SAINT LUKE'S CANCER INSTITUTE ANNUAL REPORT 2019

Incorporating the 2018 Cancer Registry Statistical Review

Saint Luke's™
CANCER INSTITUTE

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Dear Colleague,

Our work at Saint Luke's Cancer Institute is driven by a vision to improve outcomes and quality of life for our patients.

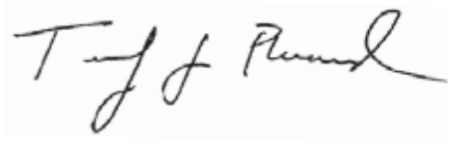
We believe it is our duty to provide easy access to top-quality care in the communities we serve. Saint Luke's Cancer Institute's comprehensive care network offers screening and treatment locations throughout Kansas City and beyond. From Trenton to Butler, Warrensburg to Overland Park, and everywhere in between, we bring cancer care to people where they work and live.

- Seven Saint Luke's Cancer Institute locations, with full medical oncology/hematology services and chemotherapy-infusion
- Nine breast screening centers, offering 3D mammography with results read by fellowship-trained breast radiologists
- Twelve locations offering low-dose lung CT screening
- Four radiation therapy clinics

Our experts have extensive experience in cancer diagnosis and treatment that is tailored to the unique needs of each patient. Our multidisciplinary team uses the latest clinical trials and treatments coupled with tailored integrative therapies to treat the whole person.

Top-quality care, available everywhere. That's the Saint Luke's difference.

Regards,



Timothy J. Pluard, MD
Medical Director

NAPBC®
NATIONAL ACCREDITATION PROGRAM FOR BREAST CENTERS
ACCREDITED BREAST CENTER

Commission on Cancer® ACCREDITED PROGRAM
A QUALITY PROGRAM of the AMERICAN COLLEGE OF SURGEONS

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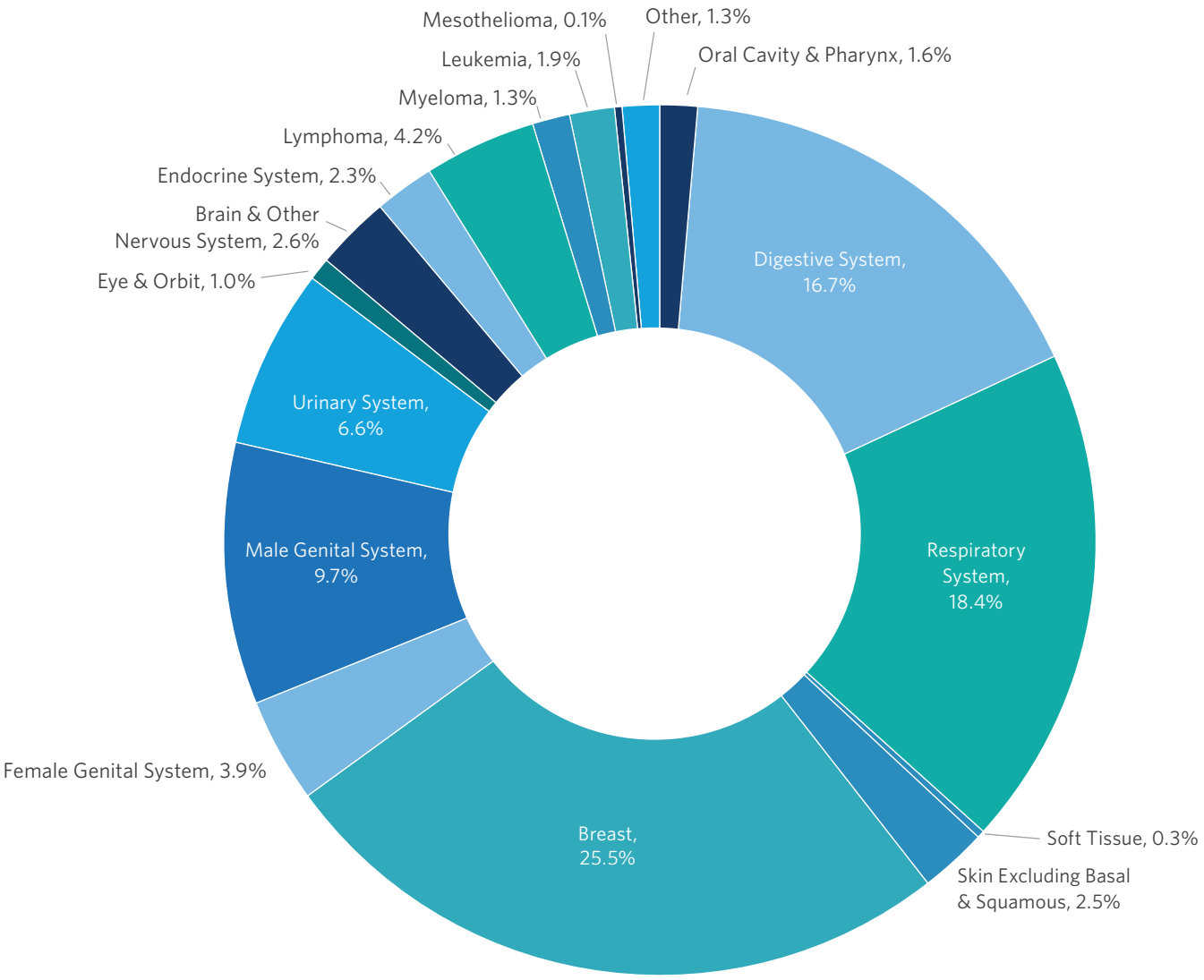
SUMMARY OF BODY SYSTEM, ANALYTIC CASES

2018 Summary of Body System, Saint Luke's Health System Analytic Cases



PRIMARY SITE	2018
Oral Cavity & Pharynx	39
Digestive System	402
Respiratory System	443
Soft Tissue	7
Skin Excluding Basal & Squamous	60
Breast	613
Female Genital System	93
Male Genital System	232
Urinary System	158
Eye & Orbit	24
Brain & Other Nervous System	63
Endocrine System	55
Lymphoma	102
Myeloma	31
Leukemia	46
Mesothelioma	3
Other	32
ALL SITES	2,403

CANCER CONFERENCES AND COMMITTEES

Saint Luke's Multidisciplinary Cancer Conferences

Experts from multiple specialties form Saint Luke's Cancer Conferences. Together, they review patient cases and make treatment recommendations. Conference members vary by cancer site and include medical and radiation oncologists, surgeons, radiologists, pathologists, and ancillary support services.

In 2018, Saint Luke's offered site-specific cancer conferences for brain and spine, breast, lung, gynecologic, and gastrointestinal cancers.

Summary of 2018 Site-Specific Conferences

Site-Specific Conference	Interval	Number of Conferences	Number of Analytic Cases Presented
Breast	Weekly	40	212
Head & Neck	Monthly	12	63
Gastrointestinal	Weekly	41	330
Gynecologic	Bimonthly	17	76
Neuro-oncology	Weekly	43	304
Thoracic	Weekly	49	329
Totals		**202**	**1,314**

Saint Luke's Cancer Committee

A multidisciplinary team provides oversight of the oncology program. Committee members hail from each of the Saint Luke's Cancer Institute locations and include physicians from diagnostic and treatment specialties and non-physicians from administrative and supportive services. The committee convened in January of 2019 and met six times throughout the year.

2019 Committee Members

Required Physician Members

Timothy J. Pluard, MD
Medical Director, Saint Luke's Cancer Institute
Medical Oncologist/Hematologist, Saint Luke's Cancer Institute

Brenna Winn, APRN, NP-C
Palliative Care Physician, Saint Luke's Hospital

Susan Herzberg, MD
Radiation Oncologist, Saint Luke's Cancer Institute

Furha Cossor, MD
Medical Oncologist/Hematologist, Saint Luke's Cancer Institute

Megan McNally, MD
General Surgeon, Saint Luke's Health System

Megan Saettele, MD
Breast Radiologist, Saint Luke's Cancer Institute

Ashley Schneider, MD
MAWD Pathologist

Janakiraman Subramanian, MD
Medical Oncologist/Hematologist, Saint Luke's Cancer Institute

Required Non-Physician Members

Elizabeth Anderson, MS, RD, LD
Registered Dietician Specialist, Saint Luke's Hospital

Pete Audello, RHIT, CTR
Senior Cancer Registrar, Saint Luke's Health System

Kim Day, RT, R, M
Breast Center Manager, Saint Luke's Health System

Jake Eyler, M Div
Chaplain, Saint Luke's Hospital

Kim Blankenship, RN, BSN, OCN
Director, Oncology Services, Saint Luke's Cancer Institute

Sheila Luektemeyer, BS, PT
Physical Therapist, Saint Luke's Hospital

Monty Miller, LCSW
Manager, Support Care Services, Saint Luke's Cancer Institute

Mark Monn
Quality Resource Analyst, Saint Luke's Cancer Institute

Pete Audello, RHIT, CTR
Senior Cancer Registrar, Saint Luke's Health System

Kitty Muehlbach, LMSW
Social Worker, Saint Luke's Hospital

Carrie Lavin, RN, BSN, OCN
Vice President, Clinical Service Lines, Saint Luke's Health System

Carol Quiring, BSN, MHA
President and CEO, Saint Luke's Home Care and Hospice

Andrea Watson, RN, BSN
Lead Clinical Research Nurse, Saint Luke's Cancer Institute

Meredith Wills, PharmD
Pharmacy Supervisor, Saint Luke's Hospital

Whitney Ford, MS, CGC
Genetic Counselor, Saint Luke's Cancer Institute

Additional Members

Clara Anderson-Sainte, LCSW
Social Worker, Gilda's Club Kansas City

Heather Edwards, BSN, RN, OCN
Clinical Education Specialist, Saint Luke's Health System

Lee Cummings, MD
Transplant Surgeon, Saint Luke's Hospital

J. Russell Davis, MD
Cardiothoracic Surgeon, Saint Luke's Hospital

Donell Wolf, RN, MSN, NE-BC
Nurse, Saint Luke's North Hospital

Jameson Forster, MD
Abdominal Transplantation and HEP Surgery Director, Saint Luke's Hospital

Shahzad Raza, MD
Hematology Oncology, Saint Luke's Cancer Institute

Emily Kayrish
Director of Marketing, Saint Luke's Health System

Susie Krug, BSN, RN
Chief Nursing Officer, Saint Luke's East Hospital

Nikki Leake
American Cancer Society

Trina Lee, MS, RHIA, CCS
Cancer Registry Manager, Saint Luke's Health System

Susan Melton
Senior Director of Development, Saint Luke's Hospital Foundation

John Shook, MD
Breast Program Director, Saint Luke's Health System

Elizabeth Vincent, RN, MSN, MBA, VA-BC, OCN
Outpatient Services, Saint Luke's Cushing Hospital

Jan Watkins, RN, MS, OCN, CHPN
Director, Cancer Services, Liberty Hospital

Julia Woods, RN, MSN, OCN
Chief Nursing Officer, Saint Luke's South Hospital

CANCER PREVENTION AND EARLY DETECTION OUTCOMES

Saint Luke's Cancer Prevention and Early Detection Outcomes

Saint Luke's provides cancer prevention programs targeted to meet the needs of the community and designed to reduce the incidence of a specific cancer type. Each prevention program is consistent with evidence-based national guidelines for cancer prevention.

