	24	7.3%	33	2.3%	7	1.4%	6	2.0%	14	1.5%	1	1.3%	85	2.4%
Tongue	4	1.2%	7	0.5%	3	0.6%	1	0.3%	4	0.4%	1	1.3%	20	0.6%
Salivary Glands	3	0.9%	1	0.1%	3	0.6%	1	0.3%	4	0.4%	0	0.0%	12	0.3%
Floor of Mouth	5	1.5%	2	0.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	7	0.2%
Gum and Other Mouth	7	2.1%	7	0.5%	0	0.0%	0	0.0%	1	0.1%	0	0.0%	15	0.4%
Nasopharynx	1	0.3%	0	0.0%	0	0.0%	0	0.0%	1	0.1%	0	0.0%	2	0.1%
Tonsil	1	0.3%	13	0.9%	1	0.2%	2	0.7%	4	0.4%	0	0.0%	21	0.6%
Oropharynx	1	0.3%	2	0.1%	0	0.0%	1	0.3%	0	0.0%	0	0.0%	4	0.1%
Hypopharynx	2	0.6%	1	0.1%	0	0.0%	1	0.3%	0	0.0%	0	0.0%	4	0.1%
<b>Digestive System</b>	<b>35</b>	<b>10.7%</b>	<b>158</b>	<b>11.2%</b>	<b>130</b>	<b>25.5%</b>	<b>68</b>	<b>23.2%</b>	<b>142</b>	<b>15.7%</b>	<b>18</b>	<b>24.0%</b>	<b>551</b>	<b>15.6%</b>
Esophagus	1	0.3%	9	0.6%	11	2.2%	2	0.7%	16	1.8%	1	1.3%	40	1.1%
Stomach	2	0.6%	9	0.6%	4	0.8%	6	2.0%	11	1.2%	1	1.3%	33	0.9%
Small Intestine	0	0.0%	4	0.3%	2	0.4%	3	1.0%	3	0.3%	0	0.0%	12	0.3%



Primary Site	Emanuel		Good Samaritan		Meridian Park		Mount Hood		Salmon Creek		Silverton		Legacy Health	
	N=	%	N=	%	N=	%	N=	%	N=	%	N=	%	N=	%
Colon (excluding Rectum)	10	3.0%	57	4.0%	48	9.4%	26	8.9%	45	5.0%	9	12.0%	195	5.5%
Cecum	2	0.6%	5	0.4%	10	2.0%	2	0.7%	7	0.8%	1	1.3%	27	0.8%
Appendix	2	0.6%	5	0.4%	1	0.2%	3	1.0%	7	0.8%	3	4.0%	21	0.6%
Ascending Colon	2	0.6%	18	1.3%	15	2.9%	1	0.3%	4	0.4%	0	0.0%	40	1.1%
Hepatic Flexure	0	0.0%	5	0.4%	1	0.2%	5	1.7%	0	0.0%	0	0.0%	11	0.3%
Transverse Colon	0	0.0%	9	0.6%	4	0.8%	1	0.3%	6	0.7%	1	1.3%	21	0.6%
Splenic Flexure	1	0.3%	2	0.1%	1	0.2%	1	0.3%	1	0.1%	0	0.0%	6	0.2%
Descending Colon	0	0.0%	0	0.0%	0	0.0%	2	0.7%	3	0.3%	0	0.0%	5	0.1%
Sigmoid Colon	2	0.6%	9	0.6%	14	2.8%	9	3.1%	15	1.7%	3	4.0%	52	1.5%
Large Intestine	1	0.3%	4	0.3%	2	0.4%	2	0.7%	2	0.2%	1	1.3%	12	0.3%
Rectum and Rectosigmoid	4	1.2%	40	2.8%	9	1.8%	8	2.7%	11	1.2%	4	5.3%	76	2.2%
Rectosigmoid Junction	3	0.9%	7	0.5%	3	0.6%	4	1.4%	2	0.2%	2	2.7%	21	0.6%
Rectum	1	0.3%	33	2.3%	6	1.2%	4	1.4%	9	1.0%	2	2.7%	55	1.6%
Anus, Anal Canal and Anorectum	0	0.0%	5	0.4%	4	0.8%	3	1.0%	6	0.7%	0	0.0%	18	0.5%
Liver and Intrahepatic Bile Duct	13	4.0%	16	1.1%	20	3.9%	3	1.0%	11	1.2%	1	1.3%	64	1.8%
Liver	12	3.7%	12	0.8%	16	3.1%	2	0.7%	9	1.0%	0	0.0%	51	1.4%
Intrahepatic Bile Duct	1	0.3%	4	0.3%	4	0.8%	1	0.3%	2	0.2%	0	0.0%	12	0.3%
Gallbladder	0	0.0%	3	0.2%	1	0.2%	1	0.3%	5	0.6%	0	0.0%	10	0.3%
Other Biliary	2	0.6%	1	0.1%	4	0.8%	0	0.0%	3	0.3%	0	0.0%	10	0.3%
Pancreas	3	0.9%	12	0.8%	24	4.7%	16	5.5%	31	3.4%	2	2.7%	88	2.5%
Retroperitoneum	0	0.0%	2	0.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	0.1%
Peritoneum, Omentum and Mesentery	0	0.0%	0	0.0%	1	0.2%	0	0.0%	0	0.0%	0	0.0%	1	0.0%
Other Digestive Organs	0	0.0%	0	0.0%	2	0.4%	0	0.0%	0	0.0%	0	0.0%	2	0.1%
Respiratory System	42	12.8%	135	9.5%	40	7.9%	37	12.6%	117	12.9%	5	6.7%	376	10.7%
Nose, Nasal Cavity and Middle Ear	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.1%	0	0.0%	1	0.0%
Larynx	9	2.7%	5	0.4%	0	0.0%	2	0.7%	1	0.1%	0	0.0%	17	0.5%
Lung and Bronchus	31	9.5%	130	9.2%	40	7.9%	35	11.9%	115	12.7%	5	6.7%	356	10.1%
Trachea, Mediastinum and Other Respir	2	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	0.1%
Bones and Joints	2	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	0.1%
Soft Tissue (including Heart)	2	0.6%	2	0.1%	0	0.0%	1	0.3%	5	0.6%	0	0.0%	10	0.3%
Skin (excluding Basal and Squamous)	2	0.6%	72	5.1%	6	1.2%	0	0.0%	22	2.4%	2	2.7%	104	3.0%
Melanoma	2	0.6%	72	5.1%	6	1.2%	0	0.0%	22	2.4%	1	1.3%	103	2.9%
Other Non-Epithelial Skin	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	1.3%	1	0.0%
Breast	0	0.0%	454	32.1%	147	28.9%	69	23.5%	222	24.5%	18	24.0%	910	25.8%
Female Genital System	3	0.9%	180	12.7%	52	10.2%	5	1.7%	35	3.9%	5	6.7%	280	7.9%
Cervix Uteri	0	0.0%	26	1.8%	3	0.6%	3	1.0%	4	0.4%	2	2.7%	38	1.1%
Corpus and Uterus	1	0.3%	100	7.1%	42	8.3%	1	0.3%	20	2.2%	2	2.7%	166	4.7%
Ovary	2	0.6%	32	2.3%	1	0.2%	1	0.3%	7	0.8%	0	0.0%	43	1.2%
Vagina	0	0.0%	2	0.1%	1	0.2%	0	0.0%	1	0.1%	0	0.0%	4	0.1%
Vulva	0	0.0%	11	0.8%	1	0.2%	0	0.0%	3	0.3%	1	1.3%	16	0.5%
Other Female Genital Organs	0	0.0%	9	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	9	0.3%
Male Genital System	42	12.8%	184	13.0%	37	7.3%	38	13.0%	72	7.9%	8	10.7%	381	10.8%
Prostate	40	12.2%	179	12.7%	32	6.3%	34	11.6%	59	6.5%	7	9.3%	351	10.0%
Testis	2	0.6%	5	0.4%	4	0.8%	3	1.0%	13	1.4%	0	0.0%	27	0.8%
Penis	0	0.0%	0	0.0%	1	0.2%	0	0.0%	0	0.0%	1	1.3%	2	0.1%
Other Male Genital Organs	0	0.0%	0	0.0%	0	0.0%	1	0.3%	0	0.0%	0	0.0%	1	0.0%
Urinary System	41	12.5%	110	7.8%	37	7.3%	35	11.9%	96	10.6%	8	10.7%	327	9.3%
Urinary Bladder	20	6.1%	47	3.3%	32	6.3%	23	7.8%	51	5.6%	7	9.3%	180	5.1%
Kidney and Renal Pelvis	21	6.4%	60	4.2%	8	1.6%	11	3.8%	43	4.7%	1	1.3%	144	4.1%
Ureter	0	0.0%	2	0.1%	1	0.2%	0	0.0%	1	0.1%	0	0.0%	4	0.1%
Other Urinary Organs	0	0.0%	1	0.1%	0	0.0%	1	0.3%	1	0.1%	0	0.0%	3	0.1%
Brain and Other Nervous System	41	12.5%	15	1.1%	4	0.8%	8	2.7%	29	3.2%	3	4.0%	100	2.8%
Brain	24	7.3%	4	0.3%	4	0.8%	4	1.4%	13	1.4%	0	0.0%	49	1.4%
Cranial Nerves Other Nervous System	17	5.2%	11	0.8%	0	0.0%	4	1.4%	16	1.8%	3	4.0%	51	1.4%
Endocrine	33	10.1%	11	0.8%	4	0.8%	3	1.0%	23	2.5%	1	1.3%	75	2.1%
Thyroid	23	7.0%	7	0.5%	3	0.6%	3	1.0%	21	2.3%	1	1.3%	58	1.6%
Other Endocrine including Thymus	10	3.0%	4	0.3%	1	0.2%	0	0.0%	2	0.2%	0	0.0%	17	0.5%
Lymphoma	15	4.6%	29	2.1%	23	4.5%	10	3.4%	44	4.9%	4	5.3%	125	3.5%
Hodgkin Lymphoma	5	1.5%	3	0.2%	1	0.2%	0	0.0%	1	0.1%	0	0.0%	10	0.3%
Non-Hodgkin Lymphoma	10	3.0%	26	1.8%	22	4.3%	10	3.4%	43	4.7%	4	5.3%	115	3.3%
Myeloma	1	0.3%	8	0.6%	1	0.2%	1	0.3%	9	1.0%	0	0.0%	20	0.6%
Leukemia	32	9.8%	7	0.5%	7	1.4%	5	1.7%	30	3.3%	1	1.3%	82	2.3%
Lymphocytic Leukemia	24	7.3%	5	0.4%	4	0.8%	3	1.0%	19	2.1%	1	1.3%	56	1.6%
Myeloid and Monocytic Leukemia	7	2.1%	2	0.1%	3	0.6%	2	0.7%	11	1.2%	0	0.0%	25	0.7%
Other Leukemia	1	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.0%
Mesothelioma	4	1.2%	2	0.1%	1	0.2%	0	0.0%	3	0.3%	0	0.0%	10	0.3%
Miscellaneous	9	2.7%	14	1.0%	13	2.6%	7	2.4%	43	4.7%	1	1.3%	87	2.5%
Total	328	100%	1414	100%	509	100%	293	100%	906	100%	75	100%	3525	100%

