Committed to Improving Cancer Care.

2014-2015 Sioux Falls Cancer Committee Annual Report

SANFORD CANCER CENTER

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Director, Clinical Research

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Medical Oncology

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Diagnostic Radiology

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Pathology

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Medical Oncology

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Surgery

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Surgery

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To learn more about Sanford Cancer Center, go to cancer.sanfordhealth.org

1309 W. 17th Street, Sioux Falls, SD 57104

A Letter from the Chair of the Cancer Committee

Maria Bell, MD, FACOG, MPH, MBA
Cancer Committee Chair

The past year has been an exciting time to have the privilege of working full time in caring for patients with a cancer diagnosis. The world of healthcare in general in the United States is rapidly changing. This is also true of cancer care. Recommendations for cancer screenings are being debated, genomic research is rapidly growing, technological innovations are being adopted, the cost of care is being tackled, and patients are increasingly more informed. As these changes continue to impact how we deliver care your entire Sanford Cancer Center team remains committed to providing patient centric care.

Each year we present a snippet of the work we are doing at Sanford Cancer Center to bring you the best in cancer care. Two essential components to decreasing mortality from cancer are prevention and early detection. With rare exception, the sooner we identify a cancer, the more likely we are able to successfully treat that disease. As we continue our Dedication to the Work of Health and Healing, preventing disease and identifying disease early are essential to success in our work for you. You also have a significant role in partnership with us by completing the recommended screenings so this year we are providing a discussion about cancer screenings.

At this time next year, we will have completed construction on the next phase of our cancer services buildings. The Edith Sanford Breast Cancer building will be completed in late 2016 and will bring much needed patient care space to the Sanford Campus for the growing demand for Sanford services. Watch us grow and come take a look when the building is complete.

We hope you find the contents of this annual report of interest. You may always go to www.SanfordCancer.org to dive further into all we do, to schedule an appointment, find a physician, and learn about open clinical trials.

Thank you for trusting us with your care. We are committed to providing you with the best available care at the right time for the maximum benefit.

Cancer Screening Guide

Breast Cancer

Screening Mammograms

- An x-ray of the breast used to detect breast changes in women who have no signs or symptoms of breast cancer.
- Yearly for women 40 and over

Contact Breast Health Institute at (605) 328-4592 to schedule a screening.

Clinical Breast Exam

- An examination of the breast done by a health professional.
- Every three years for women in their 20's and 30's
- Yearly for women 40 and over
- Monthly self breast exam

Cervical Cancer

Cervical Cancer screening should begin at age 21 for all women

- Women between ages 21 and 29 should have a Pap test every 3 years.
- A Pap test is an examination of cells collected from the cervix, which is the lower end of the uterus, also referred to as Pap Smear.
- Women between the ages of 30 and 65 should have a Pap test plus an HPV test (called "co-testing") every 5 years OR a Pap test alone every 3 years.
  - An HPV test is a test for the presence of the Human Papilloma Virus in the cells of the cervix.
- Women over age 65 who have had regular cervical cancer testing with normal results may stop testing for cervical cancer.

Skin Cancer

Skin Evaluations

- Visual inspection of your skin by a physician.
- Yearly for everyone.

Colorectal Cancer

Beginning at age 50, men and women should have one of the screening tests below. Talk to your doctor about which test is best for you.

Colonoscopy

- An examination of the inside of the colon, using a colonoscope inserted into the rectum.
- Every 10 years for those 50 and over.

Fecal Immunochemical Test (FIT)

- A test for blood in stool where a sample of stool is placed on a card and then sent to a lab for testing.
- Multiple stool take-home test should be used.
- A single test in the doctor's office is not adequate.
- Must be completed every year to be effective.
- Every year for those 50 and over.

Prostate Cancer

The American Cancer Society recommends discussing the risks and potential benefits of prostate cancer screening with your health care provider before making a decision about being screened.

- Age 50: Discussions about screening should take place for those who are at average risk.
- Age 45: Discussions about screening should start for those at high risk.

High risk factors include:

- African descent
- Immediate relative with a history of prostate cancer at an early age (younger than age 65)

PSA (Prostate Specific Antigen)

- A blood test looking for abnormal levels of PSA in the blood.

Digital Rectal Examination

- An exam to detect abnormalities of the prostate that can be felt from within the rectum.

Lung Cancer

Low Dose CT Scan

CT or CAT scan of the lungs with a special scanner that uses a low dose of radiation. Screening for lung cancer is only appropriate and recommended for those at high risk for lung cancer:

- Men and women between the ages of 55 and 77 who are current smokers or have quit within the past 15 years AND have a smoking history of at least 30 pack years (1 pack per day for 30 years, or 2 packs per day for 15 years, or 3 packs per day for 10 years) are eligible.

Contact your Sanford Clinic to schedule a screening.

Annual Report 2014-2015

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Colonoscopy to Prevent Colorectal Cancer

Heather McDougall, MD
Gastroenterology

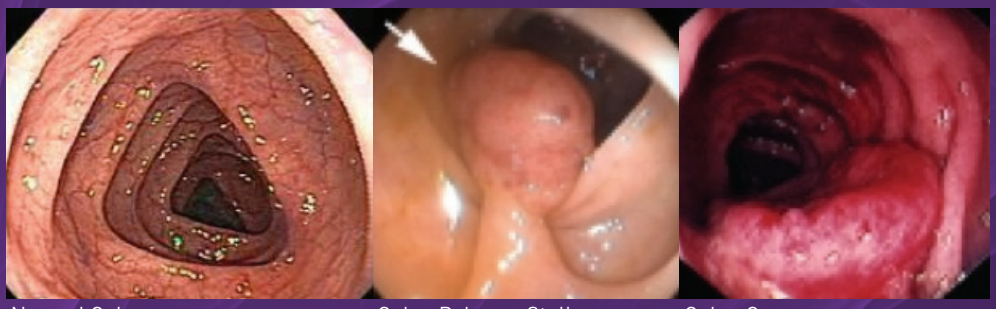
Colorectal cancer is cancer that develops in the lining of the colon or rectum, and is the 3rd most common cancer in the United States. The lifetime risk of developing colon cancer for an average risk person is 5%. Each year nearly 140,000 men and women in the United States are diagnosed with colorectal cancer. It is the second most common cause of cancer death and an estimated 50,000 people in the US will die due to colon cancer in 2015. Colonoscopy is the single best way to detect and prevent colorectal cancer. A person at average risk of developing colorectal cancer should start having screening colonoscopies at age 50. Persons at increased risk (family history of colorectal cancer, history of certain family cancer syndromes, inflammatory bowel disease) may need to start screening before age 50.

Colonoscopy is a screening test to detect colorectal cancer or precancerous growths called polyps. Polyps are growths of abnormal cells. In the colon and rectum some types of polyps can grow into cancer over time. Most colorectal cancers are slow growing and typically it takes years for a precancerous polyp to develop into a cancer. If precancerous polyps are detected during colonoscopy and removed from the colon, cancer can be prevented. Precancerous polyps typically do not cause any symptoms, so colonoscopy is the best way to detect polyps. Likewise, most colorectal cancer does not cause symptoms in the early stages. If colorectal cancer is detected early, 9 out of 10 people are alive in 5 years.

During a colonoscopy, a thin flexible tube with a camera at the end is inserted into the anus and used to look at the colon lining for polyps and cancers. The flexible tube is about the thickness of a finger. In order for the doctor to see the lining of the colon clearly, the colon must first be cleaned out. The process of cleaning out the colon is called a bowel prep. Usually the patient begins this process the day before a colonoscopy. The patient will have clear liquids such as broth, jello, tea, coffee, apple juice and begin drinking a strong laxative medication. Cleaning out the colon is very important for the doctor to be able to see polyps. Studies have shown that drinking half of the laxative the evening before the colonoscopy, and the rest of the laxative on the morning of the colonoscopy does the best job of cleaning out the colon. This is called a split bowel prep.

During a colonoscopy the patient lays on their left side with knees pulled up towards the chest in a sitting position. Before the doctor starts performing a colonoscopy, patients are given sedative medicines through an IV in a blood vessel to make them sleepy and comfortable during the test. The patient will not be able to drive or return to work for the rest of the day after a colonoscopy due to effects of the sedative medicines. The colonoscopy usually takes between 30-45 minutes but can take longer if polyps are found. If polyps are found, the doctor typically removes them during the colonoscopy. The polyp tissue removed is then sent to a pathology doctor who will look at it under a microscope in order to determine if it is a precancerous polyp. If a cancer is found during a colonoscopy, a biopsy (a small piece of tissue) will be taken for further testing. After the colonoscopy is done, patients are monitored in a recovery area for about an hour. Patients are able to return to work and their usual activities the following day.

Colorectal cancer is a common cancer in both men and women in the US, and kills many people each year. It is highly preventable if precancerous polyps are removed from the colon before they have a chance to grow into a cancer, and highly treatable if detected in the early stages. Colonoscopies are one of the few medical tests that can both prevent and detect cancer. Polyps and early stage cancers do not usually cause symptoms. Waiting until symptoms develop to have a colonoscopy may be too late. Talk to your primary care provider about getting a screening colonoscopy done.



Normal Colon | Colon Polyp on Stalk | Colon Cancer

80% by 2018 Initiative

Colorectal cancer is the nation's second leading cause of cancer death.

Jill Ireland, American Cancer Society

Colorectal Cancer is a major public health problem. It is the second leading cause of cancer death and a cause of considerable suffering among more than 140,000 adults diagnosed with colorectal cancer each year. Colorectal cancer can be detected at a curable stage and be prevented through the detection and removal of precancerous polyps. About 1 in 3 adults between 50 and 75 years old are not getting tested as recommended.

80% by 2018 is a national initiative in which hundreds of organizations, including Sanford Health, have committed to eliminating colorectal cancer as a major public health problem and are working toward the shared goal of reaching 80% of adults aged 50 and older screened for colorectal cancer by the year 2018. The National Colorectal Cancer Roundtable, an organization co-founded by the American Cancer Society and the Centers for Disease Control and Prevention, is leading the 80% by 2018 movement and rallying organizations behind this shared goal. Currently, the rates are between 58-70% in South Dakota, North Dakota and Minnesota. By working together, we can help eliminate colorectal cancer as a major public health problem.