High-Risk Breast Clinic

Program details

- Led by advanced nurse practitioners
- Locations at Saint Luke's Hospital of Kansas City, Saint Luke's East Hospital, Saint Luke's North Hospital, and Saint Luke's South Hospital
- Offers individuals at high risk for developing breast cancer:
  - Early detection
  - Surveillance
  - Education
  - Preventive therapies
  - Research
- Incorporates hands-on clinical assessment and technology following National Comprehensive Cancer Network guidelines
- Collaboration with genetic counselors

Program offerings

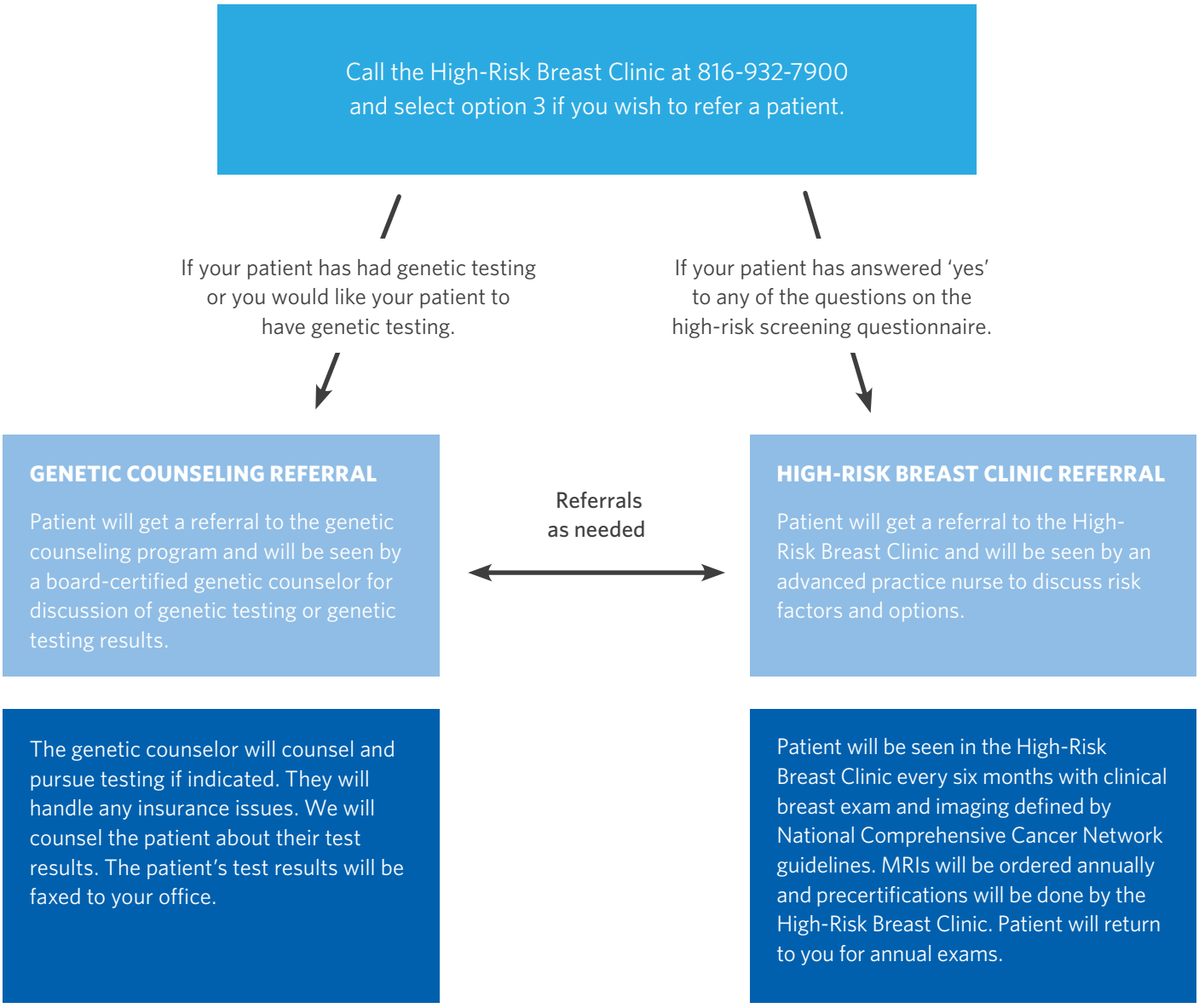
- Consultation about personal risk factors as related to breast cancer and possible preventive strategies
- Clinical breast exam by a MammaCare®-certified nurse practitioner
- Instructions for breast self-exam using the MammaCare® method
- Imaging studies
- Referral for cancer risk assessment by a certified genetic counselor and genetic testing when applicable
- Referral to medical oncologist if pharmacologic risk reduction options are necessary
- Referral to surgeons who specialize in breast surgery if indicated
- Referral for ovarian cancer screening when applicable
- Research opportunities

High-Risk Breast Cancer Clinic screening	Patients	Patients requiring breast MRI	Cancer diagnosed related to screening
Jan. – Dec. 2017	1,503	377	8
Jan. – Dec. 2018	1,506	512	7
Jan. – July 2019	782	226	2

◆ Learn more
816-932-7900, option 3
saintlukeskc.org/high-risk

Referring protocol for outside providers

Cancer screening options and recommendations evolve quickly with each new study or discovery, making it difficult for primary care providers to stay up-to-date. The team at Saint Luke's High-Risk Breast Clinic specializes in knowing the latest recommendations and options. An integrated group of nurse practitioners, genetic counselors, and physicians created this algorithm to help providers navigate the complexities of the referral process. In 2018, we expanded our high-risk program to encompass all types of cancer, offering a higher level of early detection to patients.



◆ Learn more

816-932-7900, option 3
saintlukeskc.org/high-risk

Low-Dose Computed Tomography Lung Cancer Screening Program

Program details

- Led by Melissa Rosado de Christenson, MD, radiologist, and Trent West, patient navigator
- Patients meet high-risk criteria
- Low-dose lung CT performed
- Radiologist meets with patients who have a positive LDCT scan (Lung RAD 3 and 4) to review screening findings
- Patient navigator calls patient within 24 hours when scan is negative (Lung RAD 1 and 2)
- Lung cancer screening counseling and shared decision-making visit conducted by a physician or physician assistant, nurse practitioner, or clinical nurse specialist
- Specific criteria to be covered in shared decision-making visit

Eligibility criteria

- 55 – 77 years old (Medicare) or 55 – 80 years old (private insurance)
- Asymptomatic
- Tobacco smoking history of at least 30 pack years (one pack year = smoking an average of one pack a day for one year; one pack = 20 cigarettes)
- Current smoker or someone who has quit smoking within the last 15 years
- Receives a written order for low-dose CT lung cancer screening

Expansion

Saint Luke's offers lung cancer screening at 11 locations in the Kansas City metro area:

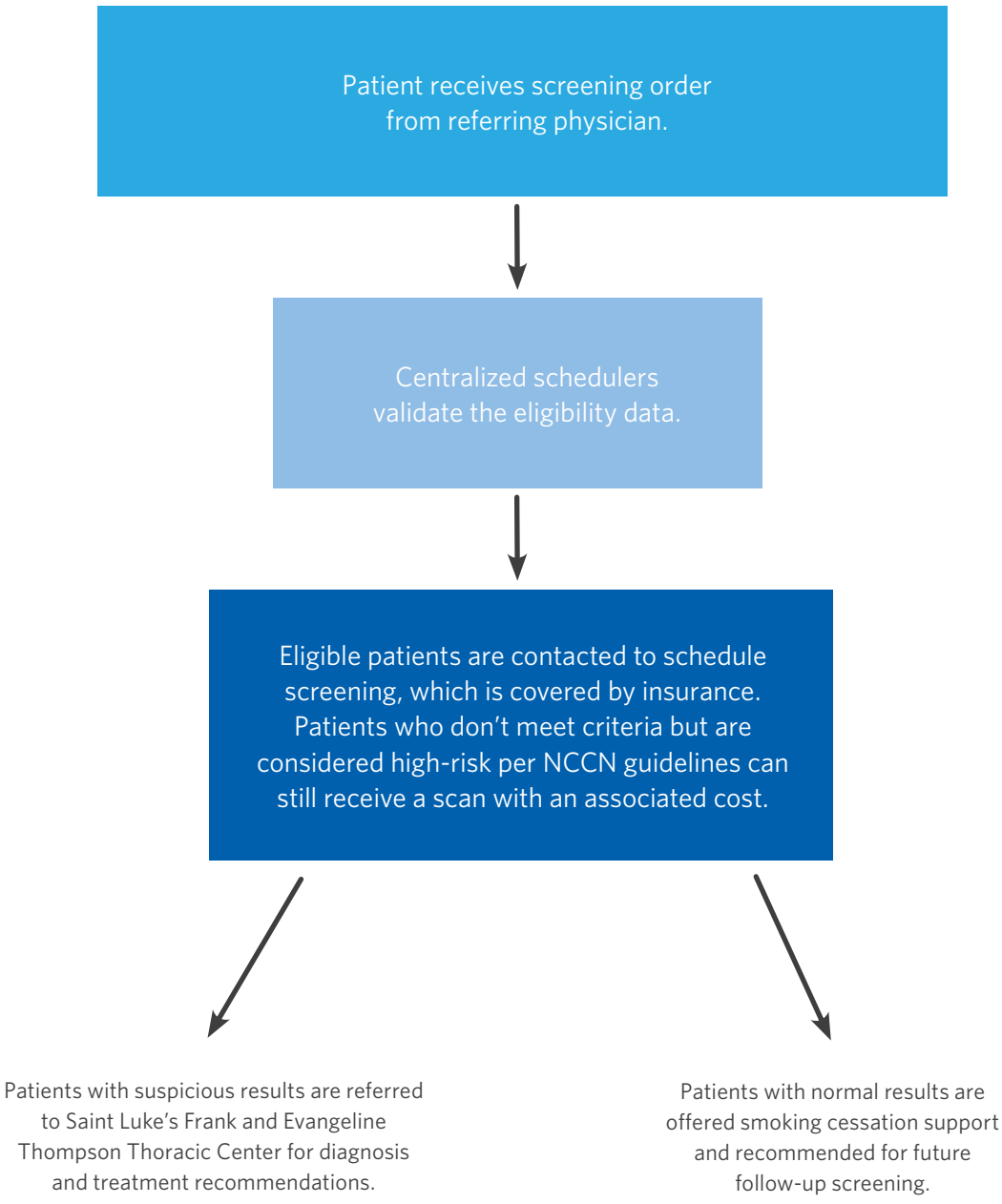
- Saint Luke's Hospital, Kansas City, Missouri
- Saint Luke's Medical Imaging Center, Kansas City, Missouri
- Saint Luke's East Hospital, Lee's Summit, Missouri
- Saint Luke's South Hospital, Overland Park, Kansas
- Saint Luke's North Hospital–Barry Road, Kansas City, Missouri
- Saint Luke's Cushing Hospital, Leavenworth, Kansas
- Hedrick Medical Center, Chillicothe, Missouri
- Saint Luke's Multispecialty Clinic–Blue Springs, Blue Springs, Missouri
- Saint Luke's Multispecialty Clinic–Burlington Creek, Kansas City, Missouri
- Saint Luke's Multispecialty Clinic–Mission Farms, Overland Park, Kansas
- Saint Luke's Multispecialty Clinic–Shoal Creek, Kansas City, Missouri

◆ Learn more

816-932-6800
saintlukeskc.org/lung-screening

Lung cancer screening with low-dose CT	Patients screened	Patients requiring active surveillance or follow-up	Patients needing surgical or treatment intervention	Cancer diagnosed related to screening
Jan. – Dec. 2016	511	84	8	8
Jan. – Dec. 2017	866	138	10	9
Jan. – Dec. 2018	1,156	217	15	18
Jan. – Oct. 2019	1,206	204	14	15

Referring protocol for the Low-Dose Computed Tomography Lung Cancer Screening Program



◆ Learn more

816-932-6800
saintlukeskc.org/lung-screening

Supportive Oncology and Rehabilitation Services

The care at Saint Luke's Cancer Institute goes beyond surgery, chemotherapy, and radiation. We evaluate the psychological, social, financial, spiritual, and physical effects a cancer diagnosis may have on patients and their families, then work as a team to address those issues.