Smoking is widely recognized as the leading cause of lung cancer. Similar to national data and all other Commission on Cancer (CoC) accredited programs, the majority of lung cancer patients diagnosed and/or treated at Legacy Cancer Institute are between the ages of 70 to 79 (see Table 3). Lung cancer is more common in men than women, and particularly among African American men. According to the most recent NCI Surveillance, Epidemiology, and End Results Program (SEER) data, the rate of new lung cancer cases per 100,000 for African American men is 69.3, compared to 60.5 for white men. On the other hand, the rate of new lung cancer cases is higher among white women (50.8) than African American women (43.3) (SEER 21 2014-18, Age-Adjusted).

**Table 3, 2019 Lung/Bronchus Malignancies by Age, Legacy vs Commission on Cancer (CoC)**

Age at Diagnosis	Lung/Bronchus	
	Legacy 2019*	CoC 2018*
0-29	0.6%	0.1%
30-39	0.3%	0.4%
40-49	2.3%	2.4%
50-59	8.0%	14.0%
60-69	30.3%	31.8%
70-79	40.0%	34.7%
80-89	17.1%	14.9%
>90	1.4%	1.7%

\*Most current data available

**Table 4, Lung/Bronchus Malignancies by Gender**

Gender	Legacy 2019*	CoC 2018*
Female	29%	21%
Male	71%	79%

\*Most current data available

Consistent with national statistics, the majority of patients diagnosed and/or treated with lung cancer in 2019 at Legacy Cancer Institute were diagnosed with stage IV disease (41%) (see Table 5). The relative five-year survival rate for lung cancer is about 21.7%. Unfortunately, most lung cancers are detected at an advanced stage, only after the presence and persistence of symptoms. Until recently, there was no proven way to screen for lung cancer. Luckily, through advances in screening and treatment, lung cancers are being detected and cured at earlier stages. Promising data from NCI SEER has shown age-adjusted rates for new lung and bronchus cancer cases falling an average of 2.2% yearly, from 2009 to 2018. Similarly, age-adjusted death rates have been falling an average 3.6% each year over the same time period. This underscores the importance of lung cancer screening for early detection and improved survival.

**Table 5, Legacy and Commission on Cancer AJCC Major Stage Groups — Lung/Bronchus**

AJCC Stage	Lung/Bronchus	
	Legacy 2019*	CoC 2018*
Stage 0	0.0%	0.5%
Stage I	18.6%	26.5%
Stage II	4.3%	8.2%
Stage III	17.4%	18.3%
Stage IV	41.1%	40.0%
NA or Unk	18.6%	6.6%

\*Most current data available

The best way to improve cancer care and survival is through prevention, screening and research. We continue to enroll patients in lung cancer clinical trials, as well as multiple other tumor sites. More information about cancer research at Legacy Cancer Institute can be found in this report.



## Legacy Lung Cancer Screening Program

By Brandy M. Carpenter, DNP, FNP-C, AG-ACNP-BC, TTS; nurse practitioner; lead program coordinator lung cancer screening/tobacco treatment, Legacy Cancer Institute

Lung cancer continues to be the leading cause of cancer death among both men and women, making up about one out of every four cancer deaths.



Each year, more people die of lung cancer than colon, breast and prostate cancers combined. While lung cancer remains the leading cause of cancer deaths among both women and men, over the past five years, the survival rate has increased from

13% to close to 23%. Advancements in lung cancer treatment modalities and introduction of a preventive lung cancer screening program are contributing to the increased survival rates.

Today, less than 15% of Americans who met previous U.S. Preventive Services Task Force (USPSTF) lung cancer screening criteria are tested each year. Given that the American Cancer Society predicts 131,880 lung cancer deaths in 2021, more-widespread screening could save up to 60,000 lives in the U.S. each year. The USPSTF guidelines were recently updated in March 2021. Annual lung cancer screening with a low-dose CT (LDCT) is recommended in patients, ages 50-80, with at least a 20-pack year smoking history (previously at least 30-pack year smoking history), who are current smokers or quit smoking in the past 15 years. The change in guidelines resulted in more than double the number of eligible American adults from 7.8 million to more than 14 million.