Since joining the 80% by 2018 movement in 2014, Sanford Health has launched the following quality initiatives to increase colorectal cancer screening:

- Set a system-wide colorectal cancer screening goal of 80 percent
- Implement evidence-based colorectal cancer screening interventions based on SD Department of Health grant requirements
- Provide direct assessment to providers on their colon cancer screening performance
- Monitor quality screening indicators by tracking adenoma detection rate
- Promote provider recommendation through staff education training module
- Implement alerts for patients due for colorectal cancer screening to specialty clinic staff
- Partner with Lewis Drug Pharmacy to distribute take-home colorectal cancer screening tests at time of annual flu vaccination in 2016

80% by 2018 Vision Statement

Sanford Health is embracing the shared goal of reaching 80% screened for colorectal cancer by 2018. Our organization stands united in the belief that we can eliminate colorectal cancer as a major public health problem. We have screening technologies that work, the capacity to apply these technologies, and effective local models for delivering the continuum of care in a more organized fashion. Equal access to care is everyone's responsibility. We share a commitment to eliminating disparities in access to care. As such, our organization will work to empower communities, patients, and providers to embrace these models and develop the partnerships needed to deliver coordinated, quality colorectal cancer screening and follow up care that engages the patient and empowers them to complete needed care from screening through treatment and long-term follow-up.

Legislative Advocacy to Increase Colorectal Cancer Screening Among Medicare Beneficiaries

Thomas Asfeldt
Director,
Cancer Services

I had the privilege of attending the American Cancer Society Cancer Action Network (ACS CAN) annual leadership summit and lobby day in Washington, DC September 27-30, 2015. My participation was as a volunteer and at the invitation of ACS CAN to represent South Dakota in meetings with our Federal Legislators. ACS CAN is the advocacy arm of the American Cancer Society. It was established 10 years ago to advocate on local, state and federal levels. As one of 500 volunteers representing every legislative district in the United States we collectively made a visit to every Federal Legislator on lobby day.

During my time in DC we engaged in face-to-face conversations with Senator Thune, Senator Rounds, and Representative Noem to discuss legislative issues surrounding cancer screening, care and research. The specific asks made of our legislators this year included a request to cosponsor the Removing Barriers to Colorectal Cancer Screening Act of 2015 (H.R. 1220 and S. 624).

This act will close a Medicare colorectal cancer screening loophole that for billing purposes converts a screening colonoscopy which does not require a co-pay to a diagnostic procedure when an abnormality is found. This then requires Medicare beneficiaries to pay a co-pay for this preventative screening.

Specifically, the *"bill amends title XVIII (Medicare) of the Social Security Act to waive coinsurance for colorectal cancer screening tests (in order to cover 100% of their cost under Medicare part B [Supplementary Medical Insurance Benefits for the Aged and Disabled]), regardless of the code billed for a diagnosis as a result of a test, or for the removal of tissue or other procedure furnished in connection with, as a result of, and in the same clinical encounter as the screening test."*

For those with private insurance, rules governing the Affordable Care Act require that after a colonoscopy is performed as a screening procedure the plan or insurer is required to cover any pathology exam on a polyp biopsy as an essential part of the screening procedure without cost sharing. The finding of a polyp and the subsequent pathology exam is critical for achieving the primary purpose of the colonoscopy screening. The ACA rules, however, do not apply to Medicare beneficiaries requiring legislative action to provide the same no cost sharing benefit available to those privately insured.

The Act has bipartisan support in both the House of Representatives and the Senate. Our South Dakota legislators were keenly interested in the impacts of the Act on our Medicare beneficiaries and eager to understand the impacts of the Act on cancer screening and cancer survival.

Go to ACSCAN.org to become a member and support this work.

References:

Howard DH, Guy GP, Ekwueme DU. Eliminating Cost-Sharing Requirements for Colon Cancer Screening in Medicare. Cancer. 2014;120: 3850-3852.

Removing Barriers to Colorectal Cancer Screening Act of 2015, HR 1220, 114 Cong, (2015-2016).

Removing Barriers to Colorectal Cancer Screening Act of 2015, S 624, 114 Cong, (2015-2016).

Improving Cancer Screening Rates – Focus, Teamwork and Persistence

Sharon Hunt,
Vice President
Sanford Cancer

Statistics from the Centers for Disease Control (CDC) indicate the top four cancers by incidence are breast, prostate, lung and colon/rectum cancers, both nationally and in Sanford's service area. US Preventative Services Task Force (USPSTF) recommends routine screening for breast, lung, colon/rectum and cervical cancers.

The Healthy People 2020 Objectives include efforts to increase the proportion of adults who receive breast and colorectal cancer screening based upon the most recent guidelines. Targets are set for breast cancer screening at 81.8% and colorectal cancer screening at 70.5%. Screening rates, provided to the CDC through a self-reported survey sample of the applicable population, indicate that the nation as a whole has room for improvement, as well as Sanford's service area.

As evidenced nationally and regionally, improving screening rates has proved to be difficult. In 2010, national breast cancer screening rates were at 72.4% and colorectal cancer screening rates were at 58.6%. Progress has been made, due in part to changing USPSTF recommendations and increasing insurance coverage, but too much of our population remains unscreened or under screened.

Sanford has provided a focus and engaged the entire integrated health system in the effort to improve cancer screening rates. Sanford's

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Quality Council set objectives to increase breast and colorectal cancer screening rates throughout the Sanford footprint to 80% of appropriate populations. Screening completion is measured by documentation of screening test results, as opposed to the CDC's reliance upon self-reported patient results. Recognizing that some of the population will receive screening exams without documentation at Sanford, our measure of screening rates will be conservative.

	Screening Rate		
	National	SD	MN
Female Breast	78.7	79.7	83.7
Colon and Rectum	65.5	62.6	70.9

In 2008, the effectiveness of various approaches to increasing screening for breast, cervical and colorectal cancers was reviewed in the Guide to Community Preventative Services and in 2012 the reviews were updated in the American Journal of Preventative Medicine by Sabatino et al. The reviews found that increasing cancer screening utilization requires a multitude of tactics, grouped into the three general strategies of increasing demand for screening, decreasing barriers to screening, and increasing provider promotion of screening.

• **Increasing the Demand:** Efforts to increase the population's desire to participate in cancer screenings focus on education (one-on-one and group), reminders, mass media and directed media. Reviews found evidence to recommend one-on-one education to increase breast and colorectal cancer demand for screening and found evidence for efficacy of group education for breast cancer. Strong evidence supported the use of reminders – with the combination of phone calls and letters deemed most effective. Little evidence supported the use of either population incentives or mass media campaigns.

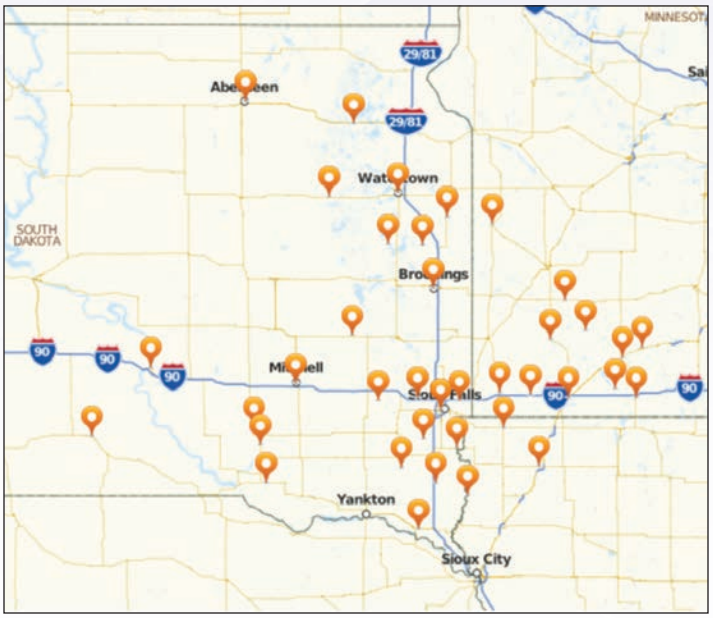
• **Decreasing Barriers:** Enhancing access with extended hours, mobile and rural screening opportunities, reducing patient out-of-pocket costs, and decreasing anxiety/fear comprise the evaluated methods to decrease barriers to screening. Strong evidence favored reducing structural barriers (distance, access, etc.) for both breast and colorectal screening (especially fecal occult blood tests (FOBT) for colorectal screening). Less support that for reducing out-of-pocket costs increased screening.

• **Increasing Provider Promotion:** Assessment of the effectiveness of methods to influence provider promotion like use of provider reminders, provider assessment and feedback and provider incentives indicated mixed results. Provider assessment and feedback received sufficient evidence to recommend as a strategy, however, provider incentives were not supported as an effective tactic.

Sanford has increased efforts in each of the primary strategy areas and has seen improvement over the past several months.

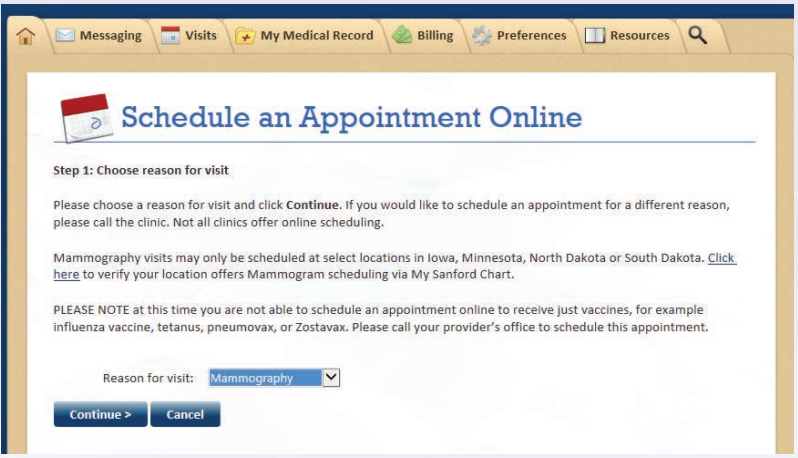
• **Increasing Demand** – Along with providing education and awareness-raising for the community and our patients, this year Sanford ramped up the efforts of our medical home clinics by adding specialty clinic aid. Sanford embarked on a mission to educate frontline staff throughout the integrated health network (specialty and primary care alike) on the importance of screening and on tactics to engage patients in a screening conversation. By March of 2015, Sanford had provided all of the specialty clinics with tools to engage patients who were due for breast cancer screening whenever and wherever they received healthcare. In September of 2015 the efforts were expanded to include colorectal screening. Sanford also enlisted the power of the patient portal in the EMR system (MySanford Chart) to remind patients of upcoming screening dates, adding to the already in place reminder systems. Eligible patients receive an e-mail tickler, pointing them to checking in with their MySanford Chart messages.