A growing base of research shows supportive care interventions complement medical care, enhance quality of life, and extend life. Comprehensive and integrated supportive care adds value in both cost and quality to evidence-based and patient-driven treatment.

We evaluate

At every visit with a Saint Luke's Cancer Institute provider, patients fill out a questionnaire that assesses their distress. Based on responses, we can make appropriate referrals to our specially trained support professionals. We continue that support from the time of diagnosis through treatment and beyond.

We extend

Our team is dedicated to bringing these care services to our patients where they live. We offer in-person appointments at our four Kansas City metropolitan locations, plus telehealth appointments at three regional hospitals. Supportive services experts attend patient care conferences to add input about the specific needs for each patient and family.

We educate

We always look for innovative ways to educate ourselves and our patients. This year, we offered lectures featuring experts in cancer prevention and control, discussing cancer genetics, movement, cancer screening, and nutrition.

We partnered with Gilda's Club Kansas City to provide education and support to our patients. Anyone touched by cancer can participate in educational workshops, social activities, networking groups, and more.

Saint Luke's Muriel I. Kauffman Women's Heart Center and Saint Luke's Cancer Institute partnered to offer Food as Medicine Everyday (FAME) four-class series for cancer patients. The series is designed to provide nutritional support through cancer treatment and recovery.

Support care services

One in three patients are referred to the following Supportive Oncology and Rehabilitation Services:

- Psychology
- Social work
- Nutrition
- Genetic counseling
- Nurse navigation
- Survivorship
- Spiritual health
- Physical and occupational rehabilitation
- Patient education classes and guest speakers
- Exercise, yoga, massage

◆ Learn more

816-932-4576
saintlukeskc.org/supportiveoncology

SIGNATURE PROGRAMS

Saint Luke's Cancer Institute Signature Programs

Saint Luke's Koontz Center for Advanced Breast Cancer

As a national leader in the treatment of Stage 4 breast cancer, Saint Luke's Hospital Koontz Center for Advanced Breast Cancer is continuing to change the way women and men live with metastatic breast cancer.

Treatment Part 1: The Most Stage 4 Clinical Trials and Leading-Edge Medical Treatments
Saint Luke's Cancer Institute has one of the widest portfolio of clinical trials available for Stage 4 breast cancer in the Kansas City area. We believe that every patient at every therapeutic change should have a clinical trial option, and screen all patients to find a trial that might work for them. Twenty-two percent of Koontz Center patients participate in a clinical trial, while nationally only five percent of Stage 4 patients participate in a clinical trial.

Treatment Part 2: Genomic Sequencing and Personalized Treatment
All patients of the Koontz Center have their tumor sequenced to find the exact mutation causing the spread of the disease. While most other centers only test 600 cancer genes, Saint Luke's is the only center in a 450-mile radius of Kansas City to test all 20,000 genes. This gives patients a much higher likelihood of finding the best treatment possible.

Treatment Part 3: Integrative, Holistic Therapies
By combining advanced medicine with integrative therapies, our doctors can ease many of the symptoms associated with treatment and enhance quality of life. Our practitioners have expertise in working specifically with patients diagnosed with metastatic breast cancer, and their work can play a role in slowing the growth of Stage 4 breast cancer.

New patient consultation with our multidisciplinary team
Prior to the first visit, patients complete a series of pre-screening assessments in a variety of areas:

- PROMIS (Patient-Reported Outcome Measurement Information System) measures
- Sleep
- Physician function
- Fatigue
- Pain interference
- Daily Spiritual Experience Scale (DSES)
- DSM-5 Self-Related Level 1 Cross-Cutting Symptom Measure-Adult
- Koontz Center forms to assess social work issues, nutritional concerns, and genetic testing

During the first consultation, a patient will meet separately with members of our team of breast cancer providers in a comprehensive, half-day assessment. Our specialists include:

- Medical oncologist
- Nurse navigator
- Registered dietitian
- Psychologist
- Oncology social worker
- Genetic counselor
- Spiritual wellness chaplain
- Exercise physiologist

The team will analyze the patient's treatment history and do a complete assessment of their current needs. At the end of the day, the patient will receive a customized treatment plan, which will incorporate the recommendations of the entire team.

Our integrative therapies include:

- Genetic counseling
- Nutrition planning
- Exercise physiology
- Palliative care
- Emotional support
- Advanced breast cancer support groups
- Spiritual counseling
- Yoga
- Massage
- Acupuncture

We encourage patients to bring a loved one to their consultation. We believe it is essential that patients and their family members have the opportunity to ask questions and understand treatment recommendations. Patients also receive a video recording of the consultation that they can review later and share with family.

◆ Learn more

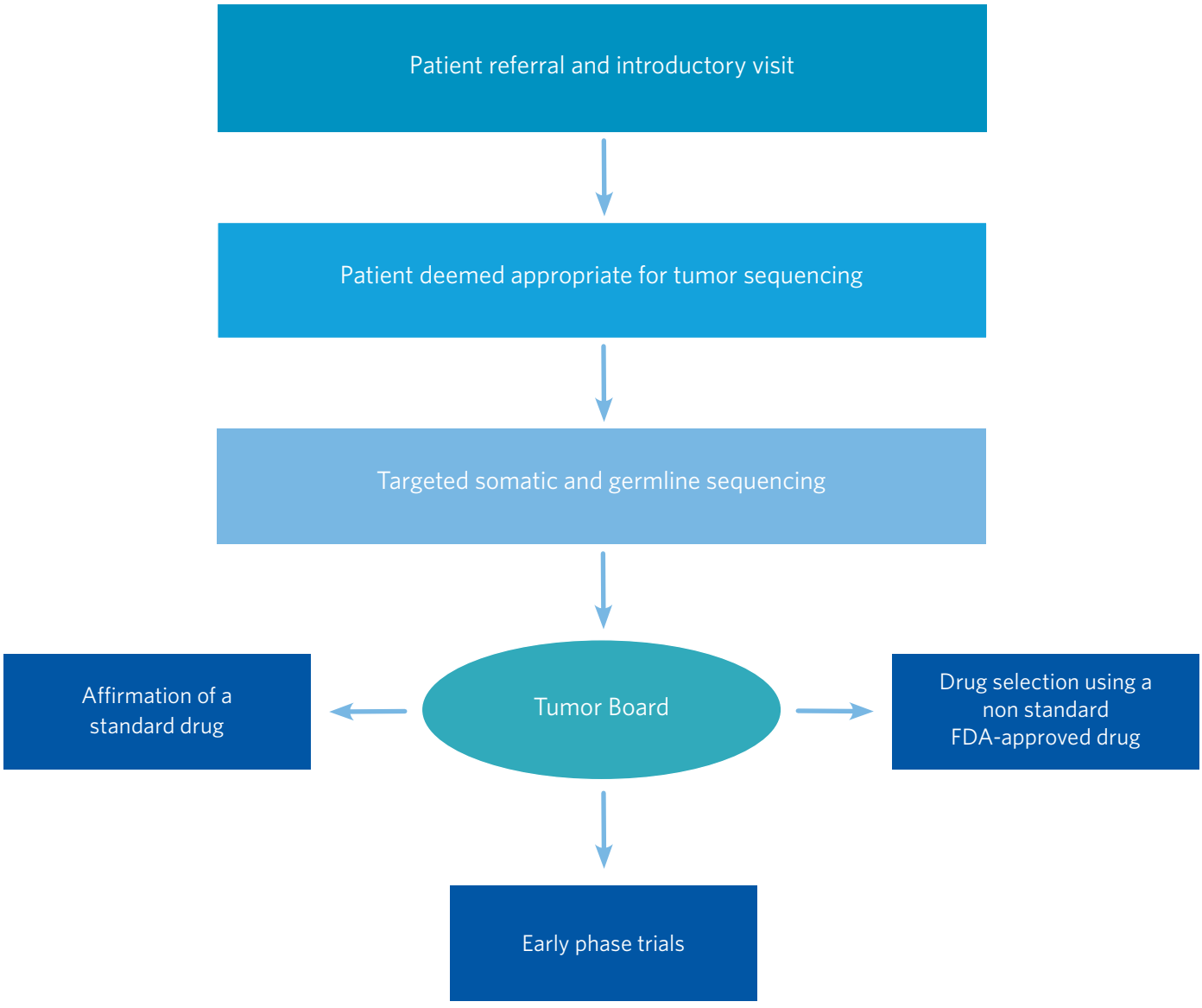
816-522-2201
saintlukeskc.org/nextstep

Saint Luke's Center for Precision Oncology

Saint Luke's Cancer Institute launched its Center for Precision Oncology in 2016 with the goal of offering personalized cancer therapies based on a patient's individual genomic profile. It is the only center within 450 miles of Kansas City to offer whole genome sequencing, and while most treatment centers test 600 genes, we test all 20,000.

Our multidisciplinary team of experts in the fields of medical oncology, cancer genomics, and computational biology meet in a molecular tumor board to discuss the patient's testing results and determine the best course of treatment.

Model for Precision Oncology Clinic and Molecular Tumor Board



Saint Luke's Gastrointestinal Cancer Program

Saint Luke's Gastrointestinal Cancer Program is the only cancer program in Kansas City to be nationally recognized as an NPF Center by the National Pancreas Foundation. This designation is only given to premier health care facilities that focus on the multidisciplinary treatment of pancreas disease, treating the whole patient with a focus on the best possible outcomes, and an improved quality of life.

Our experts specialize in a wide range of gastrointestinal diseases, including:

- Pancreatic cancer
- Colorectal cancer
- Esophageal cancer
- Liver cancer
- Neuroendocrine tumors
- Bile duct cancer
- Stomach cancer
- Carcinoid tumors
- Appendix cancer
- Cancer of unknown primary

Our multidisciplinary care team includes:

- Medical oncologists
- Radiation oncologists
- Hepatobiliary experts
- Imaging studies
- Surgeons
- Radiologists
- Pathologists
- Genetic counselors

These practitioners meet in a weekly cancer conference to discuss each patient's case and work together to create an individualized treatment plan.

Learn more
816-932-22878
saintlukeskc.org/cancer

RESEARCH AND **PUBLICATIONS**

Saint Luke's Cancer Institute Research and Publications

Medical, Financial and Insurance Related Concerns of Metastatic Breast Cancer Patients

Savannah J. Geske, PhD, Katie Ambrosier, LCSW and Timothy J. Pluard, MD, Saint Luke's Cancer Institute

Background

The medical, financial, and insurance concerns of patients throughout the cancer trajectory are well documented. Over a quarter of patients report at least one financial problem. Due to the financial burden of cancer care, patients report that they delay filling prescriptions, have difficulty making ends meet, are concerned about their household's financial situation and skip doses of medication. These are significant findings as consistent use of medication is necessary for treatment and those with increased financial problems also have lower scores on physical and mental health quality of life measures. While most providers agree that the burden of metastatic breast cancer (MBC) is also significant, little information is known about the specific medical, financial and insurance needs of those with MBC.