Legacy's lung cancer screening program has been a leader in lung cancer screening in the state of Oregon since its pilot program in 2012, and full program implementation aligned with the Legacy

Cancer Institute in March 2014. The program has increased its footprint to two locations (Legacy Good Samaritan Medical Center and Legacy Meridian Park Medical Center) and plans to expand to an additional two locations in the near future. The lung cancer screening program continues to maintain its certification through the American College of Radiology as well as designations for both sites as a Go 2 Foundation Screening Center of Excellence.

Dr. Jordan Fein, pulmonologist and director of Legacy Health's lung cancer screening program, oversees two nurse practitioners and one registered nurse who coordinate and facilitate the program for Legacy's health system. The program has seen substantial growth in the past five years, growing from more than 500 patients in 2015 to close to 1,900 LDCTs in 2020. The LDCTs performed in 2020 resulted in 117 Lung-RADS category 4 findings (lesions suspicious for malignancy), and 28 total lung cancers diagnosed to date. Despite the COVID-19 pandemic, the lung cancer screening program was able to grow by more than 10% from 2019 to 2020.

The Legacy lung cancer screening team continues to provide shared decision making and smoking cessation as integral components of the screening experience. In 2019, the lung cancer screening team developed and implemented group tobacco cessation counseling offered to patients in the lung cancer screening program. To date, more than 100 group meetings have been facilitated by the team. Legacy's lung cancer screening program continues to strive to be the best lung cancer screening program in the Pacific Northwest.

## Advances in Lung Cancer Diagnostics

*By Jordan Fein, MD; pulmonologist; medical director, lung cancer screening program, Legacy Medical Group–Pulmonary*

There have been a number of advances in lung cancer diagnostics over the past five years, and this continues to be an area of rapid growth. With low dose CT lung cancer screening as a standard of care, identifying early-stage lung cancers has required new tools to biopsy smaller and smaller lung nodules.



Legacy Health is a leader in lung cancer screening, being one of the first and largest lung cancer screening programs in Oregon. We have historically used technologies such as CT guided biopsies and electromagnetic navigational bronchoscopic biopsies, where a catheter is directed under computer guidance through a scope out into the lung. The more recent development of a robotic platform for biopsies and potential treatment has taken this to a new level. The new robotic platform allows the physician to “drive” the instruments under direct visualization through the lung airways, directly to the lung nodule and biopsy with greater precision and less invasiveness. Pairing this technology with robotic surgery in the same event is opening new avenues for minimally invasive lung cancer diagnostics and treatment. Look for much more information to come on this topic.

Lung cancer staging, which is the characterization of how widespread a cancer is within the body, is another area where Legacy has continued to lead. Newly diagnosed patients are discussed at Legacy’s multidisciplinary thoracic cancer conference (tumor board) and undergo staging of lymph nodes by endobronchial ultrasound guided biopsies to ensure accurate stage and appropriate treatment plans based on pathologic stage.

Lastly, one of the areas of greatest advancement in lung cancer diagnostics is the use of molecular testing. Molecular testing identifies specific driver mutations which allows us to target and personalize treatment regimens for an individual’s specific cancer based on the tumor biology. The molecular testing lung panel is ordered following identification of the cancer to test for mutations including EGFR, ALK, ROS-1, BRAF, MET, RET, and PD-L1 expression. The information from testing performed right here at Legacy’s laboratory ensures a rapid turnaround time with the most up to date information to make the best treatment decisions for our patients. Next generation sequencing is being explored at Legacy to test for even more mutations as this field rapidly evolves.

Lung cancer diagnostics continue to rapidly evolve and contribute to improved survival rates for lung cancer. At Legacy Health, we continue to be leaders in lung cancer care and incorporate the latest in lung cancer diagnostics into the thoracic oncology program.

## Lung Cancer Surgery Program at Legacy

*By Kai Engstad, MD; cardiothoracic surgeon; medical director, lung cancer program, Legacy Cancer Institute*

While lung cancer is the second most common cancer among both men and women, it is by far the number one cause of death, making up almost



25% of cancer deaths. Unfortunately, it is often diagnosed when a cure is no longer a possibility. While we generally consider it to be a disease of smokers, increasingly we are seeing people who have never smoked diagnosed with the disease.

Luckily, in more recent years we are making the diagnosis of lung cancer at an earlier point. This is largely due to the introduction of screening. Just like mammograms are used to detect breast cancer early, CT screening for lung cancer detects the disease at an earlier stage when a cure is more likely.

Legacy has developed a robust lung cancer screening program. Patients who are at risk and eligible for screening are identified by a highly trained and experienced nurse practitioner. Scans are interpreted by radiologists specializing in lung cancer, and all patients with abnormal findings are reviewed by a pulmonologist with expertise in the evaluation and management of lung cancer and/or other respiratory conditions.

This program has led to a growing number of patients with lung cancers that can be potentially cured by surgery alone due to early detection. The surgical treatment of lung cancer has developed greatly over the years. At Legacy, we now perform almost all operations for lung cancer using mini-

mally invasive techniques. In the past, most operations involved large incisions and spreading of the ribs, with significant pain and long hospital stays. Today, using video assisted thoracoscopic surgery (VATS) and robotic assisted thoracoscopic surgery (RATS), pain is dramatically lessened, hospital stays are shortened, and patients can resume their normal activities faster and without restriction.

Enhanced recovery after surgery (ERAS) is another component of the program. As the patient moves from home to the hospital, through the operation, recovering in the hospital and getting back home, ERAS places an emphasis on all the small details that help patients avoid complications and hasten recovery. While in the hospital, a robust and experienced team of physicians, nurses, physician assistants, respiratory and physical therapists, among others, all contribute to successful surgical outcomes.

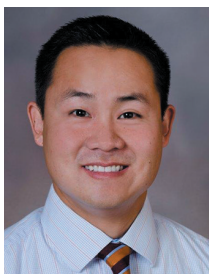
Before and after surgery, patients are also evaluated by a multidisciplinary team at the weekly thoracic cancer conference or tumor board. This group, consisting of surgeons, pulmonologists, medical and radiation oncologists, radiologists and pathologists, and additional team members, reviews every patient to ensure prompt referral for any further patient-centered treatment and evaluation in clinical research trials.

Our aim for patients undergoing surgery for lung cancer at Legacy is to provide a cure through world class, personalized treatment and care.

## Medical Oncology for Lung Cancer

By Ted Huang, MD; medical oncologist, OHSU Knight-Legacy Health Cancer Collaborative

In the past five years, tremendous strides have been made in the care of lung cancer. The introduction of immune checkpoint inhibitors has significantly



improved survival outcomes in patients with advanced small cell and non-small cell lung cancers. Median overall survival has improved from 8-11 months for metastatic lung cancer, to six months and longer. At five years, 25% of patients are still alive,

which was unthinkable a decade ago. Patients who were previously afraid of the usual side effects associated with chemotherapy (e.g. nausea and vomiting, hair loss, lowered blood counts, weakened immune systems, nerve damage) are now able to receive treatment that is considered much less toxic, resulting in better quality of life and a longer one, too.

Working closely with Legacy pulmonologists, radiologists, thoracic surgeons, and pathologists, we have developed a molecular lung panel that

tests a patient's tumor biopsy for potentially targetable mutations. The results provide select patients the opportunity to receive the latest FDA-approved oral treatments that are highly effective, superior to chemotherapy, and associated with less adverse side effects. The streamlined process allows us to collect critical information more quickly and create more timely patient treatment plans. Having an agreed upon treatment plan earlier in the process helps to alleviate both patient symptoms and the anxiety associated with a cancer diagnosis.