• **Decreasing Barriers –** Sanford's approach to tackling the impediments to screening has included extending screening appointment times to evenings and Saturdays. Sanford's mobile mammography service brings mammograms to rural MN, SD and IA and also provides mammograms at business sites, churches, community centers and health fairs. Sanford's mobile mammography program and fixed rural units bring breast cancer screening close to home or work for thousands of women each year.

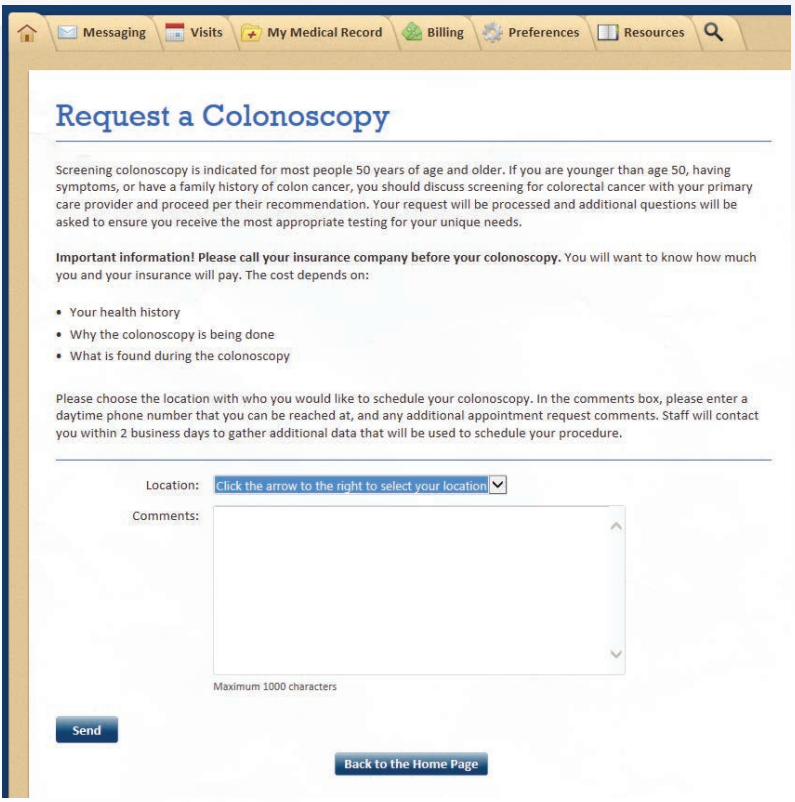


Mammography Screening Sites

Scheduling a Mammogram:

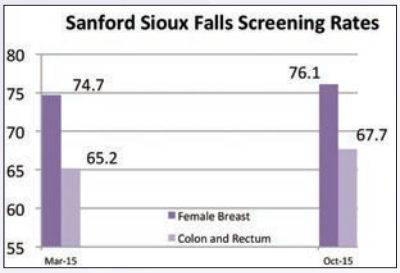


Request a Colonoscopy



Appointments are easier too, with the use of the patient portal for requesting and making screening appointments. MySanford Chart usage has steadily climbed as functionality like appointment scheduling and rapid test results have been added. Sanford participates in several programs to aid with out-of-pocket costs for patients, including use of the Sanford Health Foundation.

• **Increasing Provider Promotion –** The importance of provider promotion of screening is difficult to overstate. Sanford's medical home model reinforces the relationship between a patient and their physician, setting the foundation for robust discussion and shared decision-making. The ability to discuss screening is especially needed with the increased complexity of guidelines and recommendations for breast cancer screening and the choice of modality for colorectal screening. Not only has Sanford provided tools for the primary care providers to recognize and connect with patients in need of screening, but Sanford also provides timely assessment and feedback regarding screening rates. Sanford providers are alerted to overdue screening tests when patients arrive, and through Healthy Planet registries, imbedded in our EMR. Screening rates for breast cancer and colorectal cancer are transparently displayed by region, clinic and individual provider – allowing best practices to be identified and shared.



• Results - Although we haven't yet met our goals, or the Health People 2020 Objectives, our efforts over the past months have increased screening rates for both breast cancer and colorectal cancer. The increases may seem modest in percent, but represent hundreds of members of the community, now appropriately screened. With continued focus, teamwork and persistence, together we can reduce cancer mortality through increased screening.

References:

U.S. Cancer Statistics Working Group. United States Cancer Statistics: 1999–2012 *Incidence and Mortality Web-based Report*. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; 2015. Available at: www.cdc.gov/uscs.

Sabatino, Susan A MD, MPH, Lawrence, Briana, MPH; et al. "Effectiveness of Interventions to Increase Screening for Breast, Cervical, and Colorectal Cancers." Am J Prev Med 2012;43(1):97-118.

Primary Site Distribution/New Cancer Cases 2014

Lip, Oral Cavity & Pharynx:	# of Cases	% of Cases	Male	Female
Lip	19	1.1%	11	8
Tongue	32	1.8%	25	7
Floor of Mouth	5	0.3%	4	1
Salivary Glands	6	0.3%	4	2
Gum & Other Mouth	12	0.7%	8	4
Tonsil	26	1.5%	25	1
Nasopharynx	1	0.1%	1	0
Hypopharynx	3	0.2%	1	2
Oropharynx	5	0.3%	3	2
Other Oral Cavity	1	0.1%	1	0
Digestive Organs:				
Esophagus	11	0.6%	7	4
Stomach	23	1.3%	16	7
Small Intestine	13	0.7%	5	8
Colon	102	5.7%	54	48
Rectosigmoid	12	0.7%	6	6
Rectum	56	3.2%	31	25
Anus	5	0.3%	3	2
Anal Canal	2	0.1%	0	2
Liver	10	0.6%	7	3
Intrahepatic Bile Duct	4	0.2%	3	1
Gallbladder	5	0.3%	2	3
Other Biliary Tract	7	0.4%	2	5
Pancreas	54	3.1%	29	25
Peritoneum	6	0.3%	1	5
Retroperitoneum	3	0.2%	1	2
Respiratory System & Intrathoracic Organs:				
Larynx	21	1.2%	16	5
Lung & Bronchus	186	10.6%	90	96
Nasal Cavity	1	0.1%	0	1
Maxillary Sinus	4	0.2%	2	2
Mediastinum	2	0.1%	2	0
Pleura	2	0.1%	2	0
Bones:				
Bones & Joints	4	0.2%	1	3
Soft Tissue:				
Soft Tissue	9	0.5%	6	3

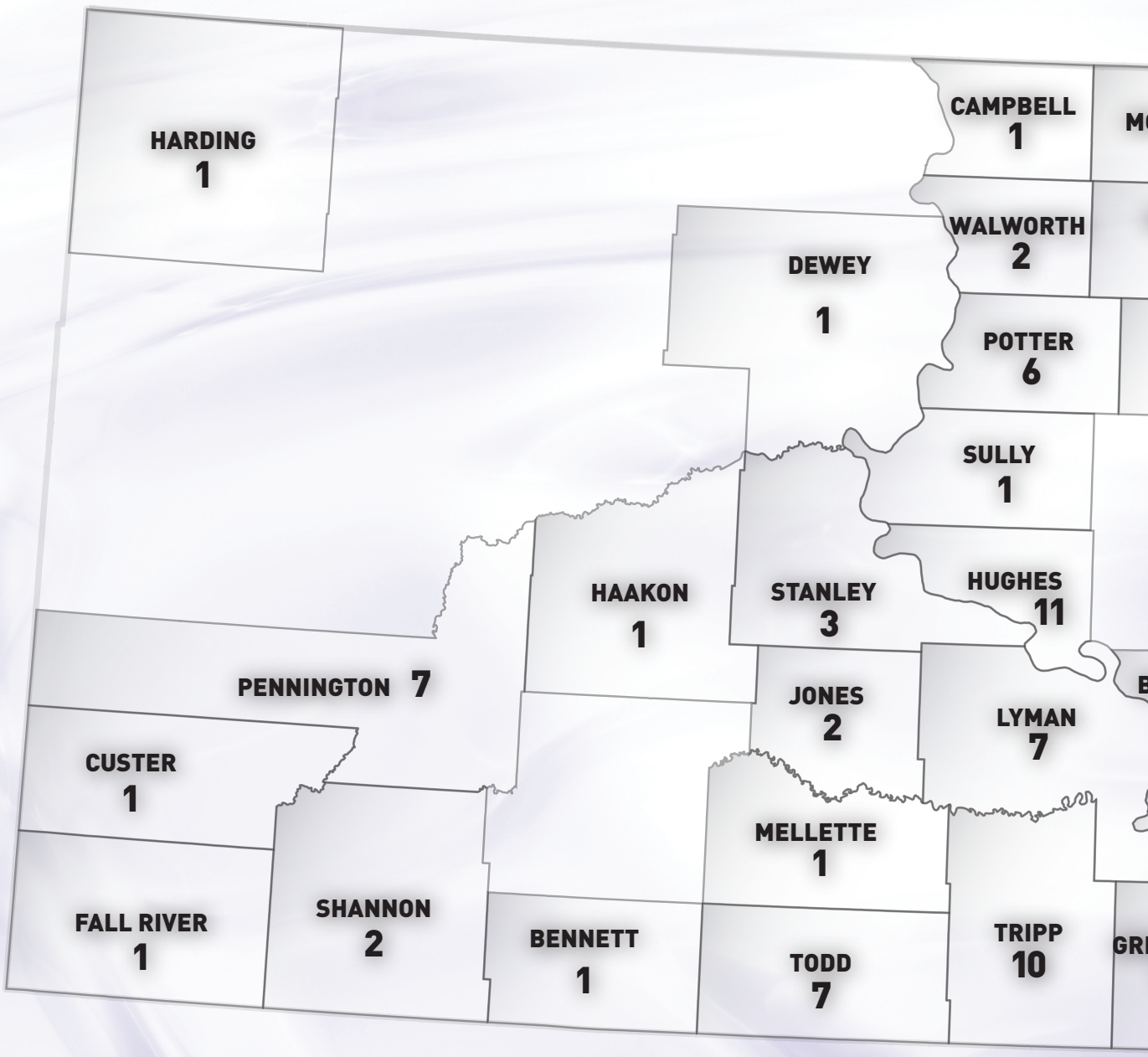
Skin (Melanoma/Invasive only):	# of Cases	% of Cases	Male	Female
Skin - Melanoma	95	5.4%	55	40
Skin - Invasive	9	0.5%	6	3