Methods

Saint Luke's Cancer Institute (SLCI) employs providers in the fields of medical and surgical oncology, gynecologic oncology, hematology, and radiation oncology who subspecialize in every type of cancer. In October of 2016, the Koontz Center for Advanced Breast Cancer was established within the Saint Luke's Cancer Institute. This center focuses exclusively on patients with MBC with a dual focus of improving outcomes and quality of life of those with MBC. In addition to a robust therapeutic research program, genomics, and immunotherapy, a comprehensive supportive/integrative team, including social worker, is imbedded in the center. Social workers see patients throughout the entirety of SLCI and Saint Luke's Hospital Koontz Center for Advanced Breast Cancer. As part of their interactions with patients, social workers document the date of intervention, patients' name, concern addressed, and length of every interaction. The following data compares the reported needs of those with MBC in the Koontz Center for Advanced Breast Cancer to the non-MBC patients within the SLCI population from September 1st of 2017 to August 31st of 2018.

Results

In total, there were 2,072 interactions with non-MBC patients during this period. The top three reported concerns were medication assistance (n=335, 16.15%), being uninsured (n=298, 14.37%) and transportation (n=284, 13.69%). For those with MBC, there were a total of 476 interactions within the same time frame and the top three reported concerns were medication assistance (n=166, 34.87%), insurance issues (n=75, 15.76%) and financial distress (n=66, 13.87%). Forty-four percent of non-MBC patients have repeat appointments and meet with social work on average 5 times. Of MBC patients, 60.68% have repeat appointments and meet with social work on average 7 times.

FIG 1. Percentage of Patients Who Attend Repeat Appointments to Social Work

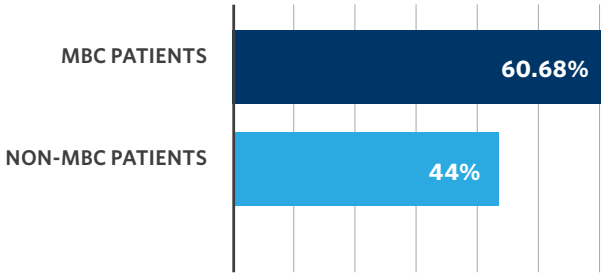
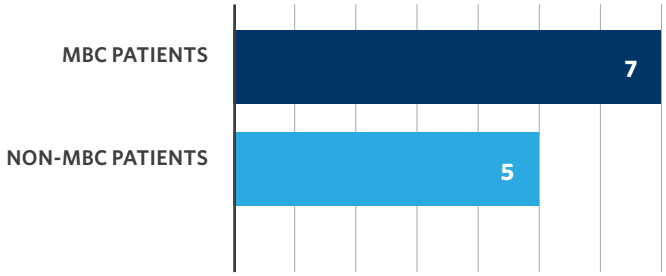


FIG 2. Average Number of Repeat Appointments with Social Work



Conclusions

Results indicate differences and similarities for MBC patients compared to non-MBC patients. This could be explained by the fact that both populations share several concerns such as financial barriers to medications, high insurance premiums, and decreased ability to work. However, due to the nature of MBC, patients with MBC often deal with these concerns for longer periods of time and are often required to utilize expensive specialty medication. The top three concerns of MBC patients including medication assistance, insurance issues, and financial distress, are closely related to one another as it relates to gaps in healthcare coverage. The high cost of treatment for advanced disease, coupled with the specific and unique needs of those living with MBC, can directly impact patients' ability to access necessary care.

Within the Koontz Center, the social work team seeks to mitigate these concerns. A member of the social work team meets with each new patient during their initial visit to the Koontz Center for Advanced Breast Cancer. Therefore, social workers are able to discuss potential scenarios that patients may encounter throughout their care, such as navigating high co-pays for treatments, maintaining health insurance when a patient is no longer working, or locating resources to help with increased financial distress due to medical bills. Meeting with patients at this first visit allows social workers to provide MBC-specific resources, granting patients time to ask questions and prepare accordingly, often before these issues become a significant hardship. Following this initial meeting, patients are then aware of the social work team as an outpatient resource which can assist with future needs or questions that arise throughout the MBC journey. This model presents a unique opportunity for social workers to proactively facilitate interventions and resources to MBC patients, which can assist in lessening the burden that these medical, financial, and insurance related concerns have on patients' quality of life. Future research should focus on how efforts at the Koontz Center for Advanced Breast Cancer may affect patients reported levels of financial stress and financial strain.

FIG 3. Total Concerns Reported by MBC Patients

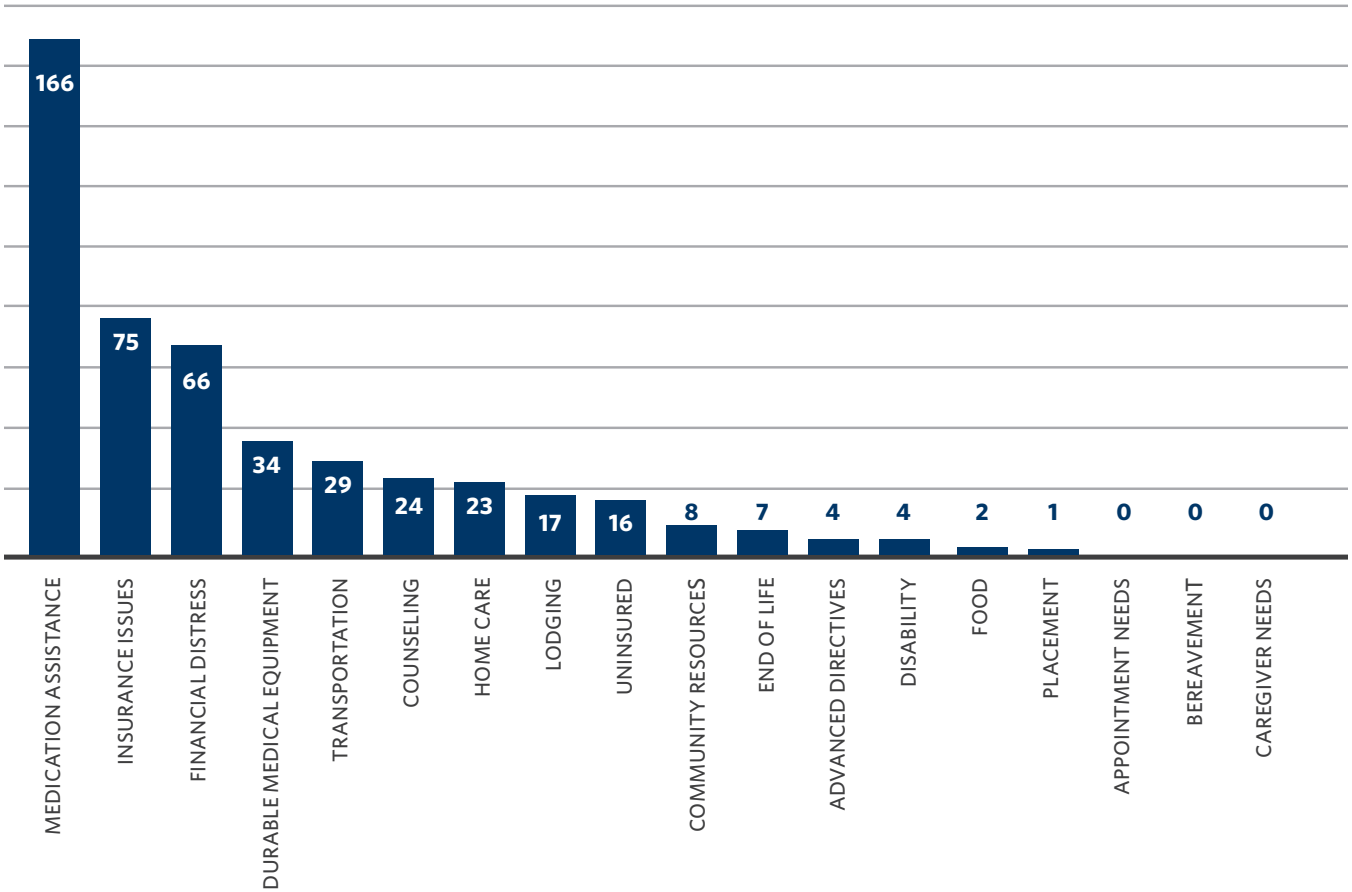
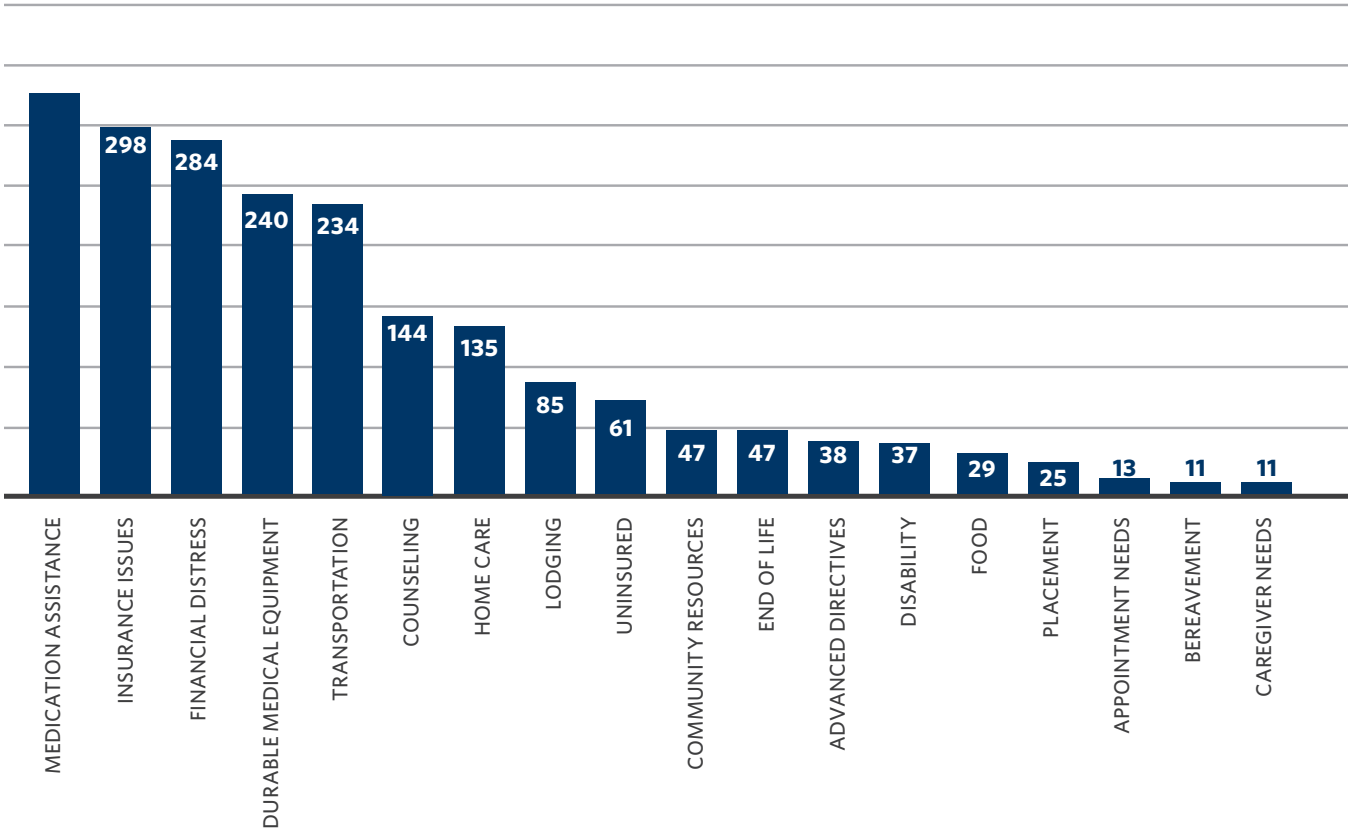


FIG 4. Total Concerns Reported by Non-MBC Patients



Patient-Defined Treatment Success: Perspectives of Patients with Advanced-Stage Lung Cancer

Addison Tolentino, MD, Saint Luke's Cancer Institute

Purpose

In the United States, lung cancer accounts for 14% of cancer diagnoses and 28% of cancer deaths annually. Because no cure exists for advanced lung cancer, the primary treatment goal is to prolong survival.