Within the OHSU Knight-Legacy Health Cancer Collaborative, our medical oncologists also partner with Legacy Cancer Institute's radiation oncology team to develop and coordinate treatment plans to make the treatment process as smooth as possible for patients and their families. Various clinical trials are also available through the Legacy Cancer Institute and OHSU Knight Cancer Collaborative. Our clinical trials bring cutting edge research to patients in our local communities.

## Advances in Lung Cancer Radiotherapy

By Kathryn Panwala, MD; radiation oncologist, Legacy Cancer Institute

For many decades lung cancer has been the leading cause of cancer mortality. We are seeing improvement in lung cancer deaths with smoking cessation efforts, earlier stage lung cancer detection (CT screening programs), improvement in systemic therapy (targeted/maintenance and immunotherapy) based on biomarker testing for patients with more advanced disease, and the use of SABR (stereotactic ablative radiation therapy) in the setting of oligometastatic (limited number of metastatic sites) or oligoprogressive (limited number of metastatic sites not responding to systemic therapy) disease.



Advances in radiotherapy delivery have improved treatment tolerability and effectiveness. Four-dimensional planning enables us to account for tumor movement throughout the patient's respiratory cycle, allowing for tighter treatment margins. Intensity Modulated Radiation Therapy (IMRT)/Volumetric Modulated Arc Therapy (VMAT) treatment techniques facilitate the sculpting of radiation treatment (RT) dose (high dose to tumor, minimizing dose to normal tissues) and reduces treatment delivery time. Daily image guidance permits visualization of the tumor prior to treatment and the hexapod treatment couch can correct for small shifts/tilts in patient set-up. Motion management techniques such as abdominal compression can limit tumor movement. Finally, improvements in treatment planning software, RayStation, support adaptive radiation therapy, accounting for changing tumor volume and changes in patient normal tissue position (weight loss) to modify plan delivery daily.

SABR (also known as SBRT) has been used in the setting of both early-stage lung cancer and oligometastatic cancer. This technique uses a short course (1-5 fractions) of highly conforming, dose intense radiation therapy precisely delivered to limited sized targets. SABR is recommended in the setting of stage I-II (T1-3N0M0) non-small cell lung cancer (NSCLC) patients who are deemed medically inoperable or decline surgery. Currently, Legacy is participating in a clinical trial (SWOG S1914) that utilizes SBRT with or without the addition of atezoli-

zumab for high-risk patients to reduce regional or distant failures. In the setting of oligometastatic disease, the National Comprehensive Cancer Network (NCCN) Guidelines recommend SABR for patients with good performance status and limited metastatic disease burden (up to 3-5 lesions) or in patients with ALK fusions or EGFR mutations progressing in a limited number of sites on targeted therapy. In the setting of CNS metastases, the use of Gamma Knife/Stereotactic Radiosurgery (SRS) has been shown to significantly reduce neurocognitive changes and is preferred to whole brain RT (even hippocampal avoidance techniques) if it can be delivered.

For stage III NSCLC, radiation delivery is a mainstay of definitive treatment. Radiation treatment schedules are evolving towards hypofractionation reducing treatment delivery time. A current Legacy trial (NRG LU 004) is evaluating in high PD-L1 (stage IIB-III) patients the use of durvalumab with accelerated hypofractionated (60 Gy/3 weeks) or conventionally fractionated (60 Gy/6 weeks) radiation. The use of postoperative RT for mediastinal nodal involvement is being re-examined but may remain beneficial in selective patients.

The use of RT in limited stage small cell carcinoma has been shown to improve survival and reduce risk of local failure. In an effort to improve survival in limited stage small cell carcinoma, the NRG LU005 trial (open at all Legacy facilities) is looking at +/- atezolizumab to standard chemoRT. The use of consolidative thoracic RT in patients with low bulk metastatic extensive stage small cell carcinoma with complete response (CR) or near CR has been shown to improve median overall survival. A current Legacy trial (NRG LU007), in extensive stage small cell carcinoma, is randomizing patients with either stable or partial response after chemotherapy and on maintenance atezolizumab to +/- consolidative RT to 1-5 sites. The use of prophylactic cranial irradiation (PCI) is falling out of favor due to neurocognitive changes and use of MRI surveillance.

Given the complexity and evolving treatment strategies for lung cancer patients, it is important that patient care is discussed in multi-disciplinary conferences to provide patients with best quality of care and quality of life.

## Legacy Lung Cancer Screening Program Update

By Philip Baker, MD; radiologist, Diagnostic Imaging NW

Lung cancer remains the number one cause of cancer deaths for both men and women in the U.S. Legacy's lung cancer screening program began



almost a decade ago after the publication of results from the National Lung Screening Trial (NLST), which included more than 50,000 participants. The NLST was the first large-scale trial in the U.S. of annual low-dose CT chest exams for early

detection of lung cancer in at-risk patients. The NLST showed that annual low-dose CT chest exams were effective in early detection of lung cancer and for the first time provided a means of both early detection and reduction in deaths.

As one of the first comprehensive Lung Cancer Screening programs in Oregon, Legacy's lung cancer screening program adheres to the standards and guidelines detailed in NLST published reports and adopted by the American College of Radiology. This includes the specific patient inclusion criteria (age, smoking use, and time since last use), informed consent, smoking cessation support and detailed patient result tracking, and notification and referral for suspected lung cancer. Legacy's lung cancer screening program includes administrators, schedulers, medical assistants, nurse practitioners, CT technologists, radiologists, pulmonologists, oncologists and cardiothoracic surgeons — a true multi-disciplinary team.

The grading and results reporting system used by Legacy radiologists to categorize lung nodules as ranging from benign to highly suspicious, was developed by the American College of Radiology (ACR Lung-RADS) and is analogous to one used for decades in interpreting mammography exams (ACR Bi-RADS). Each ACR Lung-RADS category includes specific guidelines for further evaluating suspect nodules in a minimally invasive manner. When more extensive evaluation or treatment of suspect nodules is required, cases are presented at a weekly multi-disciplinary Legacy Thoracic Cancer

Conference and patient-specific care plans are created.

Legacy's lung cancer screening program continues to improve accessibility for patients from all Legacy Health service areas. Originally started at Legacy Good Samaritan Medical Center, Legacy Meridian Park Medical Center was added two years ago and Legacy Salmon Creek Medical Center is being added presently with Legacy Mount Hood Medical Center to follow. Additionally, government and most commercial insurers routinely reimburse for exams; and as a referral program, the work required of referring providers to access care for their patients has been minimized. Following a referral, patients are evaluated, enrolled and followed by program staff and providers. Also of note: the screening CT exam itself is highly standardized and takes only a few seconds to perform, does not require IV contrast, and can be obtained with very low doses of radiation, about equal to a routine two-view x-ray exam of the chest.

After a decade of dedicated work and care, Legacy has grown a model lung cancer screening program with almost 2,200 screening exams performed annually. For the next decade, it is expected that number will double if not triple, fueled by the recent expansion of the recommend age range for screening by the U.S. Preventive Task Force,\* addition of more Legacy screening sites and continued growing awareness of screening's effectiveness in reducing lung cancer deaths.