Breast:				
Breast	302	17.2%	1	301
Female Genital Organs:				
Cervix	17	0.9%	NA	17
Uterine	110	6.3%	NA	110
Ovary	37	2.1%	NA	37
Vagina	3	0.2%	NA	3
Vulva	26	1.4%	NA	26
Fallopian Tube	1	0.1%	NA	1
Placenta	1	0.1%	NA	1
Male Genital Organs:				
Prostate	139	7.9%	139	NA
Testis	10	0.6%	10	NA
Penis	1	0.1%	1	NA
Urinary Tract:				
Urinary Bladder	46	2.6%	34	12
Kidney	55	3.1%	40	15
Renal Pelvis	5	0.3%	4	1
Ureter	4	0.2%	4	0
Eye:				
Orbit	1	0.1%	1	0
Brain & Nervous System:				
Brain	33	1.9%	22	11
Endocrine System:				
Thyroid Gland	47	2.7%	13	34
Adrenal Gland	4	0.2%	2	2
Lymphoma:				
Hodgkin	7	0.4%	5	2
Non-Hodgkin	56	3.2%	35	21
Hematopoietic & Recticuloendothelial Systems:				
Multiple Myeloma	23	1.3%	14	9
Lymphocytic Leukemia	16	0.9%	9	7
Myeloid Leukemia	22	1.3%	15	7
Bone Marrow/Blood	18	1.0%	10	8
Unknown Primary Site:				
Unknown	16	0.9%	9	7

Female = 958 54.6%
Male = 798 45.4%

New Cancer Cases	**1,839**
CIN III (in situ cervix)	**26**
Benign Brain	**57**
Total Cases this display	**1,756**

County of Residence at Diagnosis 2014*

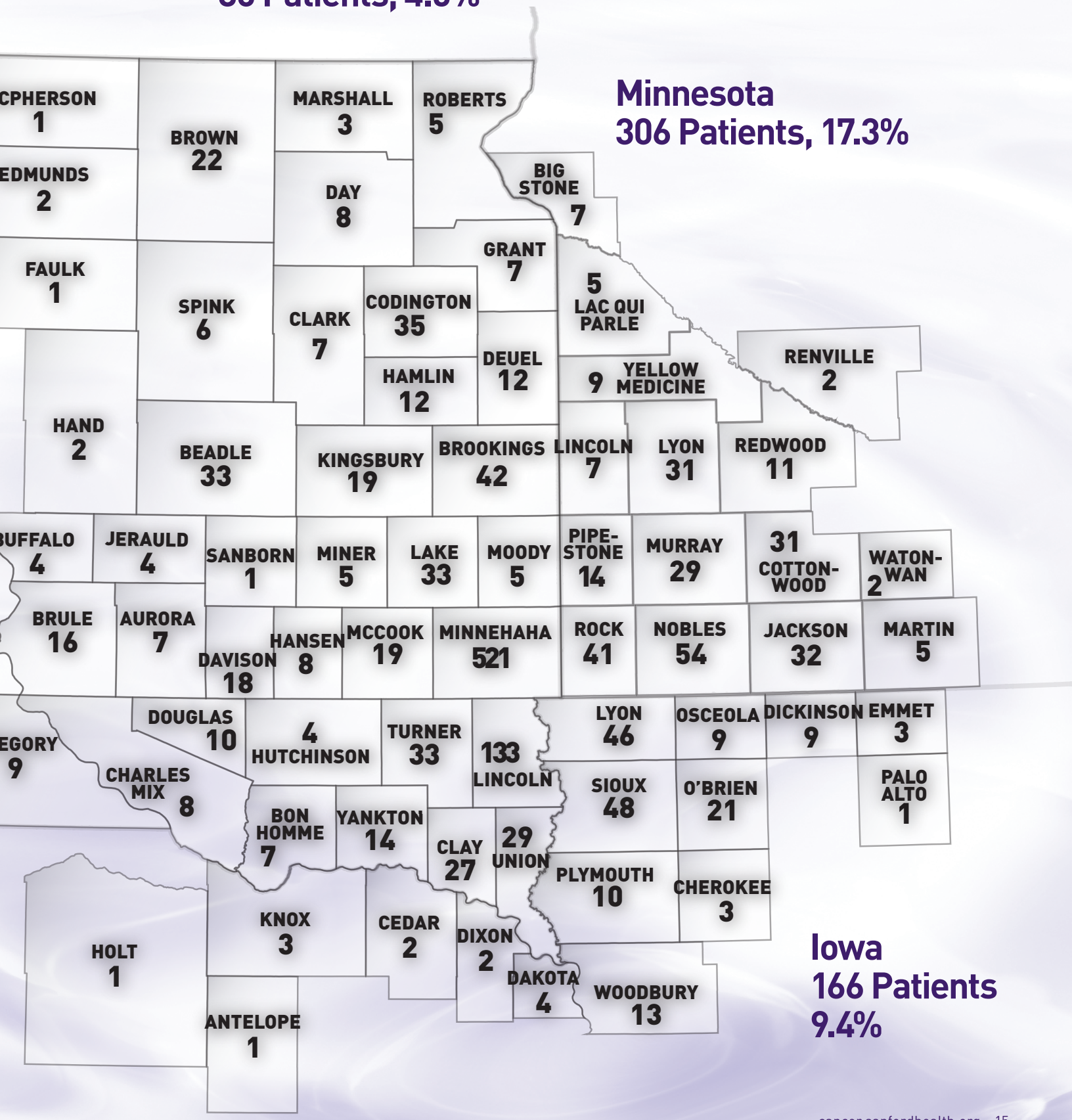


California
1 Patient
0.1%

South Dakota
1,198 Patients
67.8%

Nebraska
16 Patients,
0.9%

***72 patients had more than one primary in 2014 and are listed once.**


North Dakota
80 Patients, 4.5%
Minnesota
306 Patients, 17.3%
Iowa
166 Patients
9.4%
CPHERSON 1
BROWN 22
MARSHALL 3
ROBERTS 5
EDMUNDS 2
DAY 8
BIG STONE 7
FAULK 1
SPINK 6
CLARK 7
CODINGTON 35
GRANT 7
5 LAC QUI PARLE
HAMLIN 12
DEUEL 12
9 YELLOW MEDICINE
RENVILLE 2
HAND 2
BEADLE 33
KINGSBURY 19
BROOKINGS 42
LINCOLN 7
LYON 31
REDWOOD 11
BUFFALO 4
JERAULD 4
SANBORN 1
MINER 5
LAKE 33
MOODY 5
PIPE-STONE 14
MURRAY 29
31 COTTON-WOOD
WATON-WAN 2
BRULE 16
AURORA 7
DAVISON 18
HANSEN 8
MCCOOK 19
MINNEHAHA 521
ROCK 41
NOBLES 54
JACKSON 32
MARTIN 5
EGORY 9
DOUGLAS 10
4 HUTCHINSON
TURNER 33
133 LINCOLN
LYON 46
OSCEOLA 9
DICKINSON 9
EMMET 3
CHARLES MIX 8
BON HOMME 7
YANKTON 14
CLAY 27
29 UNION
SIOUX 48
O'BRIEN 21
PALO ALTO 1
PLYMOUTH 10
CHEROKEE 3
KNOX 3
CEDAR 2
DIXON 2
HOLT 1
DAKOTA 4
WOODBURY 13
ANTELOPE 1

3-Dimensional Breast Imaging

Tom Cink, MD
Breast Imaging

The imaging options available to screen and diagnose breast cancer are continuing to change rapidly. In 2000, most imaging departments were still using film/screen imaging as the primary imaging modality. The results of the DMIST (digital mammographic imaging screening trial) multi-institutional trial which compared film/screen with full-field digital imaging(2D) for breast cancer diagnosis were published in the New England Journal of Medicine in October 2005 by lead investigator Dr. Etta Pisano. This study showed that digital mammography is more accurate than film/screen in women under the age of 50, in women with heterogeneously and extremely dense breast tissue, and in premenopausal and perimenopausal women.

After the results of the DMIST trial were published, there was a rapid move nationally to digital breast imaging including at Sanford Breast Health Institute in 2006. The move to digital imaging also correlated with the development of more robust PACS (picture archiving and communication systems) for storage and retrieval of the images. Digital imaging offers many additional advantages for viewing and interpreting the studies, including the ability to electronically adjust the contrast and brightness of the image and to magnify the image. Digital imaging made the images available anywhere one had access to the PACS system and eliminated the need to physically print the images to film, the storage of film, and the continual retrieval for review or comparison. With the adoption of digital imaging, gone also were dark rooms, automated film processors and development chemicals.

The continued quest for a better imaging modality to more readily detect the smallest breast cancers has led to a unique imaging technique called tomosynthesis or 3D breast imaging. This technique delivers a series of high-resolution (1 millimeter thick) tomographic images, which can be viewed in a series to evaluate all layers of the breast. This eliminates overlapping of tissue densities, as seen on the traditional 2D digital image. Tomosynthesis is a transformational imaging technique and allows improved evaluation over 2D imaging, as much as a chest CT does over a traditional chest x-ray.

The use of any new imaging modality requires a complete training course for all physicians that will interpret the images and for all technologists that will use the equipment. Once this was accomplished the Edith Sanford Breast Center began to screen all patients at the Sanford Women's Health Plaza and Sioux Falls Sanford Cancer Center locations in October 2012 with tomosynthesis.

We were invited and joined a multi-institutional group whose purpose is to investigate and define the benefits of tomosynthesis. In addition to Edith Sanford, this group includes 12 other breast imaging programs including Yale University School of Medicine, Massachusetts General Hospital, Albert Einstein Medical Center, and other academic, teaching and quality private programs from all over the United States.

The group's first project was to compare tomosynthesis imaging to digital imaging i.e. 2D vs. 3D. We used a retrospective analysis of screening performance metrics from the 13 institutions for the year before tomosynthesis implementation to the same metrics obtained after tomosynthesis implementation. The outcomes measured included the cancer detection rate, recall rate and positive predictive values for recall and for biopsy.

This study included 454,850 examinations and was published in the Journal of the American Medical Association June 25, 2014. This is the largest published study to date of tomosynthesis and was much heralded in the national media. The results revealed an overall 41% increased detection of invasive breast cancers with 3D vs. 2D. In addition, there was an overall 15% decrease in recall rate for the whole group. This indicates that tomosynthesis is both a more sensitive and a more specific test to use in screening for breast cancer. The positive predictive value (PPV) for recall was increased 49% and PPV for biopsy was increased by 21%.

The results revealed an overall 41% increased detection of invasive breast cancers with 3D vs. 2D.