Objectives

The study aim was to determine whether individual preferences, characteristics, and treatment experiences affect the meaning of treatment success.

Materials and methods

A quantitative study using an observational, longitudinal cohort of patients with advanced stage non–small-cell lung cancer was conducted. Data sources included medical records and patient interviews. Data were analyzed using x2, Fisher's exact, and McNemar's tests, as well as logistic regressions.

Results

At the first interview of 235 individuals, 12% considered survival alone as their definition of treatment success; others defined treatment success as survival plus other aspects, such as quality of life and reaching an important personal goal. As they moved through chemotherapy, 47% of the patients changed their definition of treatment success. Bivariate analysis showed that patients with lower incomes tended to be more likely to change their definition of treatment success compared with their counterparts with higher income (P = .0245).

Conclusion

By taking chemotherapy, patients expect to increase their odds of survival and want to maintain the quality of life and functionality. A patient's definition of treatment success is often changing as treatment continues, making it appropriate to ensure patient-provider communication throughout their clinical care. The study results are limited to patients with advanced non–small-cell lung cancer and drawn from a predominantly white patient population, mainly from the US Midwest.

J Oncol Pract 15:e758-e768.

Introduction

In the United States, lung cancer is the leading cause of cancer-related deaths.[1] In 2016, there were more than a quarter of a million new cases, accounting for 14% of all cancers diagnosed. The latest data indicate that 28% of all cancer deaths will be caused by lung cancer.[2] Of the 609,640 cancer deaths projected to occur in the United States in 2018, more than 170,000 could be from lung cancer.[3]

Forty percent of patients diagnosed with non–small-cell lung cancer (NSCLC) have advanced-stage disease.[2] It is the most common type of lung cancer (85%). Lung cancer has been and continues to be a significant factor in health care costs and utilization of health care services.[4,5] Because the average age at diagnosis of lung cancer is 70 years, health care costs will likely continue at high levels, and perhaps increase, as the population explosion generation, often termed "Baby Boomers," ages.

To date, there is no known cure for advanced-stage lung cancer, and treatment options for metastatic NSCLC are limited to a few chemotherapy protocols with approximately equal impact on symptom management and patient survival.[6-10] From the perspective of physicians, the primary treatment goal for advanced-stage NSCLC is, typically, to prolong survival. Temel et al[11] reported a longevity advantage for patients with metastatic NSCLC who received early palliative care along with standard care (n = 77) relative to those who received only standard care (n = 74). In this randomized phase III trial, there were fewer in the early palliative care group who received aggressive end-of-life care (33% v 54%; P = .05). In addition, the initial palliative care group had a longer median survival (11.6 months v 8.9 months; P = .02). Early palliative care was patient centered, and the com-bination of a patient-specific approach with standard cancer care led to improvement in quantity and quality of life.[11]

Despite a similar improvement in survival by the most commonly used chemotherapy drugs used in the treatment of advanced NSCLC, each has a different toxicity profile. Toxicity can affect a patient's tolerance to chemotherapy, which is individually experienced and may change over time. Hurria et al[12] noted the importance of determining how to predict and manage the toxicity that is common in older adults with cancer. Furthermore, their results emphasize the need to include the characteristics and perspectives of patients in treatment planning and care.[12]

A study of physical therapy and patient-defined treatment success found that the definition of treatment success did not change after the treatment.[13] Other research examined the quality of life, patients' preferences for treatment, and expectations about the effect of chemotherapy.[14-17] However, there was no study involving patients with advanced-stage lung cancer to denned patient-centered treatment success by comparing survival alone (living longer) with survival with other options (living longer with other options, such as quality of life).

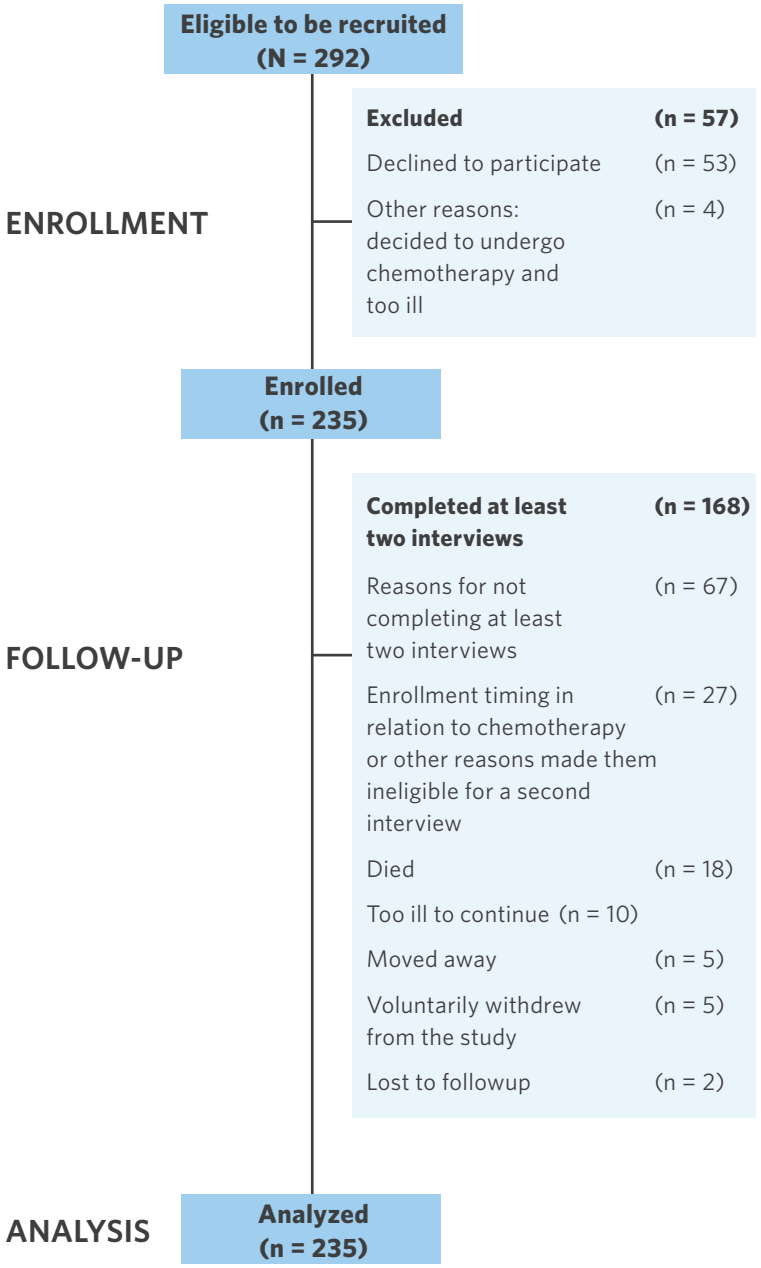
We prospectively evaluated patients' definition of treatment success for chemotherapy of advanced-stage lung cancer. The goal was to facilitate patients' treatment choices using their preferences of drugs and adverse effect tolerances. We focused on how patients denned success for the treatment of advanced-stage lung cancer. The aim was to determine if patient characteristics and treatment experiences affect their definition of, and the meaning of, treatment success during their disease.

Materials and methods

Patients

A prospective cohort study was conducted to determine patients' definitions of treatment success and to determine if patient characteristics and treatment experience affect their definition of success. Between January 2014 and April 2016, 235 adult patients (≥ 19 years old) with advanced NSCLC from nine cancer centers located in eight U.S. Midwestern states and one in Florida were recruited and enrolled. Eligibility criteria included: diagnosis of advanced stage (stage 3b and above on the basis of the American Joint Committee on Cancer 7th edition) NSCLC, age 19 years or older, ability to understand spoken English, willing and able to provide informed consent, and eligible to undergo chemotherapy for advanced-stage NSCLC. Participants were interviewed to collect data before, during, and after first-line chemotherapy (maximum of three interviews per participant). Seventy-one percent (168 of 235) of the enrolled patients had at least two interviews, and the median follow-up for the group (including those with one interview) was 1 month and 6 days (range, 0 to 13 months). In addition to documenting information regarding their experience of chemotherapy from a review of their medical records, data were obtained regarding their definition of treatment success at each of the interviews. The investigators performed this investigation after appropriate approval by the UNMC and relevant local Human Investigations Committee for each participating center.

FIG 1. Participant Flow



Outcomes, measures, and data collection

The primary outcome was the patients' definition of what they believed constituted treatment success. Outcome data were collected by use of a questionnaire/script typically administered as an interview, although those who preferred to do so could write their answers directly on the questionnaire. Most chose to be interviewed. At each interview to define treatment success in their own words, patients were asked, "How would you define 'treatment success' of your chemotherapy?" They were also asked a question regarding their willingness to tolerate the chemotherapy adverse effects if it meant living longer. These questions were administered from one to three time points as appropriate to the patient's circumstances, with a maximum of before (interview 1), during (interview 2), and after (interview 3) chemotherapy. Interview 1 (pretreatment) was conducted before treatment had begun, ideally at enrollment when patients came for their clinic visit for planning chemotherapy. Interview 2 occurred between day 1 and day 3 of the second chemotherapy cycle (+3 day 1/day 1 was preferred). We preferred to interview patients on day 1 of the second chemotherapy cycle, but for practical purposes, we had a 3-day window period for the second interview. Interview 3 took place after completing the first line chemotherapy cycles, discontinuing chemotherapy for any reason, or going onto maintenance therapy. We considered interviews 2 and 3 as the after-treatment interview (interview 2 occurred after the completion of the first chemotherapy cycle and interview 3 occurred after completing all planned chemotherapy cycles).