\*U.S. Preventive Task Force Recommendation as of March 9, 2021:

**"...Annual screening [is recommended] in adults aged 50 to 80 years who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery."**



## Genomic Testing of Lung Cancer in the Era of Personalized Medicine

By Yasmine Akkari, PhD, FACMG; scientific director, cytogenetics and molecular pathology, Legacy Cancer Institute

Lung cancer is the most common form of cancer death worldwide.<sup>1</sup> When considered a separate category, lung cancer in never-smokers would rank as the seventh most common cause of cancer death worldwide, before that of the cervix, pancreas and prostate (Parkin et al., 2002). Based on histological evaluation and clinical presentation, it is generally divided into two broad categories: small cell lung cancer (SCLC), a highly malignant and undifferentiated neoplasm, consisting of primitive-appearing cells with a high propensity to metastasis, and non-small cell lung cancer (NSCLC), representing all other subtypes and commonly divided into three pathological presentations (squamous cell carcinoma, adenocarcinoma, large cell carcinoma). Although it is estimated that 80–90% of NSCLC incidence can be attributed to cigarette smoking, 10–20% of lung cancer cases occur in never-smokers (Schwartz et al., 2007). Moreover, this percentage is expected to increase as smoking cessation and prevention programs are successfully implemented. While SCLC is usually very responsive to chemotherapy and radiotherapy, NSCLC is resistant to conventional chemotherapy and has been historically treated primarily with surgery.<sup>2</sup>

In the current era of personalized medicine and the progress in identifying targetable genomic driver aberrations in NSCLC, molecular testing has become a mandatory component of the management for this disease. Specifically, the detection of pathogenic mutations in EGFR, BRAF and MET, as



well as structural rearrangements in ALK, ROS1, RET and NTRK, have been incorporated in the diagnostic standards of NSCLC. In addition to genomic examination, most NSCLC are subject to evaluation for PD-L1 protein expression. Taken together, these laboratory tests are utilized not only as predictive markers for therapeutic drugs but also for a more accurate subclassification of lung cancers.<sup>3</sup> In never-smokers, lung cancer is almost universally NSCLC, with the majority being adenocarcinoma. In this article, we will focus on the recent advances in the molecular characterization of NSCLC and discuss the promise of liquid biopsy and germline predisposition to lung cancer in never-smokers.

Unfortunately, more than 60% of lung cancer patients present with locally advanced or metastatic disease, rendering management with surgical resection unsuccessful. In the last decade, however, the discovery of genetic alterations in the epidermal growth factor receptor (EGFR) and rearrangements involving the echinoderm microtubule-associated protein-like 4 (EML4) and anaplastic lymphoma kinase (ALK) genes in NSCLC has led to the rapid development of targeted therapy using tyrosine kinase inhibitors (TKIs) and crizotinib, respectively. These two genetic alterations have been shown to be present in 25% of NSCLC and have been documented to respond to targeted therapy with improved clinical outcome, compared with conventional chemo- and radiation-based therapies.<sup>4</sup>

Continued efforts in large-scale genomics have uncovered many other genetic alterations, the majority of which involve mutations in KRAS, BRAF, METex14 skipping, amplification of MET and rearrangements of ROS1, RET, and NTRK1/2/3. The development of targeted therapies and clinical trials have increased rapidly. Both predictive and prognostic biomarkers are recommended in the workup of NSCLC. A predictive biomarker is indicative of therapeutic efficacy, whereas a prognostic marker is indicative of patient survival independent of treatment regimen.

As mentioned above, predictive biomarkers include pathogenic aberrations in the ALK, EGFR, ROS1, BRAF, NTRK, MET, RET and PD-L1 genes, with emerging predictive biomarkers, including ERBB2 and KRAS and determination of tumor mutation burden (NCCN, 5.2021 Revision). Furthermore, in NSCLC, where few hot spot EGFR variants comprise the majority of activating mutations, and tumor accessibility and heterogeneity pose significant challenges, successful exploitation of liquid biopsy has been well documented in concordance studies.<sup>5</sup> In one study published in 2017, comparison of NSCLC patient DNA from tissue samples with cell free DNA yielded 97% concordance using an NGS panel of 39 genes, but only in patients with metastatic disease.<sup>6</sup> This was consistent with the fact that metastatic burden directly correlates with increased concentration of circulating tumor DNA (ctDNA).

Other applications of liquid biopsy include the monitoring of treatment response and/or detection of resistance variants especially in the case of NSCLC disease progression. In addition, various mechanisms for resistance to therapy have been elucidated using liquid biopsy. This is particularly demonstrated in the frequent acquisition of the EGFR T790M resistance variant in ctDNA following administration of first generation tyrosine kinase inhibitors (TKI), or the lack thereof in cases of transition of NSCLC to small cell carcinoma also leading to TKI resistance.<sup>7</sup>

Lung cancer in never-smokers presents with gender, pathological, and molecular differences, and has been recognized more recently as a different disease. Familial aggregation has provided indirect evidence for a genetic role in lung cancer susceptibility, even when adjusted for shared environmental factors. This has prompted a worldwide effort to search for genes and genetic regions (loci) associated with predisposition to this disease. In addition, past epidemiological studies have demonstrated a two to three-fold increase in the risk of lung cancer in relatives of patients. Genome wide association studies have identified several susceptibility loci influencing lung cancer risk such as the one on 6q23-25, where the search of the culprit gene is still ongoing<sup>8</sup> and on 13q31.3, where transcription levels of the GPC5 gene were shown to be decreased in patient samples.<sup>9</sup> In addition, several hypotheses were put forth for the increased risk of lung cancer in never-smokers, including differences in DNA repair capacity or oxidation pathways. To this end, polymorphisms in genes involved in both excision repair (ERCC1 and XRCC1) and oxidation-induced damage (CYP1A1 and GSTM1) have been shown to increase disease risk in carriers (Schwartz et al., 2007). However, the identification of specific genes in lung carcinogenesis, and the availability of accurate family segregation data have remained elusive.

With the advent of whole genome and whole exome (protein coding region of the genome) sequencing, protein expression array technologies, and the ability to compare sequence information between somatic and germline tissue in affected patients, information about lung cancer predisposition in never-smokers has seen a successful surge of promising clues. Pathways that lead to lung tumorigenesis are being dissected and evidence is rapidly accumulating about the role of the EGFR gene in this disease. The EGFR protein belongs to a family of receptor tyrosine kinases that are mutated in 50% of lung cancers and initiate an anti-apoptotic and invasion signaling cascade. These studies, in turn, led to the development of tyrosine kinase inhibitors (TKIs) and showed measurable success

in a subset of never-smoker patients later found to carry activating EGFR gene alterations. In particular, a specific, highly conserved, somatic mutation, p.Thr790Met, was reported in some cases of NSCLC that recur after an initial response to TKIs. This suggested a proliferative advantage of cells carrying this variant and prompted investigators to screen several families in which multiple never-smoker individuals developed lung adenocarcinoma. Testing of affected individuals and comparison to their non-affected relatives showed the presence of the p.Thr790Met variant in both germline and normal lung tissue. Conversely, analysis of tumor tissue showed the presence of other pathogenic variants most often occurring in cis with the Thr790Met variant. The implication of this finding may help explain the mechanism of tumor progression in these individuals and its relatively late occurrence (~ age 50) in these families.<sup>10</sup> This emphasizes the need for EGFR gene testing in families with strong aggregation of lung cancer.

The discovery of germline EGFR mutations in familial lung cancer stimulated a wide interest in the identification of inherited variants in high-penetrance but low-frequency genes similar to what was achieved in breast and ovarian (eg. BRCA1/2) or colorectal cancers (eg. APC). These studies, using families with several affected individuals from mul-

iple generations, are ongoing. The goal of these studies is to provide such families with appropriate screening guidelines and understand the molecular pathways in the development of this disease.