For Sanford patients there was a 46% increase in detection of invasive cancers and a 20% decrease in recall rates after using 3D for one year. We also found that our screening program had the highest number of cancers diagnosed per 1000 patients screened both in the 2D and 3D groups of any of the 13 institutions despite a similar average age of the patients. In the years since instituting 3D

we have dramatically increased our percentage of early cancer diagnoses (Stage 0 and 1) and decreased our percentage of advanced cancers (Stages 2, 3 and 4). (See slide 1).

Our multicenter group is continuing to study other aspects of tomosynthesis. Additional results have been obtained and are expected to be published soon regarding the efficacy of 3D in all age groups and all levels of breast density. Previous studies comparing age and density have revealed that 3D imaging shows improved results over 2D in all age groups and in all densities. Subsequent projects will involve an in-depth study of interval cancers and a comparison of these lesions with both 2D and 3D.

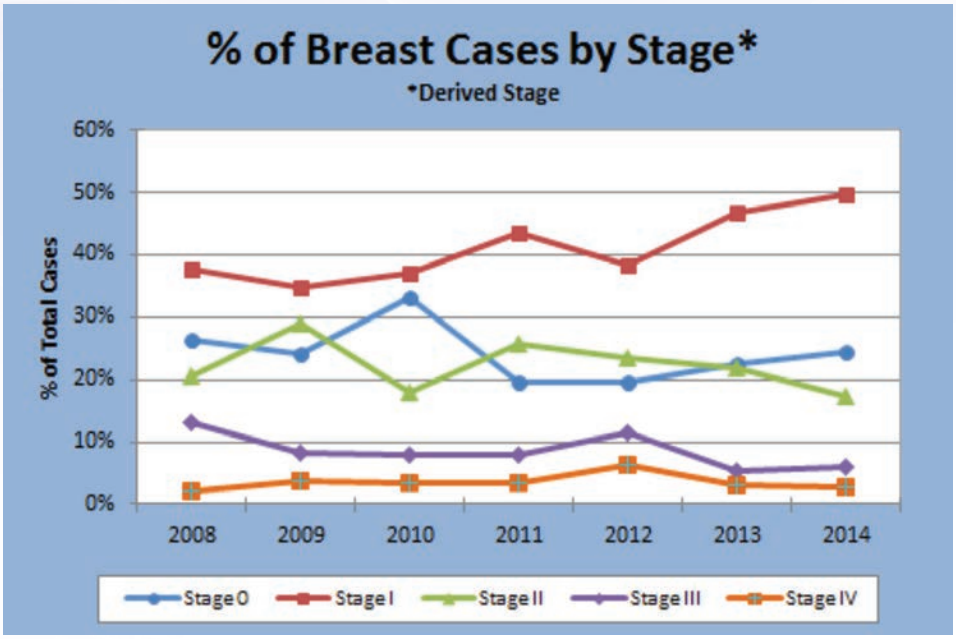
The patient aspects of utilizing tomosynthesis to screen for breast cancer are significant. Cancers are found earlier when they are easier to treat, have less debility, and much greater survival rate. The survival rate decreases from near 100% for a cancer diagnosed at stage 1 to about 22% for cancers diagnosed at stage 4.

The economic aspects of utilizing tomosynthesis are also large both for the patient and the insurance company. The decreased recall rate decreases cost for both since the average cost of a recall has been published as $1,200.

When cancers are diagnosed earlier, as they are with tomosynthesis, there is a significant decrease in cost since the average cost of treatment of a stage 1 cancer is $43,530, compared with $223,568 for stage 4.

Scott Pohlman, who is with the Hologic company, and I have created a model to estimate the impact of early diagnosis with tomosynthesis vs 2D, which was presented at the National Consortium of Breast Centers' annual meeting. The money saved in early diagnosis alone is more than $23 per patient screened with tomosynthesis. Combined analyses show about twice this amount saved when considering all aspects for utilizing tomosynthesis.

Despite providing the leading breast cancer screening modality to our patients, there is still controversy among national organizations as to the exact screening recommendations. The United States Preventative Services Task Force (USPSTF) currently has one set of guidelines and other national organizations including the American Cancer Society have slightly differing recommendations for breast cancer screening. The way that these organizations decide on their recommendations is by evaluating the data and outcomes of previous trials. In order to get survival data, one needs to screen a population and then follow these people for some period of time, sometimes for decades. The problem that I see with the mature randomized control trials is that they were done in the era of the older imaging modalities such as film/screen or 2D mammography. There also weren't the level of quality control or dedicated breast imaging physicians as there is today. Thus the level of mammography's contribution to mortality reduction is underestimated.



With the amount of dissonance in screening and ever increasing level of understanding of the importance of the patient's own genetic makeup in breast cancer, we are entering a study with the University of California health system which is funded by a $14 million grant from the Patient Centered Outcomes Research Institute (PCORI). This is called the Wisdom Trial (Women Informed to Screen Depending on Measures of Risk). We will use an innovative risk-based screening model in both randomized and patient selected arms. 100,000 women will be screened based on their genetic risk, and studied for 5 years. This study is designed to take the latest advances in the field of genetics and apply them clinically to the individual patient. Patients will want to be in this study to determine their own genetic risk and to find the best screening regimen for themselves based on their own level of risk.

In conclusion, we are dedicated to finding answers to today's most crucial challenges in breast cancer imaging. We have found tomosynthesis to be a transformational imaging modality for breast screening and diagnosis. We are excited to be involved in large multicenter research studies to further define the advantages of tomosynthesis and to find the optimal screening plan for each patient.

Pediatric Oncology Program 2014

40 Pediatric Patients
Age <1 - 19 years

Type of Cancer Benign & Malignant	Number of Patients
Leukemia	9
Brain/Nervous System	8
Kidney	6
Adrenal Gland	3
Soft Tissue	2
Ovary	2
Thyroid Gland	2
Lymphoma	2
Retroperitoneum	1
Mediastinum	1
Bones	1
Urinary Bladder	1
Orbit	1
Pituitary Gland	1

Lung cancer and smoking, early detection and survival

Michael Keppen, MD
Medical Oncology

The connection between smoking tobacco and lung cancer was first identified in 1965 as the result of the American Cancer Society Cancer Prevention Study - I. Without a shadow of a doubt the study demonstrated that smoking causes cancer. More recently, the lifetime risk of lung cancer in smokers is 24.4% for males and 18.5% for females compared to never smokers at 0.2% for men and 0.4% for women.

In the last several decades smoking rates in the United States, and most other developed countries, have declined dramatically. In South Dakota in 2015, approximately 15% of adults smoke. The impact of smoking on lung cancer increases as the amount of tobacco inhaled increases. A person who smoked one pack per day for 30 years has a similar high risk for lung cancer as another person who smoked two packs per day for 15 years. Quitting tobacco use is very important in decreasing the risk for lung cancer, however, those who quit smoking remain at high risk for lung cancer for many years after cessation.

There is a screening test for lung cancer for those with a history of smoking. The low dose CT lung screen is discussed by Dr. Julia Prescott-Focht in the following article. As we consider screening for any cancer, we consider whether early detection improves the survival of that cancer being screened. Low-dose CT screening for lung cancer is as successful in saving lives as mammograms are in defining early stage breast cancer. In the case of lung cancer, survival is dramatically different depending on the stage of disease at the time of diagnosis. The five year survival rates for non-small cell lung cancer (NSCLC), the cancer of smokers, range from 49% for patients diagnosed early with stage IA disease compared to 1% for those diagnosed with stage IV disease.

NSCLC Stage at diagnosis	5-year Observed Survival Rate
IA	49%
IB	45%
IIA	30%
IIB	31%
IIIA	14%
IIIB	5%
IV	1%

The goal for lung cancer screening is to identify lung cancer as early as possible when there are no symptoms and the disease is most treatable.

For anyone currently using tobacco, the sooner you quit the better. We know quitting tobacco is not easy. Keep trying and find the right mix of support, medications, and will power until you are successful. And for anyone with a history of smoking one pack per day for 30 years or more, not only should you stop tobacco use, you should get screened for lung cancer. We are here to help with both.

Reducing Lung Cancer Mortality with Low-Dose CT Lung Screening

Julia A. Prescott-Focht, DO, Thoracic Radiologist

Lung cancer causes more deaths in the United States than breast, colorectal and prostate cancers combined. Even with advancements in surgery, radiation and chemotherapy, the 5-year survival rate has improved by just 4% since the 1970s (and remains dismal at 16%). Because of smoking cessation, the rate of smoking has declined over the past several decades from >40 % in 1965 to <20% today. Unfortunately, many former heavy smokers remain at high risk and are now the largest group of patients diagnosed with lung cancer. In fact, given the large population of former heavy smokers in the aging baby boomers, lung cancer mortality may actually rise in the absence of screening.

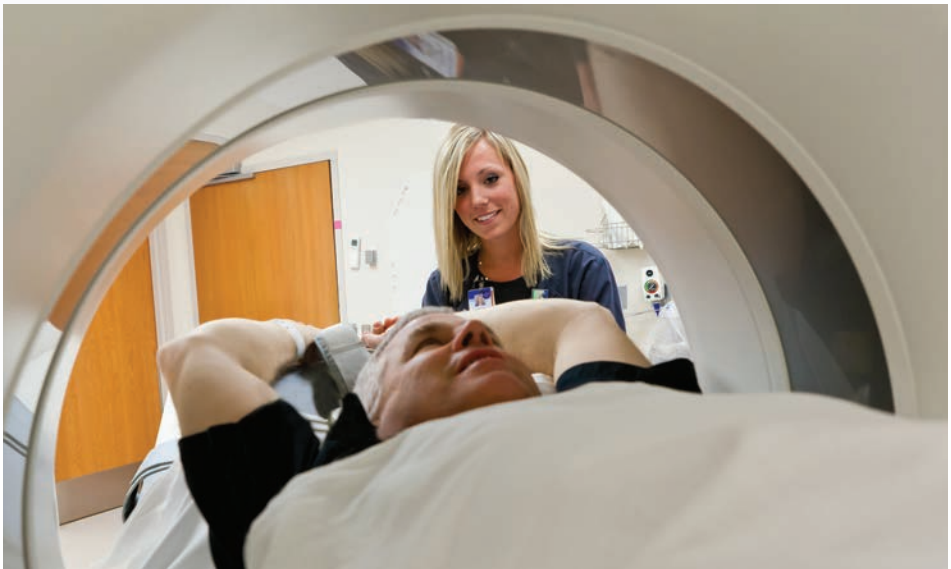
In 2011, the National Lung Screening Trial (NLST) reported a 20% lung cancer-specific mortality benefit in high-risk current and former heavy smokers who were screened for three years with annual low-dose CT (LDCT) compared with screening with annual chest radiography. Shortly thereafter, the National Comprehensive Cancer Network (NCCN) came forth recommending annual LDCT lung screening. As of today, annual LDCT lung screening has been endorsed by nearly 40 major medical societies and organizations.