Category themes that emerged from this cohort included: Living longer or survival alone (LL), improvement of quality of life (QoL) only without LL, and improvement of QoL and LL plus other responses related to personal goals that did not fall in the two major themes (+Other). An example of a +Other response was: "I want to live till the birthday of my grandson." All categories centered on survival (LL), improved QoL, and attainment of personal goals. The themes were used to define the definition of treatment success outcome variable. Data from patient-centered outcomes research in focus group sessions conducted in 2013[18,19] were used to identify thematic groups and to develop the interview scripts. Patients were asked open-ended questions to ascertain concordance, or lack thereof, with the thematic categories of this cohort. Two independent analysts analyzed data of the open-ended answers of this cohort study, and they placed the results into categories. The research team discussed and resolved any disagreement between the two analysts. Statistical

TABLE 1. Patient Characteristics at Baseline (N = 235)

VARIABLE	NO.	%
Age, years		
Mean, SD	68 (10)	
Range: minimum-maximum	39-92	
Age group, years		
≤ 60	51	21.7
61-70	85	36.2
≥ 70	99	42.1
Sex		
Male	130	55.3
Female	105	44.7
Race		
White	224	95.3
Black/African American	6	2.6
Other	5	2.1
Education		
Less than high school or high school diploma or GED degree	122	51.9
Some college or bachelor's or higher degree	107	45.5
Not reported	6	2.6
Employment		
Working	60	25.5
Not working	175	74.5
Marital status		
Married	145	61.7
Not married	89	37.9
Not reported	1	0.4
Income		
Annual income ≥ $45,000	68	28.9
Annual income ≤ $45,000	84	35.7
Not reported	83	35.3
Primary method of payment		
Private insurance	74	31.5
Medicare	121	51.5
Medicaid	22	9.4
Other	18	7.7
Urban/rural		
Urban	155	66.0
Rural	80	34.0
Severity index of comorbility,* mean ± SD	6.5 (± 4.1)	

Abbreviations: GED, General Educational Development; SD, standard deviation.
**Comorbidity scale based on Cumulative Illness Rating Scale for Geriatrics, adapted from Miller, Paradis, and Reynolds, 1991.*

TABLE 2. Patients' Definitions of Treatment Success and Changes Between Their First and Last Interview

VARIABLE	NO.	%
Treatment success definition at patient's first interview (n = 235)		
LL/survival alone	28	11.9
LL with other answers	142	60.4
QoL without LL	54	23.0
Undecided/unclear/NR	11	4.7
Selected only patients who had > 1 interview (n = 168)		
Treatment success definition at patient's last interview		
LL/survival alone	14	8.3
LL with other answers	102	60.7
QoL without LL	42	25.0
Undecided/unclear/NR	10	6.0
Changes in treatment success definition between first and last interviews		
Changed	79	47.0
No change	89	53.0

Abbreviations: LL, living longer; NR, not reported; QoL, quality of life.

analysis was performed after defining categories. Patient characteristics included socioeconomic and demographic characteristics, such as age, sex, race, education, employment, income, geographic location, and insurance coverage. Participants who had chemotherapy after enrolling in the study were considered as having had treatment experience. A proportional description of the outcome measure was used to identify factors associated with the change of the treatment success definition before and after treatment experience (eg, between the first and the last interview).

Proportional and odds changes in what constituted treatment success before the patient's first interview and after more chemotherapy at the patient's last interview were used to evaluate the hypothesis of a relationship between the patient's definitions and their characteristics and to examine the likelihood of change in the definition after additional chemotherapy. This was intended to reveal baseline characteristics that could be used to guide treatment decisions, anticipating changes in what constitutes treatment success.

Analytical and Statistical Approaches

Data were tabulated to describe the definition of treatment success according to categorical themes identified at the first and the last interviews (for those with more than one interview). Changes in treatment success definitions between the first and the last interviews were assessed by use of McNemar's test. The association between patient characteristics and the two main categorical themes at the first interview was assessed by use of bivariate (for each characteristic) x^2 and Fisher's exact tests. We also used multi-variate analyses on the basis of logistic regressions and odds ratios (ORs) with 95% CIs. The association between patient characteristics and the presence of changes in the definition of treatment success between first and last interviews was examined for patients by use of bivariate (for each characteristic) x^2 and Fisher's exact tests and multivariate analyses on the basis of logistic regression and ORs with 95%CIs. Missing variables were excluded rather imputed be-cause the missing values for variables were relatively few.

TABLE 3. Change in Treatment Success Definitions Between First and Last Interviews: LL *v* More Than Survival Alone (n = 152)

DEFINITION OF SUCCESS	LL	MORE THAN SURVIVAL ALONE (LL + other + QoL)	TOTAL	*P**
LL	4 (20.0%)	16 (80.0%)	20	.2393
LL + others + QoL	10 (7.6%)	122 (92.4%)	132	

*NOTE. Excludes answers of undecided/unclear/not reported. Abbreviations: LL, living longer; QoL, quality of life. *McNemar's test*

Results

Patients with advanced NSCLC (n = 292) were eligible for the study. Of these, 53 declined to participate, and four did not complete because they decided not to undergo chemotherapy or were too ill. A total of 235 patients were enrolled in the study (Fig 1).

The average age of patients was 68 years (standard deviation, ±10). Being mainly from the US Midwest, they reflected the general population in that they were predominantly white (95.3%) and more rural (34%) than other regions of the United States. A slightly higher pro-portion of males (55.3%) than females (44.7%) participated. Most were retired or unemployed (74.5%), and most were married (61.7%). Approximately half (51.5%) were Medicare beneficiaries, and one-third had private insurance (Table 1).

At their first interview, most patients defined treatment success as more than survival alone (60.4%). They wished to live longer with a good QoL and/or have time with family and friends and/or reach personal goals. Chemotherapy treatment success was defined by 23.0% as a good QoL. Fewer than 12.0% considered survival alone (LL) as their definition of chemotherapy treatment success. Proportional distribution of what constituted treatment success was similar at their first interview, with little or no chemotherapy, and, after they had more chemotherapy, their last interview (Table 2). However, approximately one-half (47.0%) of patients interviewed at least twice changed their definition between the first time they were interviewed (less exposure) and the last time they were interviewed (more exposure; Table 2).

Table 3 shows the direction of change in the definition of treatment success between the first and last interviews. Although the changes were not statistically significant, of those patients who at first interview defined treatment success as survival alone, 80% changed their definition to survival and improved QoL at their last interview. More than 90.0% of those who initially indicated both QoL and LL as constituting treatment success maintained that definition at their last interview (Table 3). Additional analysis suggested that, among patients who first gave survival alone as their definition of treatment success, 52.4% changed their definition to include LL plus other goals, and 23.8%changed to improved QoL only (not included in a table). These findings highlight the importance of QoL for patients before, during, and after chemotherapy, while not diminishing their desire to live longer.

Bivariate analyses of patient characteristics and their definition of treatment success at their first interview showed no statistically significant associations. However, patients who were younger than 60 years of age and who were not working defined treatment success as LL alone (both P = .13; Table 4). Multivariate analysis showed that female (OR, 1.51), age group 61 to 70 years (OR, 1.48), and married (OR, 1.58) patients are more likely to define treatment success as more than LL. However, the differences were not statistically significant (Table 5).

An assessment of the relationship between changes in the definition of what constituted treatment success after treatment and patient characteristics revealed that those patients earning an income less than $45,000 were more likely to change their definition of success after chemo-therapy (P = .02; Table 6). No other patients' characteristics were significantly associated with the change of treatment success definition after treatment experience. However, there was a nonsignificant association for those with less than a college degree and Medicare participants. Among the participants who changed the definition of treatment success, 60% had less than a college education (P = .14). More than half of the participants who changed their definition of treatment success were Medicare participants (Table 6). Multivariate analyses revealed no statistically significant associations between other patient characteristics and the likelihood to change their definition of treatment success. However, younger (age # 60 years) and nonwhite race participants were more prone to change the definition of treatment success (Table 7).

Discussion

The aim was to determine if patient characteristics and treatment experiences affect patients' definition of treatment success. Although clinicians and researchers often define treatment success in advanced-stage NSCLC as survival, two-thirds of patients defined treatment success as more than survival.

Socioeconomic and demographic factors that may be at play in any heterogeneity in the definition reveal no statistically significant variations. However, the trend of those who are younger and not in employment possibly having an inclination toward survival and males and those in marriage tending to a more-than-survival definition for success needs to be investigated further with a more heterogeneous study population than our relatively homogenous population.

TABLE 4. Treatment Success Definition at First Interview by Patients' Characteristics With Two Outcome Categories (n = 224)

VARIABLE	TREATEMENT SUCCESS DEFINITION AT FIRST INTERVIEW (n = 224) LL (n = 28)	LL WITH OTHER ANSWERS (n = 196)	*P*
Age group, years			.1300
≤ 60	10 (35.7)	38 (19.4)	
61-70	7 (25.0)	71 (36.2)	
> 70	11 (39.3)	87 (44.4)	
Sex			.3863
Male	18 (64.3)	109 (55.6)	
Female	10 (35.7)	87 (44.4)	
Race			.2249*
White	26 (92.9)	188 (95.9)	
Black/African American	0 (0.0)	5 (2.6)	
Other	2 (7.1)	3 (1.5)	
Education			.7818
Less than high school or high school diploma or GED degree	14 (51.8)	105 (54.7)	
Some college or bachelor's or higher degree	13 (48.1)	87 (45.3)	
Employment			.1339
Working	4 (14.3)	54 (27.6)	
Not working	24 (85.7)	142 (72.4)	
Marital status			.3328
Married	15 (53.6)	123 (63.1)	
Not married	13 (46.4)	72 (36.9)	
Income			.5588
Annual income ≥ $45,000	8 (53.3)	59 (445.4)	
Annual income ≤ $45,000	7 (46.7)	71 (54.6)	
Primary method of payment			.4761*
Private insurance	8 (28.6)	63 (32.1)	
Medicare	13 (46.4)	103 (52.6)	
Medicaid	3 (10.7)	17 (8.7)	
Others	4 (14.3)	13 (6.6)	
Urban/rural			.5586
Urban	17 (60.7)	130 (66.3)	
Rural	11 (39.3)	66 (33.7)	

NOTE. Excludes answers of undecided/unclear/not reported (n = 11). Data presented as No. (%). Abbreviations: GED, General Educational Development; LL, living longer.
**Fisher's exact test.*

A previous study of treatment success, on a different population, found no longitudinal change in patient-defined desired outcomes, success criteria, or expectations in out-patient physical therapy.[8] Neither this study nor the present investigation showed statistical significance related to the impact of time. The current results, relating to care and treatment of a fatal disease, emphasize the importance of QoL before and, even more, during after-treatment experience, without a reduction in the desire to live longer. The change of QoL was especially prominent among those at the lower end of the income and education spectrum and among those on Medicare or Medicaid. These factors merit additional investigation. There are limited longitudinal data on the impact of treatment on QoL among patients with NSCLC, and there are no data on the change of QoL before and after chemotherapy. There is a report, however, relating to longitudinal data from a palliative setting, of improvement of QoL among patients with NSCLC.[9] The present findings imply that an approach that is patient centered may need to involve patients—from diagnosis and onward—in developing their treatment plan and in defining what constitutes treatment success for them. This approach would include paying attention to individual patients and periodically re-evaluating their definition of success with changes made in their care and treatment. Additional study that enables a more robust set of analyses, including adjustment of real-life covariates, such as FACT-L scores for functional and physical well-being, the regimens patients received, the number of chemotherapy treatment cycles, and experience/distress with adverse effects, may reveal the degree to which ex-periences with chemotherapy interact with treatments and with personal factors, such as whether patients have children at home, influence outcomes, either positively or negatively. Exploration of patient-specific factors may show that these factors affect subsequent treatment decisions, which may in turn increase or decrease patients' tolerance levels, QoL, or other factors. Clinicians may benefit from this information in helping patients arrive at meaningful and well-informed treatment decisions. Patients' definitions of treatment success need to be investigated further with a larger sample from a more heterogeneous study population.