### **Bibliography**

1. Parkin, D. M. et al. (2005) *CA Cancer J. Clin.* 55, 74–108.
2. Popper H. H. et al. (2014) *Transl. Lung Cancer Res.* 3(5), 291–300.
3. Osmani Lais et al. *Semin Cancer Biol.* 2018 October ; 52(Pt 1): 103–109.
4. Stella GM et al. *Lancet Respir Med.* 2013; 1:251–61.
5. Sholl LM *J Thorac Oncol.* 2017 Oct;12(10):1464-1466.
6. Muller JN *J Thorac Oncol.* 2017;12:1503-1511.
7. Matakidou, A. et al. (2005) *Br. J. Cancer* 93, 825–833.
8. Bailey-Wilson, J. E. et al (2004) *Am. J. Hum. Genet.* 75, 460–474.
9. Li, Y. et al. (2010) *Lancet Oncol.* 11, 321–330.
10. Bell D. W. et al. (2005) *Nat. Genet.* 37(12), 1315-1316.

## Metastatic Lung Cancer and Legacy Palliative Care Services

By Emily Huber, MD; palliative care physician, Legacy Medical Group–Palliative Care

Metastatic lung cancer is the most common cancer in the United States, and it presents both challenges and opportunities for palliative care. Palliative



care is a team-based approach to support patients and their families living with serious illness. The word “palliative” comes from the Latin word “to comfort.” Palliative care addresses not only physical pain and distress, but also the psychological,

socio-economic and spiritual pain that comes with a metastatic cancer diagnosis. The National Comprehensive Cancer Network (NCCN) states that “the goal of palliative care is to anticipate, prevent and reduce suffering and to support the best possible quality of life for patients, families and caregivers.”

Some of the earliest palliative care research shows that early involvement with palliative care not only improves both quality of life but also quantity of life. Early involvement with palliative care allows patients and families to benefit from the full scope of the palliative care team. The team gets to know the patient and family, explores what is important to them, plans ahead based on their values, and then ensures that medical treatment always aligns with who they are as a person.

Palliative care has much to offer in terms of managing the symptoms that often come with metastatic lung cancer. Bone metastases are common, and palliative care providers help manage pain using a multi-modal approach to decrease pain, and more importantly, improve patient function. For instance, palliative radiation therapy can be very effective in treating bone pain, and the course of treatment can be shortened based on the patient’s goals. Malignant plural effusion, or buildup of fluid around the lungs, can be managed with a catheter to manage the fluid at home. New therapies such as immune therapy have helped patients live longer with fewer side effects. Additional side effects such as nausea and vomiting, fatigue, loss of appetite, depression and anxiety can also be managed by the palliative care team.

Because survival for some patients with metastatic lung cancer is measured in years, the palliative care team builds rapport with patients and families then helps support the transition to hospice when cancer directed therapy is no longer beneficial. Palliative care allows people with metastatic lung cancer to live their best life.

Legacy Palliative Care Services is committed to providing an additional layer of support for patients living with metastatic lung cancer. Palliative care is available at all Legacy medical centers, except Legacy Silverton Medical Center. For more information about palliative care services, call Legacy Medical Group–Palliative Care directly at 503-413-6862.

## Legacy Oncology Research

*By Leslie Sorenson, CCRP; manager oncology clinical research, oncology genetics, and autologous stem cell transplant, Legacy Cancer Institute*

Oncology research at Legacy Health made some significant changes in 2020 due to the COVID-19 pandemic. These changes allowed us to continue



offering research studies and support to our patients and providers in the communities we serve. Video and telephone visits, direct mailing of National Cancer Institute (NCI) approved investigational oral agents to patients, and adjustments in

timing of study-related procedures were just a few changes that were made immediately. Research studies that involved in-person IV chemotherapy or radiation therapy were fortunately able to continue for patients, with staff working with providers and patients to limit the number of persons in attendance and pivoting to make loved ones available via video or phone as a continued means of support.

Legacy's portfolio of lung cancer research studies includes the following types of lung cancer:

- Non-small cell.
- Metastatic non-small cell.
- Limited stage small cell.
- Extensive stage small cell.

The following lung cancer protocols were recently added to our listing of available studies at Legacy Health:

**NRG-007 (RAPTOR Trial)** A Randomized Phase II/III Trial of Consolidation Radiation + Immunotherapy for ES-SCLC. This study is testing the addition of radiation therapy to immune therapy treatment (atezolizumab) for patients with extensive stage small cell lung cancer.

**SWOG-S1914** A Randomized Phase III Trial of Induction/Consolidation Atezolizumab + SBRT Versus SBRT alone in high risk, early stage NSCLC. This study is testing the addition of atezolizumab to radiation therapy for early stage non-small cell lung cancer.

Targeted therapies and the advancement of immunotherapy using checkpoint inhibitors is a major focus in lung cancer treatment research. In addition, we have several trials looking into the timing and use of consolidative radiation therapy in metastatic lung cancer with the hope of further decreasing tumor disease burden for our patients. We are excited to see the continued advancement in the area of lung cancer and the use of multimodality therapies to increase options for patients and improve outcomes.

## Continuous Quality Improvement and Adapting in Times of Crisis

By Mindy Ansteth, BS, CTR, CPHQ; manager, cancer data management and quality improvement consultant, Legacy Cancer Institute

Cancer posed an even greater threat to our nation during the COVID-19 pandemic. It didn't ease up because we were living in unprecedented times.



Cancer went about business as usual, while it was anything but usual at Legacy Cancer Institute (LCI). For newly diagnosed patients and loved ones, the pandemic meant facing a cancer diagnosis with the added fear and anxiety of

undergoing treatment with strict social distancing. For cancer screening and early detection, the pandemic caused sharp declines in screenings across the nation. The decline meant early-stage cancers were going undetected and more lives lost to the disease.

Recent studies estimate that as many as 22 million cancer screening tests may be disrupted due to the COVID-19 pandemic, with a potential of 80,000 delayed or missed cancer diagnoses across the country. In 2021, LCI, in partnership with Legacy Population Health and the Medical Homes Team, are participating in a quality initiative sponsored by the Commission on Cancer (CoC) and American Cancer Society (ACS) to restore cancer screening to pre-pandemic rates or higher. For lung cancer in particular, screening provides patients with a critical advantage since survival is as high as 55% for early stage, localized disease. Unfortunately, only about

16% of lung cancer is diagnosed early, underscoring the importance of lung cancer screening and early detection.

Legacy's lung cancer screening program is certified through the American College of Radiology (ACR) and is a designated Center of Excellence by the Lung Cancer Alliance. In the face of the pandemic, the program continued to live up to this designation. Safeguards were swiftly put in place to provide the same quality care with safe social distancing. Additionally, the LCI weekly thoracic cancer care conference (tumor board) continued to support the lung cancer screening program without delay. The conference transitioned from in-person to virtual meetings, ensuring patient care plans were discussed among the multidisciplinary care team and that any barriers to care were circumvented as quickly as possible.

LCI ranks among the nation's best cancer programs based on outcomes and quality of care. The most recent data released by the American College of Surgeons (ACS) Commission on Cancer (CoC) National Cancer Database (NCDB), demonstrates Legacy's commitment to quality care and following evidence-based treatment guidelines. As provided in Table 6, LCI greatly exceeds the CoC quality measure benchmarks for lung cancer, as well as the quality measures established for breast, colon and rectal cancers.