Similar to screening for breast cancer with mammography, which has resulted in a 5-year survival rate of 90%, early detection of lung cancer provides the best means for improved survival. Chest radiography screening programs of the past failed to decrease lung cancer mortality. Not only has low-dose CT lung screening been proven to reduce lung cancer-related deaths, but it has also demonstrated a 6.7% reduction in all-cause mortality, which sets it apart from all other cancer screening programs.

Who is Eligible?

In February 2015, the Centers for Medicare and Medicaid Services announced a national coverage decision for a LDCT lung cancer screening benefit for certain Medicare beneficiaries. Patients eligible for screening must be between the ages of 55-77; have no signs or symptoms of lung cancer; have a 30-pack years or greater history of tobacco smoking; be current smokers or have quit smoking within the last 15 years; and have a written order for LDCT from a qualified health professional following a lung cancer screening decision-making visit. The number of pack years is calculated by multiplying the number of packs smoked per day by the number of years the patient has smoked or formerly smoked (example: one-half pack per day for 40 years = 20 pack-years). For subsequent screenings, a written order is required, which may be provided during any appropriate visit from a qualified health professional. Patients with non-cigarette smoking related risk factors such as occupational exposure, radon exposure and secondhand smoke are not eligible for LDCT lung screening.

Written orders must include the number of pack years smoked, current smoking status (and for former smokers, the number of years since quitting smoking), and verification that the beneficiary is asymptomatic. Patients with upper respiratory symptoms within the past twelve weeks must either postpone their lung screens until they have been asymptomatic for twelve weeks or proceed with a diagnostic chest CT. At Sanford, the aforementioned eligibility and written order requirements are built into the Epic electronic medical record software, so that when an order is placed, the provider is asked to enter the required information in order to complete the request.



CT Findings and the Lung-RADS reporting system

Lung nodules on CT are classified as solid or subsolid. A solid lung nodule is defined as a spherical focus of increased lung attenuation that obscures the pulmonary vessels. Subsolid nodules are subclassified as ground-glass (does not obscure pulmonary vessels) or part-solid (mixed solid/ground-glass nodule).

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The evaluation of subsolid nodules requires thin-section images (< 2.5 millimeters). Various studies have shown that, on average, around 50% of subsolid nodules are infectious/inflammatory and will resolve on subsequent imaging. When subsolid nodules persist on subsequent imaging, they are more likely to be malignant than solid nodules and are typically slow-growing cancers in the adenocarcinoma spectrum (adenocarcinoma in situ and minimally invasive adenocarcinoma, formerly named bronchioloalveolar carcinoma).

A Lung-RADS reporting system is used in lung cancer screening and closely parallels the well-known BI-RADS system that has been used for decades in breast cancer screenings. Lung-RADS replicates the BI-RADS overall assessment score and assigns a score based on risk profile. Current guidelines recommend annual LDCT lung screening in patients with no nodules (Lung-RADS 1), patients with solid or part-solid nodules measuring less than 6 mm (Lung-RADS 2), and patients with ground-glass nodules measuring less than 20 mm (Lung-RADS 2). Six-month follow-up LDCT is recommended for patients with solid or part-solid nodules measuring 6-7 mm and for 4-5 mm nodules that are new on a follow-up LDCT screen (Lung-RADS 3). Larger solid and part-solid nodules are given a Lung-RADS 4 category, and tissue sampling and/or PET is recommended. The Lung-RADS system helps segregate the 95%-96% of patients who don't require biopsy (Lung-RADS 3 or less) from the 4%-5% of patients in whom biopsy may be required (Lung-RADS 4).

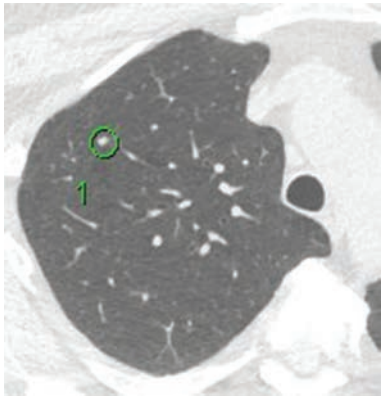
The presence of incidental findings sets CT lung screening apart from mammography, and when such findings are encountered that require further work-up, a Lung-RADS category S is assigned (in addition to a numerical Lung-RADS value given to address the lung findings).

Patient Management after LDCT screening

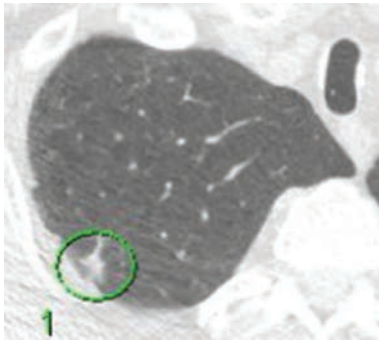
After the lung screen report with its Lung-RADS category is transcribed, each patient receives a letter generated by the interpreting radiologist that either advises the patient to continue annual LDCT screening (Lung-RADS 1 and 2 categories) or instructs them to see a pulmonologist in the lung nodule clinic (Lung-RADS 3 and 4 categories). All Lung-RADS 3 and Lung-RADS 4 category radiology reports are carbon copied to the lung nodule clinic, and nurse navigators then contact the patients to schedule an appointment for further management. Patients with positive biopsy results and other selected patients are discussed at the weekly multidisciplinary lung conference.

Case examples:

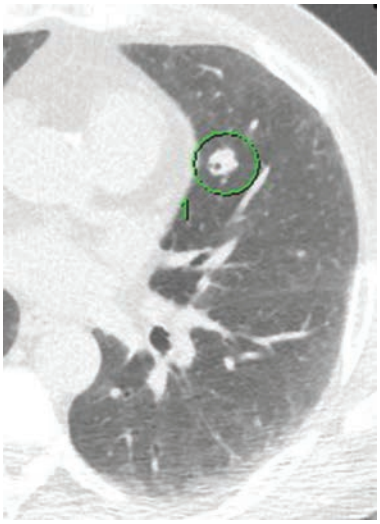
Case 1:
Lung-RADS 2. A 2-mm right upper lobe nodule (circled) is found in a 58 year-old man with a 40 pack-year history of smoking. Follow-up CT lung screen in 1 year recommended.



Case 2:
Lung-RADS 3. A 6-mm right upper lobe nodule is found in a 63 year-old man with a 30 pack-year history of smoking. Smaller nodules (not shown) were also discovered. Referral to lung nodule clinic and follow-up CT lung screen in 6 months recommended.



Case 3:
Lung-RADS 4. A 13-mm lingular polylobular nodule with intrinsic cavitation is found in a 68 year-old man with a 46 pack-year history of smoking. Referral to lung nodule clinic and tissue sampling recommended.



Pap Smear Screening and HPV Vaccine: Tools We Have to Decrease Cervical Cancer

Maria Bell, MD, MPH, MBA

Cervical cancer screening with the Pap smear has significantly reduced the incidence and mortality of cervical cancer in the US. However, it is estimated that 12,900 women will be diagnosed with cervical cancer in the US in 2015 and 4,100 will die from this disease. ("American Cancer Society: Cancer Facts and Figures 2015," 2015) Cervical cancer is a cancer in which a screening test is best suited because of the relatively long preinvasive state and ease of acquiring the sample. The risk factors for cervical cancer have been known for a long time (smoking, multiparity (having several children), multiple sexual partners). But it wasn't until the 1980s that Dr. Harald Zur Hausen published his findings on the molecular biology of Human Papilloma Virus (HPV) which irrefutably proved that HPV was the causative agent for cervical cancer. Epidemiologic studies have shown that nearly 100% of cervical cancer cases test positive for HPV. (Walbommers, Hacobs, Manos, & al, 1999)

The goal of Pap smear screening is to identify the patients in whom the cervical cancer precursors are likely to progress to invasive cancers and avoid unnecessary treatment of transient HPV. The current ASCCP Pap smear guidelines have incorporated HPV testing into the cervical cancer screening algorithm and is depicted below.

Age	Recommended screening method	Management of screening results
< 21	No screening	
21-29 years	Cytology alone every 3 years	HPV + ASC-US or cytology of LSIL more severe refer for colposcopy Cytology negative or HPV-negative ASC-US rescreen with cytology in 3 years
30-65 years	HPV and Cytology Cotesting every 5 years (preferred) or Cytology alone every 3 years (acceptable)	HPV+ ASC-US or LSIL or more severe – refer for colposcopy HPV+ with negative cytology Option 1 – 12 month follow-up with contesting Option 2 – Test for high risk HPV and if positive refer for colposcopy If high risk HPV negative, 12 month follow-up with contesting Cotest Negative or HPV- ASC-US: rescreen with cytology in 3 years
>65 years	No screening following adequate negative prior screening	
After hysterectomy removing the cervix and no history of CIN II or greater within the past 20 years or cervical cancer ever	No screening	
HPV Vaccinated	Follow age-specific recommendations	

("ACS-ASCCP-ASCP Screening Guidelines," 2012)

HPV is a skin virus which causes cervical cancer and genital warts. There are 3 HPV vaccines currently available on the market. A bivalent vaccine against HPV 16 and HPV 18 (which cause 70% of cervical cancers) is available and is marketed under the name Cervarix. A quadravalent vaccine against HPV 16, 18 and HPV 6 and 11 (cause 90% of genital warts) is marketed under the name Guardasil. A 9-valent HPV (Guardasil 9) vaccine was recently approved and covers HPV 6, 11, 16, 18, 31, 33, 45, 52, 58 and is reported to prevent 96.7% of high grade cervical, vaginal, and vulvar dysplasia. (Murray, 2015). The current recommendations for HPV vaccines by the Advisory Committee on Immunization Practices (ACIP) are the following: routine vaccination at age 11 or 12 years with HPV2, HPV 4, or HPV 9 for females and with HPV4, or HPV 9 for males. All three vaccines are each administered in a 3-dose schedule at 0, 2 and 6 months. ACIP also recommends vaccination for females aged 13 through 26 years and males aged 13 through 21 years not vaccinated previously. (Petrosky et al., 2015) Vaccination will not treat HPV once the patient has been exposed to it, therefore it is prudent to vaccinate adolescents before they become sexually active. As of 2014, South Dakota has vaccinated 60-69% of eligible girls and 30-39% of eligible boys.("HPV vaccination rates by state," 2015)

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In summary, Pap smear screening and HPV vaccination are two very good tools to decrease the incidence and mortality of cervical cancer. We encourage all patients who are eligible to receive the HPV vaccine and for women to continue with pap smear screening as recommended.