Our literature review showed that, to our knowledge, this is the first study describing the dynamics of patient-defined treatment success during chemotherapy. Our study results corroborate with findings from the

TABLE 5. Multivariate Analysis of the Association Between Patients' Characteristics and Treatment Success Definition at First Interview: Living Longer v More Than Survival Alone

VARIABLE	OR	95% CI
Sex		
Female	1.514	0.638 to 3.596
Male	Ref	
Age group, years		
≤ 60	0.468	0.177 to 1.235
61-70	1.481	0.515 to 4.261
> 70	Ref	
Education		
Less than high school or high school diploma or GED degree	Ref	
Some college or bachelor's or higher degree	0.848	0.359 to 2.001
Marital status		
Not married	Ref	
Married	1.586	0.677 to 3.716
Urban/rural		
Urban	Ref	
Rural	0.818	0.340 to 1.972

NOTE. Excludes missing values (n = 218). Variables in the model were selected based on expert opinion. OR for defining treatment success as more than survival alone by patients' characteristics (reference group: living longer/survival alone). Does not include race variable because the value of one cell (living longer) is zero for blacks and other races. Abbreviations: GED, General Educational Development; OR, odds ratio.

TABLE 6. Changes in Treatment Success Definition Between First and Last Interview by Patients' Characteristics for Patients Who Had More Than One Interview (n = 168)

VARIABLE	CHANGED (n = 79)	NO CHANGE (n = 89)	*P*
Age group, years			.5663
≤ 60	20 (25.3)	18 (20.2)	
61-70	27 (34.2)	37 (41.6)	
> 70	32 (40.5)	34 (38.2)	
Sex			.9036
Male	46 (58.2)	51 (57.3)	
Female	33 (41.8)	38 (42.7)	
Race			.4172*
White	74 (93.7)	87 (97.8)	
Black/African American	2 (2.5)	1 (1.1)	
Other	3 (3.8)	1 (1.1)	
Education †			.1445
Less than high school or high school diploma or GED degree	48 (60.8)	42 (49.4)	
Some college or bachelor's or higher degree	31 (39.2)	43 (50.6)	
Employment			.1579
Working	18 (22.8)	29 (32.6)	
Not working	61 (77.2)	60 (67.4)	
Marital status			.8965
Married	54 (68.4)	60 (67.4)	
Not married	25 (31.6)	29 (32.6)	
Income			.0245
Annual income ≥ $45,000	20 (35.1)	34 (55.7)	
Annual income ≤ $45,000	37 (64.9)	27 (44.3)	
Primary method of payment			.1288
Private insurance	22 (27.9)	39 (43.8)	
Medicare	40 (50.6)	35 (39.3)	
Medicaid	11 (13.9)	7 (7.9)	
Others	6 (7.6)	8 (9.0)	
Urban/rural			.7201
Urban	53 (67.1)	62 (69.7)	
Rural	26 (32.9)	27 (30.3)	

*NOTE. Data presented as No. (%). Abbreviation: GED, General Educational Development. *Fisher's exact test. †Excludes missing data (n = 4) for education and 50 patients who preferred not to report their income.*

TABLE 7. Multivariate Analysis of Changes in Treatment Success Definition by Patients' Characteristics

VARIABLE	OR	95% CI
Sex		
Female	1.053	0.545 to 2.036
Male	Ref	
Age group, years		
≤ 60	1.193	0.514 to 2.766
61-70	0.916	0.442 to 1.900
> 70	Ref	
Race		
Black/African American	2.668	0.220 to 32.420
Other	3.645	0.349 to 38.016
White	Ref	2.668
Education		
Less than high school or high school diploma or GED degree	Ref	
Some college or bachelor's or higher degree	0.595	0.303 to 1.165
Marital status		
Not married	Ref	
Married	1.010	0.513 to 1.989
Urban/rural		
Urban	Ref	
Rural	1.094	0.549 to 2.182

NOTE. Variables in the model were selected based on expert opinion. OR to have changed treatment success definition (reference = no change). Excludes missing values (n = 164). Abbreviations: GED, General Educational Development; OR, odds ratio.

previous studies[6-9,11,12] suggesting that many criteria need to be considered in making treatment decisions. A study using a discrete choice experiment showed that, from the patients' perspective, progression-free survival alone is not sufficient to serve as a basis for treatment decision making.[10] Findings from the current study can be adapted to other diseases, including cancers of other types as well as some chronic diseases.

The results reflect views of patients with NSCLC drawn from cancer centers in eight US Midwestern states and one in Florida, a predominantly white population. Although generalizability is limited, the lessons learned can be translated to the development, implementation, and dissemination of clinical studies to make them more patient-centered in care and treatment. Although there is potential for selection bias due to voluntary patient participation, the impact of this factor on the results is likely to be minimal, because more than 80% of the patients invited to participate accepted. Although we tested the validity of the items of the questionnaire in a limited scope, there is a need for additional validation of the questionnaire.

By taking chemotherapy, patients expect to increase their odds of survival and want to maintain the quality of life and functionality. However, a patient's definition of treatment success can be dynamic, changing as treatment continues, making it relevant to ensure patient-provider communication throughout their clinical care. A patient-centered approach would involve patients in developing treatment plans by defining what constitutes treatment success at the time of diagnosis and continuing by re-evaluating the patient's definition of success during treatment and possibly modifying care and treatment accordingly.

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References

1. Noone AM, Howlader N, Krapcho M, et al (eds): SEER Cancer Statistics Review, 1975-2015. Bethesda, MD, National Cancer Institute. https://seer.cancer.gov/csr/1975_2015/
2. American Cancer Society: Cancer Facts & Figures 2016. Atlanta, GA, American Cancer Society, 2016
3. Siegel RL, Miller KD, Jemal A: Cancer statistics, 2018. CA Cancer J Clin 68:7-30, 2018
4. Goodwin PJ, Shepherd FA: Economic issues in lung cancer: a review. J Clin Oncol 16:3900-3912, 1998
5. Kutikova L, Bowman L, Chang S, et al: The economic burden of lung cancer and the associated costs of treatment failure in the United States. Lung Cancer 50:143-154, 2005
6. Hotta K, Matsuo K, Ueoka H, et al: Meta-analysis of randomized clinical trials comparing cisplatin to carboplatin in patients with advanced non-small-cell lung cancer. J Clin Oncol 22:3852-3859, 2004
7. Ardizzoni A, Boni L, Tiseo M, et al: Cisplatin- versus carboplatin-based chemotherapy in first-line treatment of advanced non-small-cell lung cancer: An individual patient data meta-analysis. J Natl Cancer Inst 99:847-857, 2007
8. Scagliotti GV, De Marinis F, Rinaldi M, et al: Phase III randomized trial comparing three platinum-based doublets in advanced non–small-cell lung cancer. J Clin Oncol 20:4285-4291, 2002
9. Mok TS, Wu YL, Thongprasert S, et al: Gefitinib or carboplatin-paclitaxel in pulmonary adenocarcinoma. N Engl J Med 361:947-957, 2009
10. Maemondo M, Inoue A, Kobayashi K, et al: Gefitinib or chemotherapy for non-small-cell lung cancer with mutated EGFR. N Engl J Med 362:2380-2388, 2010
11. Temel JS, Greer JA, Muzikansky A, et al: Early palliative care for patients with metastatic non-small-cell lung cancer. N Engl J Med 363:733-742, 2010
12. Hurria A, Togawa K, Mohile SG, et al: Predicting chemotherapy toxicity in older adults with cancer: A prospective multicenter study. J Clin Oncol 29:3457-3465, 2011
13. Zeppieri G Jr, George SZ: Patient-defined desired outcome, success criteria, and expectation in outpatient physical therapy: A longitudinal assessment. Health Qual Life Outcomes 15:29, 2017

14. Thomas M, Spigel DR, Jotte RM, et al: nab-paclitaxel/carboplatin induction in squamous NSCLC: Longitudinal quality of life while on chemotherapy. Lung Cancer (Auckl) 8:207-216, 2017

15. M¨uhlbacher AC, Bethge S: Patients' preferences: A discrete-choice experiment for treatment of non-small-cell lung cancer. Eur J Health Econ 16:657-670, 2015

16. Blinman P, King M, Norman R, et al: Preferences for cancer treatments: An overview of methods and applications in oncology. Ann Oncol 23:1104-1110, 2012

17. Weeks JC, Catalano PJ, Cronin A, et al: Patients' expectations about effects of chemotherapy for advanced cancer. N Engl J Med 367:1616-1625, 2012

18. Islam KM, Opoku ST, Apenteng BA, et al: Engaging patients and caregivers in patient-centered outcomes research on advanced stage lung cancer: Insights from patients, caregivers, and providers. J Cancer Educ 29:796-801, 2014

19. Islam KM, Opoku ST, Apenteng BA, et al: Coping with an advanced stage lung cancer diagnosis: Patient, caregiver, and provider perspectives on the role of the health care system. J Cancer Educ 31:554-558, 2016

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Patient-Defined Treatment Success: Perspectives of Patients With Advanced-Stage Lung Cancer

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Patient Preferences of Chemotherapy Treatment Options and Tolerance of Chemotherapy Side Effects in Advanced Stage Lung Cancer

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Background

In the U.S., lung cancer accounts for 14% of cancer diagnoses and 28% of cancer deaths annually. Since no cure exists for advanced lung cancer, the main treatment goal is to prolong survival. Chemotherapy regimens produce side effects with different profiles. Coupling this with individual patient's preferred side effects could result in patient-centered choices leading to better treatment outcomes. There are apparently no previous studies of or tools for assessing and utilizing patient chemotherapy preferences in clinical settings.

The long-term goal of the study was to facilitate patients' treatment choices for advanced-stage lung cancer. A primary aim was to determine how preferences for chemotherapy side effects relate to chemotherapy choices.

Methods

An observational, longitudinal, open cohort study of patients with advanced-stage non-small cell lung cancer (NSCLC) was conducted. Data sources included patient medical records and from one to three interviews per subject. Data were analyzed using Chi-square, Fisher's Exact and McNamara's test, and logistic regression.

Results

Patients identified the top three chemotherapy side effects that they would most like to avoid: shortness of breath, bleeding, and fatigue. These side effects were similar between first and last interviews, although the rank order changed after patients experienced chemotherapy.

Conclusions

Patients ranked drug side effects that they would most like to avoid. Patient-centered clinical care and patient-centered outcomes research are feasible and may be enhanced by stakeholder commitment. The study results are limited to patients with advanced NSCLC. Most of the subjects were White, since patients were drawn from the U.S. Midwest, a predominantly White population.