**Table 6, 2018 CoC Accreditation Quality Measures**

Primary Site	Measure	CoC Benchmark	LCI Performance
<b>Breast</b>	Radiation is administered within one year (365 days) of diagnosis for women under age 70 receiving breast conserving surgery for breast cancer (BCSRT).	90%	96.0%
	Tamoxifen or third generation aromatase inhibitor is recommended or administered within one year (365 days) of diagnosis for women with AJCC T1cN0M0, or stage IB-III hormone receptor-positive breast cancer (HT).	90%	93.2%
	Radiation therapy is recommended or administered following any mastectomy within one year (365 days) of diagnosis of breast cancer for women with ≥4 positive regional lymph nodes (MASTRT).	90%	90.9%
	Image or palpation-guided needle biopsy to the primary site is performed to establish diagnosis of breast cancer, (nBx).	80%	92.6%
<b>Colon</b>	At least 12 regional lymph nodes are removed and pathologically examined for resected colon cancer (12RLN).	85%	92.1%
<b>Lung</b>	Systemic chemotherapy is administered within four months to day preoperatively or day of surgery to six months postoperatively, or it is recommended for surgically resected cases with pathologic, lymph node-positive (pN1) and (pN2) NSCLC (LCT).	85%	100%
	Surgery is not the first course of treatment for cN2, M0 lung cases (LNoSurg).	85%	100%
<b>Rectum</b>	Preoperative chemo and radiation are administered for clinical AJCC T3N0, T4N0, stage III; or postoperative chemo and radiation are administered within 180 days of diagnosis for clinical AJCC T3N0, T4N0 with pathologic AJCC T1-N0 or stage III; or treatment is recommended; for patients under age 80 receiving resection for rectal cancer (RECRCT).	85%	100%

\*Most recent data available by the CoC at the time of this report publication.

Along with the ongoing and standard quality work completed within each national oncology certification and accreditation at Legacy Health, additional performance management and improvement work are performed regularly. For example, a thoracic cancer quality improvement dashboard is one tool to identify barriers to care, benchmark LCI performance against national best practices, and reduce any variation in care across Legacy Health facilities. A regular review by a multi-disciplinary team promotes transparency, provides a forum for discussion, and is a source for regular quality improvement initiatives — no matter how large or small. Data studies are also completed regularly for oncology clinical research projects, quality improvements and for cancer program

administration.

Legacy Cancer Institute remains steadfast in its commitment to provide the best patient-centered care in the face of any challenge. It would be remiss not to express my sincere gratitude and appreciation for the countless frontline workers, clinicians and administrators across Legacy Health who worked tirelessly throughout the 2020 pandemic to put the health and safety of our patients and communities first.

## 2020 Cancer Data Management Update

By Brandy White, cancer data management technologist, Legacy Cancer Institute

### Overview

Cancer data management (CDM) is an integral component of the Legacy Cancer Institute (LCI). Our team of cancer data management profession-



als specialize in capturing and interpreting hundreds of data items, including gathering a complete history, diagnosis, treatment and health status for all patients diagnosed and/or receiving first course treatment within the Legacy Health system.

The data collected by the team serves as the foundation of advancements in cancer research, treatment, prevention and screening programs. The data provides a complete picture of each patient's cancer and contributes to improvements in health care policies, as well as patient care and outcomes.

### Challenges

Each new year gives us opportunities to embrace change, and 2020 was no different. With the outbreak of COVID-19, it is safe to say this year gave us all a run for our money! In addition to a global pandemic, significant changes over the last several years in cancer staging, genomics and genetic testing, accreditation standards and numerous data fields solidified our need to remain adaptable and resilient. Maintaining cancer data that is relevant to current practices is incredibly time consuming and detail-driven, as cancer care is continuously evolving. This evolution results in better diagnostics, therapeutics and ultimately, improved patient outcomes.

### Achievements

Although 2020 brought its own unique set of challenges and barriers, the CDM team never wavered in a commitment to excellence. The following are some of accomplishments in 2020:

- Error-free Commission on Cancer National Call for Data yearly submission.
- Transitioned 32 in-person cancer conferences per month to virtual cancer conferences.
- Provided ongoing support for and coordinated 32 cancer conferences per month.
- Responded to 91 data requests from research staff, physicians and cancer program administration.
- Accessioned 3,525 new cases into the registry database.
- Maintained a 96% yearly follow-up rate for patients diagnosed in the last five years and a 90% yearly follow-up rate for all patients followed since 1997.

### Future

The Certified Tumor Registrar (CTR) credential signifies professional excellence in the cancer data management field. In true cancer data management form, additional changes in data collection and tracking have been announced for patients diagnosed in 2021, including American Joint Committee on Cancer (AJCC) staging updates for women diagnosed with cervical cancer. Cancer data management staff are consistently presented with unique challenges, which in turn results in continued learning, personal and professional growth, and an unwavering commitment to the evolving world of cancer and helping to find a cure.

## Cancer Support Services

By Niani Dunner, MPH; coordinator, Legacy Cancer Healing Center

In addition to world-class medical care, patients and their families have access to a myriad of supportive services available at Legacy Cancer Institute



before, during and after treatment. In 2020, with the onset of the COVID-19 pandemic, many services pivoted from in-person to telephonic or virtual visits — but we never stopped providing support. In fact, some patients expressed appreciation

to be able to access services remotely, as transportation and fatigue are common barriers for oncology patients to meet in-person. When we transition back to “normal,” we will retain both, giving patients options that fit their needs. Below are highlights of some of the support services offered at the Legacy Cancer Institute and Cancer Healing Center, most of which are offered free of charge.

**Oncology nurse navigators** are often the bridge between patients, their medical team and other support service providers, answering questions and facilitating communication to ensure coordinated care. Nurse navigators monitor patients’ progress with phone calls throughout the treatment course.

**Licensed clinical social workers** help address practical and logistical barriers to cancer treatment, provide emotional support, and link to internal and external resources. They assess individual needs and connect patients and families to resources, including mental health counseling, financial assistance, transportation to-and-from treatment, home health or long-term care and more.

Our **oncology psychologist** works with other medical providers to offer support to patients and their families as they undergo cancer treatment. Depression, anxiety and post-traumatic symptoms are common among oncology patients; there are multiple ways that our oncology psychologist can help.

Our **integrative nurse practitioner** offers patients holistic assessment and symptom management, throughout active treatment and into survivorship. An individual integrative care plan offers options from both Western and Eastern medicine to help with issues such as memory, sleep, pain, fatigue, poor appetite, stress, as well as future cancer risk reduction through suggested lifestyle modifications. They help assess the safety and efficacy of alternative treatments outside of traditional Western medicine and serve as a trusted resource for evidence-based integrative therapy referrals — such as acupuncture, supplements and mind/body modalities.

**Oncology certified dietitians** offer individual consultations in nutritional counseling, as well as group nutrition classes. They help assess and address individuals’ barriers to eating, drinking, digesting and absorbing nutrients, heading off treatment delay or disruption, and improving quality of life. Post-treatment nutrition counseling and classes offer nutrition recommendations with ongoing symptom management, education on dietary modifications, and the latest research on anti-cancer foods and popular diets.

**Art therapists** are licensed mental health professionals who use various artistic mediums to allow patients to express themselves, and to promote emotional, mental and physical well-being. Legacy offers oncology patients art-based groups, individual and family sessions. Group programming ranges from a weekly Pop-Up Open Art Studio to hosting an annual Artist-in-Residence.

**Cancer support groups, classes and events** help patients socially, emotionally and physically as they adapt to their cancer diagnosis, treatment and survivorship. In addition to nutrition and art-based groups, we offer weekly exercise groups, including yoga, t'ai chi/qigong and pilates, six different monthly cancer support groups and special events, such as gong meditation for deep relaxation.