ACS-ASCCP-ASCP Screening Guidelines. (2012). *American Society for Colposcopy and Cervical Pathology*.

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Sanford Performance on American College of Surgeons Commission on Cancer Accountability and Quality Improvement Measures

Jesse Dirksen, MD, CoC Cancer Liaison Physician

One responsibility of being an ACoS Commission on Cancer (CoC) accredited program is to report clinical data to the CoC to measure our performance against other accredited programs and to participate in studies of quality.

Here we report on five measures monitored by the CoC and reported as the Cancer Program Practice Profile Reports (CP^{3}R). The percentage given provides "an indication of the proportion of patients treated according to recognized standards of care." Four of these measures are accountability measures that track adherence to a standard of care which is based on clinical trial evidence. One of the measures is a quality improvement measure that demonstrates good clinical practice but is not based on clinical trial evidence.

The CP^{3}R was designed to use cancer registry data to "improve the quality of data across several disease sites, foster pre-emptive awareness to the importance of charting and coding accuracy and improve clinical management and coordination of patient care in the multidisciplinary setting."

Estimated performance rates for Sanford Cancer Center are above accredited Commission on Cancer programs in the Midwest Division (SD, IA, MN, WI) and Nationally in four of five CP^{3}R measures, and slightly below both for one measure.

Each month the Commission on Cancer sends a report of current performance for all cases being tracked according to the measures. The Sanford Cancer Registry staff closely monitors adherence to intervention timelines reported to us by the CoC, and notifies the treating physician that the patient is nearing the expected date of intervention. The Cancer Liaison Physician also reports the current performance on these measures to the Cancer Committee at least four times per year. The report to the committee involves a review of each case that is nearing the intervention timeline tracked by the measures which is then followed by communication to the individual physician caring for the case to facilitate compliance with the quality measure.

In late 2014, an additional six measures were added to the CP^{3}R to include a total of eleven accountability or quality improvement measures for breast, lung, colon and rectal cancers. These types of measures will become more commonplace as we continue to move to a highly transparent system with publically reported performance metrics. We will continue to report how well we are doing against these measures and closely monitor our performance to maximize the quality of care we provide.

Sanford Cancer Center CP³R performance for breast, colon and rectal measures			
CP³R Measures for Breast, Colon and Rectal Cancers	Estimated Performance Rate 2013	Comparison	
		2013 Midwest Division	2013 All CoC Programs
Accountability Measures			
Radiation therapy is administered within 1 year (365 days) of diagnosis for women under age 70 receiving breast conserving surgery for **breast** cancer.	100%	95.3%	91.6%%
Combination chemotherapy is recommeded or administered within 4 months (120 days) of diagnosis for women under 70 with AJCC T1cN0, or Stage IB-III hormone receptor negative **breast** cancer.	100%	95.5%	92.4%
Tamoxifen or third generation aromatase inhibitor is considered or administered within 1 year (365 days) of diagnosis for women with AJCC T1c, or Stage IB-III hormone receptor positive **breast** cancer.	100%	96.4%	91.4%
Adjuvant chemotherapy is recommended or administered within 4 months (120 days) of diagnosis for patients under the age of 80 with AJCC Stage III (lymph node positive) **colon** cancer.	100%	93.6%	89.4%
Quality Improvement Measures			
At least 12 regional lymph nodes are removed and pathologically examined for resected colon cancer.	87.3%	92.0%	90.0%

Source: ACoS, National Cancer Database, Breast, Colon and Rectal Cancers Reports. November 16, 2015.

Melanoma Skin Cancer

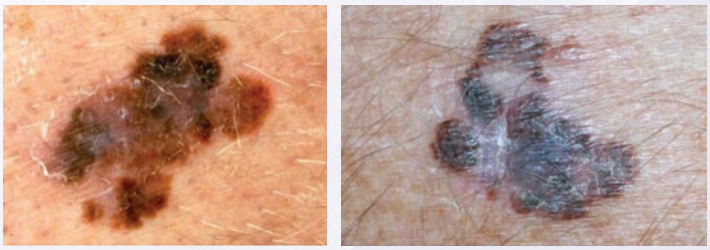
Marcus Frohm, MD

Cutaneous melanoma, the third most common form of skin cancer, arises from melanocytes (pigment-making cells). The incidence of melanoma has dramatically increased over the past 80 years. For patients born in 1935 the lifetime risk of developing melanoma is approximately 1:1500. For patients born in 2015 the lifetime risk of developing melanoma is as high as 1:40. Approximately 75,000 patients in the United States will be diagnosed with invasive melanoma (melanoma invading into the second layer of skin) in 2015, and nearly 10,000 patients will die from the disease this year. Melanoma accounts for approximately 75% of all skin cancer deaths. While the mean age at diagnosis is 62, more than 35% of cases occur in individuals younger than 45 years of age making melanoma one of the leading cancers in terms of average years of life lost per death from disease. The increasing incidence and disease prevalence is notable among young persons (particularly women). The most common location of a cutaneous primary melanoma is the back for men and the lower extremities and trunk for women.

Risk factors for melanoma are similar to those for non-melanoma skin cancer. There is clear, convincing evidence that ultraviolet light exposure (both natural sunlight and tanning bed) is a major environmental cause of melanoma. A single blistering sunburn during childhood doubles the lifetime risk of developing melanoma. Additionally, patients who begin using tanning beds in their late teens and early twenties increase their lifetime risk of developing melanoma by 75%. Considering the incidence of the three predominant forms of skin cancer, ultraviolet light, including UV exposure in tanning beds, is the single greatest carcinogen humans are exposed to on a daily basis. Additional risk factors for the development of melanoma include fair skin, light eye color, inability to tan and a predisposition to burn, numerous typical nevi (moles), one or more atypical nevi (proven by biopsy), a prior history of melanoma, family history of melanoma, and several rarer genetic syndromes.

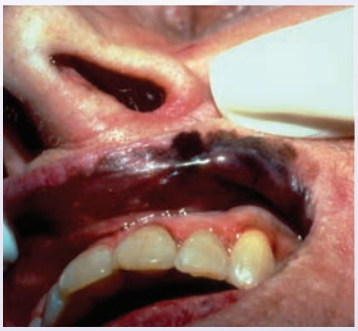
Melanoma typically presents as an "irregular" or "atypical" pigmented lesion on the skin. Features used for recognition of melanoma include the ABCDE's: A (asymmetry), B (border irregularity), C (color variegation), D (diameter greater than 6mm or difference [i.e. the "ugly duckling"]), and E (evolving over time). While these are the classic clinical features, melanoma can be very subtle or even lack pigment altogether (amelanotic melanoma). Approximately two-thirds of melanomas arise from previously normal appearing skin, while only one-third arise from a pre-existing mole; thus, any new pigmented lesion (mole) should be evaluated closely, particularly in older individuals.

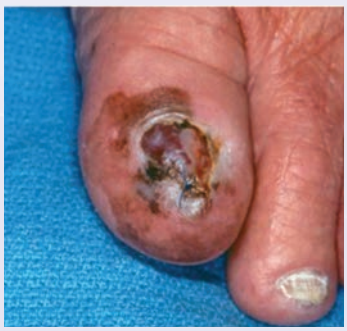
As opposed to the non-melanoma skin cancers (i.e. basal cell carcinoma and squamous cell carcinoma), melanoma can have a significant risk of metastatic disease depending on the depth of the primary tumor (termed "Breslow depth"). The term metastatic is used when the melanoma has spread to another area of the body from the primary site. After a biopsy has been performed, the pathologist will create a report with a "tumor profile" including some of the most important prognostic factors related to the risk that a melanoma will spread. The Breslow depth (a measurement of how deep the melanoma has invaded into the dermis) is the single most important prognostic factor for the melanoma primary. The vast majority of melanomas are detected early. At initial presentation, 85% of patients will have clinically localized disease (i.e. AJCC stage I and II disease), 10% present with regional disease (i.e. melanoma metastatic to the regional lymph node basin (AJCC stage III disease), and 5% present with distant metastatic disease (i.e. melanoma which has spread outside of the regional nodal basin [i.e. AJCC stage IV disease]). Treatment of the melanoma depends on the tumor thickness and stage of disease at presentation.



Firgures 1a and 1b. Classic melanomas demonstrating asymmetry, border irregularity and multiple colors.

Most melanomas are cured surgically. For melanomas less than 1 mm in Breslow depth, the treatment of choice is a standard wide local excision. For melanoma in situ (i.e. melanoma confined to just the top layer of skin with no invasive component), the recommended standard treatment margin is 0.5-1 cm. For thin invasive melanomas, the standard treatment recommendation is a 1 cm margin. For melanomas greater than 1 mm in depth, the risk of the melanoma spreading to the regional lymph nodes becomes significant (i.e. greater than 5-10% depending on the depth and other pathologic features). As such, sentinel lymph node biopsy is often recommended for patients with melanoma greater than 1 mm in depth. Sentinel lymph node biopsy is a powerful test to determine if the melanoma has spread to the regional lymph node basin. Sentinel lymph node





Firgures 2a and 2b. While melanoma is most common on the trunk and extremities, it can occur anywhere including the mucosal surfaces and digits.

biopsy is performed in the operating room at the same time as the excision of the primary site. In addition to being the most important prognostic test performed on patients with intermediate thickness and deep melanomas, the results of the test are extremely helpful in determining whether or not adjuvant (i.e. "extra") treatment is necessary. Adjuvant treatment options for lymph node positive patients include completion lymph node dissection (i.e. removal of the remaining lymph nodes in the regional basin), immunotherapy, or even potentially radiation therapy.

As stated above, most melanomas are cured surgically. However, for patients that present with metastatic disease, treatment options traditionally have been limited. These patients typically did not have a particularly favorable prognosis. Fortunately, we are entering an exciting time for melanoma treatment and research. Over the course of the last four years, six new medications have been FDA approved for the treatment of metastatic melanoma. Immunotherapy (medications that activate your immune system to target cancer cells) are the most exciting class of these medications. Immunotherapeutic options (ipilimumab, nivolumab, and pembrolizumab) have the ability to work with your own immune system to target and destroy cancer cells. These have favorable side effect profiles as compared to previous treatments for melanoma (i.e. chemotherapy and biochemotherapy). Additionally, these have truly been the first medications to significantly improve long-term survival in patients with advanced melanoma.

In the 1980's, HIV/AIDS was considered a death sentence. Through research, we now have cocktails of medications and targeted therapies for patients with HIV and AIDs. Patients are living longer, and HIV/AIDS is no longer the death sentence that it once was. It is easy to envision a similar future for the treatment of melanoma and potentially other malignancies. Some believe we may have multiple medications each aimed at a melanoma specific or patient genetic specific target.

Ten Most Common Primary Sites 2014*

Sanford USD Medical Center vs. Estimated New Cancer Cases Nationally**

	FEMALES			
Sites	**SMC = 958**	**54.6%**	**National = 810,320**	**48.7%**
Breast		31.4%		28.7%
Uterine		11.5%		6.4%
Lung & Bronchus		10%		13.3%
Colorectal		8.2%		8.0%
Skin (Melanoma)		4.2%		3.9%
Ovary		3.9%		2.7%
Thyroid		3.5%		5.8%
Vulva		2.7%		0.6%
Pancreas		2.6%		2.8%
Hodgkin/ Non-Hodgkin Lymphoma		2.4%		4.5%

	MALES			
Sites	**SMC = 798**	**45.4%**	**National = 855,220**	**51.3%**
Prostate		17.4%		27.2%
Colorectal		11.4%		8.4%
Lung & Bronchus		11.2%		13.6%
Skin (Melanoma)		6.8%		5.1%
Kidney/Renal Pelvis		5.5%		4.6%
Hodgkin/ Non-Hodgkin Lymphoma		5.0%		5.1%
Urinary Bladder		4.2%		6.6%
Pancreas		3.6%		2.8%
Pharynx		3.6%		1.4%
Tongue		3.1%		1.1%

**Excludes Carcinoma in situ of cervix and benign brain.*
*** SOURCE: Cancer Facts & Figures 2014.*
Estimated new cases are based on 1995-2010 incidence rates reported by the North American Association of Central Cancer Registries (NAACCR), representing about 89% of the US population.

Basal Cell Carcinoma and Squamous Cell Carcinoma ("Non-Melanoma" Skin Cancers)

Marcus Frohm, MD

Basal cell carcinoma and squamous cell carcinomas are cancers that originate in the top layer of the skin (epidermis). Basal cell carcinoma is the most common cancer in humans, and accounts for roughly 75% of all skin cancer diagnoses. Squamous cell carcinoma is the second most common form of skin cancer. According to one estimate, about 3.5 million basal and squamous cell skin cancers are diagnosed each year in the United States and approximately one in three Americans will be diagnosed with skin cancer in their lifetime.

Risk factors for both basal cell and squamous cell carcinoma are similar. These include ultraviolet light exposure (i.e. natural sunlight and tanning beds), fair skin, light hair and eye color, inability to tan with a predisposition to burn, northern European ancestry, previous sunburns, and prior radiation therapy. Additional risk factors for squamous cell carcinoma include a history of immunosuppression (solid organ transplant patients, hematologic disorders such as lymphoma or leukemia, drug-induced immunosuppression, etc…), and certain viral infections (human papilloma virus or the wart virus).

Squamous cell carcinoma of the skin typically presents as a firm, scaly, pink-to-red bump or plaque which may be tender or ulcerate leaving a non-healing wound. Basal cell carcinoma more commonly manifests as a "pearly" or "translucent" pink or flesh colored bump with prominent overlying blood vessels called telangiectasias. They will often bleed, heal briefly, and then bleed or scab again. The finding of any non-healing or friable lesion should certainly raise the clinical suspicion for skin cancer.

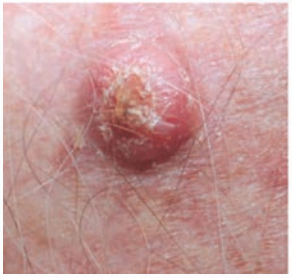


Figure 1: Squamous cell carcinoma. Note central scaling and crust.

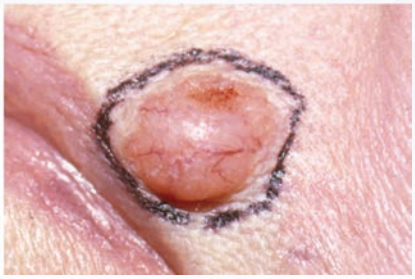


Figure 2: Basal cell carcinoma. Note prominent telangiectasia.

The biologic behavior of basal cell and squamous cell carcinoma differ. Basal cell carcinoma rarely metastasizes (spreads to other locations), though the greatest risk of basal cell carcinoma is local tissue destruction and invasion by the tumor with the potential for nerve damage, ulceration, infection, and local tissue death. Metastases or spread can occur if left untreated. On the other hand, cutaneous squamous cell carcinoma has a definite risk of metastatic disease with historic rates ranging from 0.5-6.0%. The most common site of initial metastatic disease is the regional lymph node basin. The risk of metastatic disease correlates with larger tumor size, recurrent tumors, tumors involving bone muscle or nerve, tumors that arise in high risk locations such as the lip or the ear, and host factors such as chronic immunosuppression.

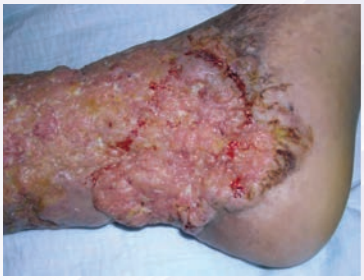


Figure 3: High-risk squamous cell carcinoma arising in a burn scar.

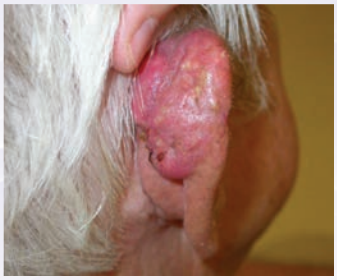


Figure 4: High-risk squamous cell carcinoma due to the size and location.

Early detection of all skin cancer is crucial. By diagnosing skin cancers in the early stages of development, more treatment options are available, the risk of recurrence following treatment decreases, and the risk of metastatic disease and potentially death are lowered dramatically. Early detection involves both the patient and the provider.

Patients should be aware of any new, changing, or symptomatic skin lesions and should bring these to the attention of their provider. High-risk patients should have a full skin cancer screening examination at least yearly with a board-certified dermatologist (American Board of Dermatology). Dermatologists have received extensive training to detect skin cancers in the earliest stages and often times before any symptoms have developed.

Once a skin cancer has been diagnosed, there are often a variety of treatment options depending on the size of the skin cancer and the location. Occasionally, for very early lesions, topical chemotherapy or immunotherapy

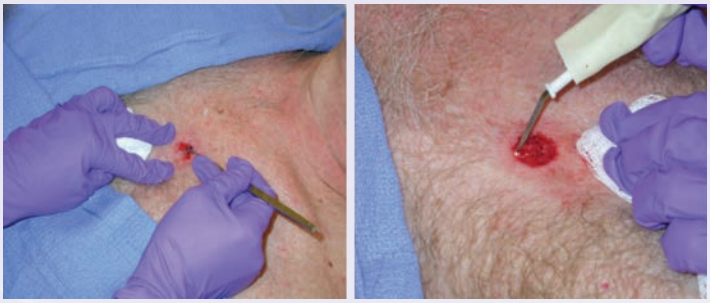


Figure 5a and 5b: Electrodessication and curettage for a low risk skin cancer.

may be an option. More often, treatment involves a destructive or surgical modality to achieve an acceptable cure rate. Destructive treatment options include cryotherapy with liquid nitrogen and electrodessication and curettage ("ED&C" or "scraping and burning"). These treatments are typically reserved for early or small tumors and have cure rates above 90% when applied to the correct tumor type. For larger or deeper tumors, standard excision with a "margin" of normal tissue is usually adequate. Typically a margin of 4-6 mm (depending on the tumor type, location and histologic features) will achieve a cure rate of 94-95% for tumors in low risk locations where an adequate margin can be taken (i.e. trunk and extremities).

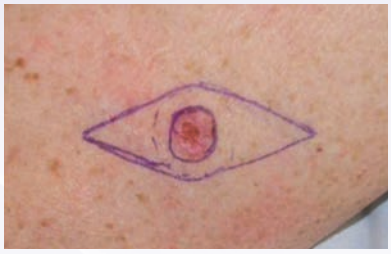


Figure 6: Standard excision with planned margins.

For larger, higher risk tumors or for those tumors in a cosmetically sensitive area, such as the head and neck, dermatologists will often recommend Mohs surgery or Mohs micrographic surgery. Mohs surgery is a special type of skin cancer surgery that involves total margin assessment. The procedure is performed by a board-certified dermatologist who has received additional extensive training in cutaneous oncology and facial plastics reconstruction in an American College of Graduate Medical Education-accredited and/or American College of Mohs Surgery (ACMS)-accredited fellowship. Mohs surgery was developed in the 1930's by Dr. Frederic Mohs and has been perfected over the last 80 years. The procedure involves removing a small sample of tissue just around the skin cancer edges. The tissue is then processed via frozen sections while the patient waits. This usually takes approximately 45 minutes. The tissue is processed in a way that allows for 100% of the peripheral and deep margin to be evaluated. As basal cell and squamous cell carcinoma often grow with a "root system" like a weed, the surgeon can repeat the process of tissue removal until all of the skin cancer is definitively removed. Mohs surgery has three primary advantages over destructive treatment modalities and standard excisional therapy. First, as all of the peripheral and deep margins are evaluated the cure rates with Mohs surgery are typically quoted at 98-99% depending on tumor characteristics. Second, since the tumor is being evaluated histologically at the time of the procedure, the patient leaves with the knowledge that the tumor has been definitively treated (i.e. there is no waiting for a pathology report to return a week later). Finally, and importantly, because the procedure involves conservation of all surrounding normal tissue, Mohs surgery has the advantage of offering the optimal cosmetic and functional outcome for tumors in high risk locations.

Following a diagnosis of skin cancer, the risk of developing further skin cancers is high – approximately 50% over a 3-5 year period. Given this risk, regular follow up with a dermatologist is important. Full skin cancer screening examinations should be performed at least yearly, and more often in high risk individuals. Additionally, patients should be counseled and educated in monthly self-skin examinations, self-lymph node examination (for squamous cell carcinoma), the early signs and symptoms of skin cancer, and preventative measures such as appropriate use of sunscreen on a daily basis, reapplication of sunscreen, sun-protective clothing and safe sun practices.

18th Street View

17th Street View

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