## Community Involvement 2020

### Community Events

#### October 2020

Worship in Pink — Komen

### Prevention and screening education and activities

#### Ongoing

Lung cancer screening program for high-risk individuals

Tobacco cessation counseling for those in lung screening program

“Meals That Heal” and “Cancer Superfoods” nutrition classes for patients and caregivers

Free screening mammograms for uninsured or underinsured low-income women, through Oregon’s Screenwise Program (previously BCCP), at Legacy Good Samaritan, Legacy Emanuel, Legacy Meridian Park and Legacy Mount Hood medical centers

### Cancer patient care conferences (tumor boards)

Brain/CNS tumors (Legacy Good Samaritan Medical Center)

Breast care (Legacy Good Samaritan Medical Center, Legacy Meridian Park Medical Center, Legacy Mount Hood Medical Center and Legacy Salmon Creek Medical Center)

Breast cancer radiology/pathology correlation (Legacy Good Samaritan Medical Center)

GastroIntestinal tumors (Legacy Good Samaritan Medical Center, Legacy Meridian Park Medical Center)

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

Gynecologic cancers (Legacy Good Samaritan Medical Center)

Head and neck tumors (Legacy Good Samaritan Medical Center)

Metastatic breast care (Legacy Good Samaritan Medical Center)

Pediatric oncology (Randall Children’s Hospital)

Thoracic tumors (Legacy Good Samaritan Medical Center)

Urologic/prostate tumors (Legacy Good Samaritan Medical Center)

### Groups, classes and events for cancer patients offered in 2020

#### Support groups

Brain tumor support group

Women’s metastatic and advanced cancer support group

Men’s cancer support group

Breast cancer support groups

Gynecological cancer support group

Head and neck cancer support group

Prostate cancer support group

#### Movement classes

Yoga for adults with cancer

Yoga for healing from cancer

Pilates for adults with cancer

T’ai chi and qi gong for individuals with cancer

Step Into Fitness: A Four-Week Wellness Program for Survivors

#### Art therapy programs

Expressions of Healing: Art and Community

Finding Center: Art Making for Mindfulness and Stress Reduction

Felting Workshop: Fiber Arts for Adults with Cancer

Creative Exploration Through the Cancer Journey

Words for Healing: Monthly Writing Series

Artist in Residence Program

Pop-Up Open Art Studio

#### Mind-body classes and special events

Mindfulness meditation

Mini-mindfulness sessions

Gong bath meditation

Cancer superfoods

Mindful movement and meditation workshops

#### Outreach via social media

Legacy’s community relations and marketing department is an important partner with the cancer program in reaching the community through social media messaging, website content and banners and targeted direct mail. Facebook posts, often related to cancer awareness months, aim to engage and motivate readers toward healthy behaviors.

## Legacy Cancer Institute Integrated Network Cancer Committee Members 2020

Mindy Ansteth, BS, CTR, CPHQ; manager, cancer data management and quality improvement consultant, Legacy Cancer Institute

Christine Brown, MS, BSN, RN, RD, OCN; community outreach and activity coordinator and Oncology Nurse Navigation Supervisor; Legacy Cancer Institute

Sara Butler, MSW, LCSW, OSW-C; oncology social worker, Legacy Cancer Institute

Andrew Cox, MD; interventional and diagnostic radiologist, Diagnostic Imaging NW, Legacy Good Samaritan Medical Center

Dawn Cox, CTR; supervisor, cancer data management, Legacy Cancer Institute

Maryam Farinola, MD; anatomic and clinical pathologist, medical director, anatomic pathology, Cascade Pathology

Emily Huber, MD; palliative care physician, Legacy Medical Group—Palliative Care

Pam Kilmurray, director, Legacy cancer service line, Legacy Good Samaritan Medical Center Rehabilitation Services, Legacy Breast Health centers and Legacy Hospice

Jutta Kress, BSN, RN, OCN; nurse education and practice specialist, Legacy Cancer Institute

Nathalie Johnson, MD, FACS; breast surgical oncologist, medical director, Legacy Cancer Institute and Legacy Breast Health Centers

Alizah Rotramel, MD, FACS; colorectal surgeon, cancer liaison physician, LMG Colon and Rectal Surgery

Mark Schray, MD; radiation oncologist, medical director, Legacy Medical Group—Radiation Oncology

Leslie Sorenson, CCRP; manager, oncology clinical research, genetics, and autologous stem cell transplant, Legacy Cancer Institute

Paul Tseng, MD, MBA, FACS; gynecologic oncologist, chair, Integrated Network Cancer Committee, Legacy Medical Group—Gynecologic Oncology

### Subcommittees of the Integrated Network Cancer Committee

Cancer Data Management Quality Committee

Cancer Quality Advisory Council

Cancer/Public Professional Education and Marketing Council

### Cancer Program and Quality Committees

Brain and Spinal Tumor Program Committee

Breast Program Leadership Committees at Legacy Good Samaritan, Legacy Meridian Park, Legacy Mount Hood and Legacy Salmon Creek medical centers

Center for Colorectal Cancer at Legacy Good Samaritan Medical Center

Colorectal Cancer System-Wide Quality and Operations Meeting

Gynecologic Oncology Program Development

Oral, Head and Neck Program Planning

Hospice Quality (QAPI)

Lung Cancer Screening

Radiation Oncology Quality Committee

Thoracic Program Development

## Honors and accreditations 2020



Legacy Health ranked among the nation's best cancer programs, according to the American College of Surgeons' (ACS) Commission on Cancer, a respected authority on cancer care. The commission also awarded Legacy's cancer program its Outstanding Achievement Award in the last four accreditation surveys.



Legacy Cancer Institute was the first in the United States to receive Network Cancer Program accreditation from the ACS. Patients can receive the same award-winning care at any of our campuses, closer to home.

The Legacy Breast Health Centers at Legacy Good Samaritan, Legacy Meridian Park, Legacy Mount Hood and Legacy Salmon Creek medical centers earned the prestigious accreditation for excellence in the care of patients with breast cancer and benign breast disease from the American College of Surgeons' National Accreditation Program for Breast Centers (NAPBC).



In addition, the Legacy Breast Health Centers at Legacy Good Samaritan, Meridian Park, Mount Hood and Salmon Creek medical centers were designated Breast Imaging Centers of Excellence by the American College of Radiology. To achieve this distinction, a facility's imaging services had to be fully ACR-accredited in mammography, stereotactic breast biopsy, breast ultrasound and ultrasound-guided breast biopsy.



Legacy Cancer Institute was one of only three nationally accredited blood and bone marrow transplant providers in Oregon. Learn more about FACT, the Foundation for the Accreditation of Cellular Therapy, which evaluates programs nationwide.



Legacy Medical Group—Radiation Oncology at Legacy Good Samaritan, Legacy Mount Hood and Legacy Salmon Creek medical centers was accredited by the American College of Radiology (ACR) Radiation Oncology Practice Accreditation (ROPA) program. Legacy Health's radiation oncology staff, equipment, treatment planning and treatment records, as well as patient-safety policies and quality control/quality assessment activities were assessed to maintain ROPA accreditation. ACR accreditation provides Legacy's radiation oncologists with valuable third-party, impartial peer review and evaluation of patient care.



Legacy's lung cancer screening program at Legacy Good Samaritan Medical Center was accredited by the American College of Radiology (ACR) as an ACR Designated Lung Cancer Screening Center. To achieve this designation, Legacy's lung cancer screening program had to maintain active ACR CT Accreditation in the ACR Chest Module and meet very specific requirements related to the screening population, staff qualifications, the ACR Lung Reporting and Data System (Lung-RADS), patient smoking cessation, CT equipment, quality control and imaging protocol.



Legacy Laboratory Services and Legacy Tumor Bank achieved College of American Pathologists (CAP) accreditation, which ensures high standards for quality and consistency in collecting, processing and storing tumor specimens.



Legacy Oncology Clinical Research received approval for NRG Oncology research group main membership.



Legacy Oncology Clinical Research was recognized by National Cancer Institute leadership as a high-performing site based on accrual.



## Legacy Cancer Institute

503-413-8050

[legacyhealth.org/cancer](https://legacyhealth.org/cancer)