Background

Lung cancer is the leading cause of cancer-related deaths in the United States (U.S.) [1]. In 2016, more than a quarter of a million new cases of lung cancer were reported [2]. In comparison to other cancers in the U.S., lung cancer, which has an average age at diagnosis of 70 years, is a major source of health care costs and utilization of health care services [3, 4]. The treatment options for non-small cell lung cancer (NSCLC) are based mainly on the stage of the cancer. Other factors, however, such as a person's health status, lung function, and characteristics of the cancer, are also considered. Treatment goals for NSCLC are to prolong survival and control disease-related symp-toms [5]. For patients who are not candidates for mo-lecularly targeted therapy, use of various platinum doublets have led to similar survival outcomes and are recommended by current National Comprehensive Cancer Network (NCCN) guidelines [6, 7]. Further-more, there are different toxicity profiles for the most commonly used chemotherapy drugs [8]. Therefore, toxicity profiles are involved in determining treatment choices, patient tolerability of chemotherapy, and treatment success [9]. Although most cancer patients prefer either an active or shared role in decision-making [10, 11], no definitive clinical guide on how to obtain and integrate their preferences of side effects in treatment decisions have been published, Moreover, most providers lack the tools, time, and re-sources to consider, efficiently and effectively, such patient-centered treatment plans [12]. The long-term goal of the present study was to deter-mine patients' chemotherapy treatment choices for advanced-stage lung cancer, utilizing their preferences of drug options before and after experiencing effects of treatment. An aim was to assess treatment choices of the patients based on their ranking of unwanted drug side effects. We were particularly interested in: (1) whether patients' characteristics are associated with the length of time they are willing to tolerate chemotherapy side effects to attain a personal goal; (2) whether the length of time patients are willing to tolerate chemotherapy side effects to attain a personal goal changes after receiving chemotherapy; (3) identifying the drug side effects (and

thus the drug profiles) that are least tolerable to patients; and (4) whether the ranking of drug profiles changes after patients receive chemotherapy.

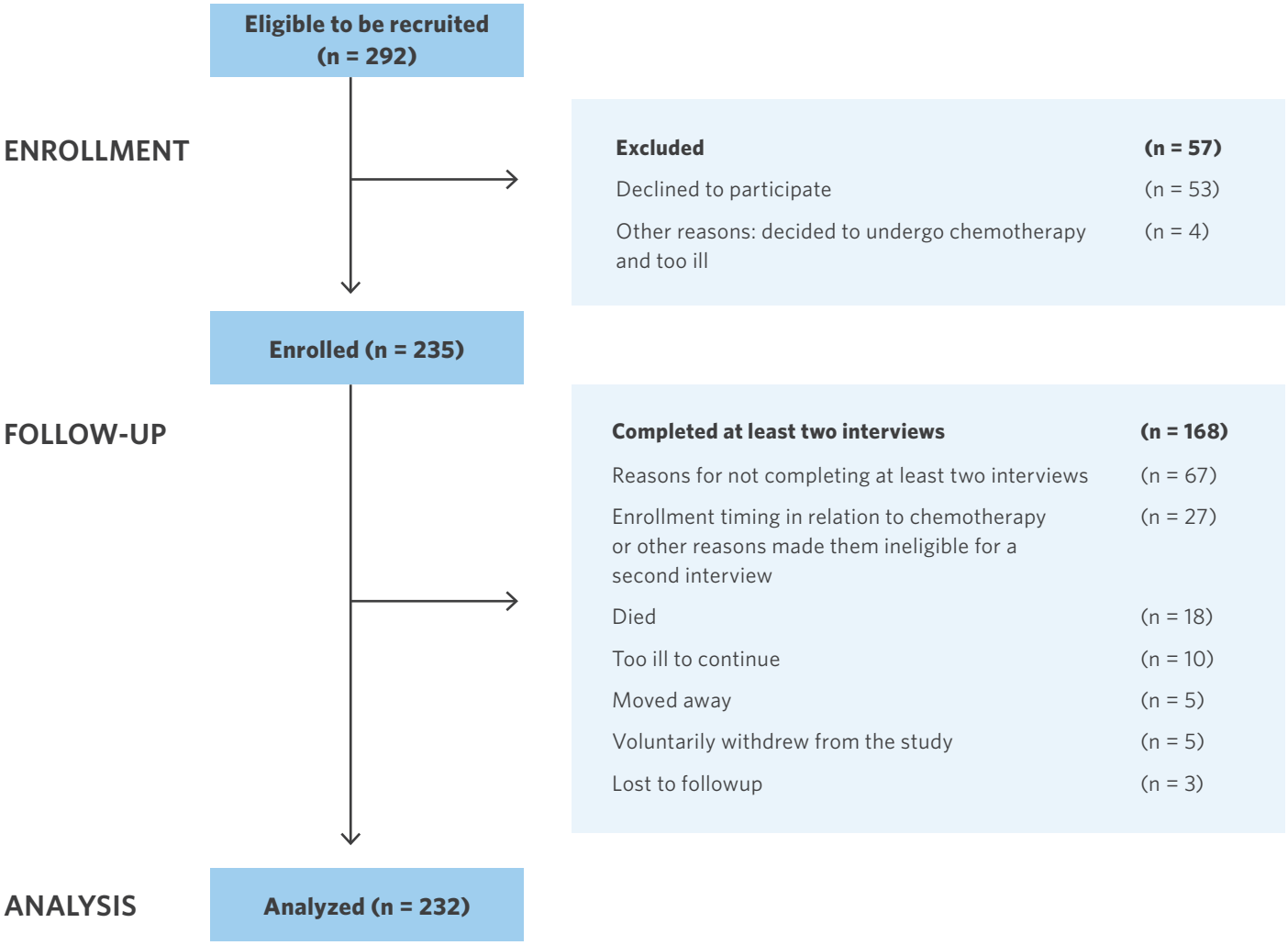
Methods

Patients

A prospective, open cohort study to assess treatment choices of patients based on their ranking of unwanted drug side effects was conducted. We recruited 235 adult patients (Fig. 1 shows the detail recruitment flow chart) with advanced non-small cell lung cancer (NSCLC) from nine cancer center sites located mainly in the U.S. Midwest between January 2014 and March 2016. Eligibility criteria included patients diagnosed with advanced stage (stage 3b and above) NSCLC, age 19 years or older with the ability to understand spoken English and willing and able to provide informed consent, and who were eligible to undergo chemotherapy for advanced stage NSCLC.

Participants were followed by site staff who collected medical record and interview questionnaire data before, during, and after first-line chemotherapy. Each participant had at least one interview, and 71% (168/235) had at least two interviews. The median follow-up of the entire group (including those with one interview) was 1 month and 6 days (Range 0–13 months). In addition to documenting the details of their chemotherapy treatment experience via reviews of medical records and personal interviews, preferences of patients and the ranking of side effects were sought during scripted interviews before and after chemotherapy. This information was used

FIG 1. Participant Flow



to identify the chemotherapy drugs that were likely to produce the side effects patients most wanted to avoid. A sample size of 210 patients at baseline will produce a 95% confidence interval equal to the sample proportion plus or minus 5% (PASS 2005; NCSS LLC; Kaysville, Utah). We assumed to 10–15% patient will miss the follow up interview for various reasons including death. To compensate the loss to follow up, we recruited 235 patient for this study.

Outcomes, measures, and data collection

Our primary aim was to determine how preferences for chemotherapy side effects relate to chemotherapy choices. Therefore, the outcomes included data regarding patient preferences and tolerance levels regarding chemotherapy treatment, specifically, the length of time they were willing to tolerate side effects, which side effects they would most like to avoid (which reveals which drug profiles are most and least tolerable), and whether or not preferences and tolerance levels change based on experience with chemotherapy. To measure the length of time that patients were willing to tolerate the side effects, they responded to a question with three categories of timelines related to length of tolerance (no time, less than 12 months, more than 12 months)as part of a questionnaire administered by an interviewer or completed by the subject (nearly all chose to be interviewed). Research staff conducted interviews or arranged for questionnaires to be completed before chemotherapy treatments began, after one or a few treatments had been administered, and/or nearing the end of first-line treatment as appropriate to the circumstances of the patients.

To rank the side effects, we generated an inventory based on those reported to be associated with chemotherapy and found on the http://www.uptodate.com website. From these data, we developed a table with the adverse events frequently reported for chemotherapy drugs commonly used for treating NSCLC. Four drugs were chosen because they were among the most-frequently administered drugs for advanced-stage NSCLC and because their adverse side effects profiles were different enough to distinguish them from others. We identified drugs that: (1) are typically used for first-line chemotherapy treatment of advanced stage NSCLC, (2) had discriminatory profiles for adverse side effects, and (3) had side effects that could be recognized by most patients. The four drugs that best fit these criteria re-quired the use of nine side effects to identify patient preferences and tolerance levels that could give the physician actionable information.

Based on our inventory of adverse side effects and profiles of the four drugs, we developed a survey tool, the 'Ranking Exercise,' to collect preferences of patients and their estimated tolerability levels of side effects they would most like to avoid (Table 1). The nine discriminatory side effects were, in alphabetical order: (1) excessive bleeding,(2) shortness of breath,(3) brittle nails, (4) dizziness, (5) considerably more expensive than other chemotherapy, (6) excessive fatigue,(7) numbness and/or tingling, (8) more trips to the clinic for chemotherapy, and (9) yellow skin/ jaundice. Recognizing that patients would like to avoid all adverse side effects of chemotherapy drugs, we asked them to tell us which ones they would most like to avoid. Participants rank-ordered side effects from one to nine, with those they would most like to avoid called, 'bad,' and given a number "1" (first rank) and those that they thought were most tolerable, 'least bad,' and given a number "9" (ninth rank), with the other seven side effects given ranking positions "2" through "8." Subjects indicated their preferences and tolerance levels for the nine discriminatory side effects.

TABLE 1. Ranking Exercise

POSSIBLE SIDE EFFECTS	RANK ORDER 1 TO 9 BAD TO LEAST BAD
A. brittle nails	A =
B. decreased energy (excessive fatigue)	B =
C. dizziness	C =
D. unusual/increased bleeding	D =
E. jaundice (yellow skin)	E =
F. more trips to clinic for treatment	F =
G. numbness and/or tingling	G =
H. shortness of breath	H =
I. a lot more expensive	I =

We linked the side effect that the patient indicated they would most like to avoid with the side effects pro-file of at least one drug. Since a side effect could be associated with more than one drug, and any drug might be associated with more than one side effect, we weighted the side effects based on the proportion of adverse side effects for each drug and prepared an algorithm that discriminated between the four chemotherapy drugs based on the ranking positions given by the patient and the types and frequencies of adverse side effects reported. Therefore, we could identify which drug(s) patients would most like to avoid and labeled these Drugs A, B, C, and D. Although this exercise can be accomplished with each of the other eight side effects for each patient, in this report, we concentrate on the simple

iteration that allowed us to link the top side effects that the patient would most like to avoid with the drug profiles that are most highly associated with the reported adverse effects, facts that can be ascertained by physicians and others in a clinical setting.

Analytical and statistical approaches

Data were tabulated to describe the proportional distribution of the 'length of time' outcome variable categorized as 'no time period,' a time less than 1 year ('months'), and time more than 1 year ('years'). In addition, we described proportions of drug side effects based on ranking by patients before and after chemotherapy and linked the drug that was connected to the least preferred side effect.

Chi-square or Fisher's exact test was used, as appropriate, to examine the association between each patient's characteristics and outcomes, separately. To meet the assumption of paired data, McNamara or Bowker's test was used to assess the discordance of individual patients' responses be-tween first and last interviews. Chi-square or Fisher's exact test was used to examine the association between patients' characteristics and the concordance between drugs to avoid and drugs to receive. The significance level for all analyses was set at p-value < 0.05. All statistical analyses were per-formed using the statistical software package SAS, version 9.4 (SAS Institute Inc., Cary, NC).

Per study protocol, we had planned to employ multiple imputation only if the missing data proportion was greater than 10%. Since the highest missing data proportion of variables used in our analysis was 7.8%, we analyzed the data by excluding missing values and did not use validated methods to deal with missing data because according to statistical standards, this low level of missing data is unlikely to impact data estimates negatively.

Results

None of the patient characteristics we tested showed statistical significance associated with the period that patients were willing to tolerate drug side effects. The results were consistent between the first and last interviews. Interviews that occurred at enrollment were termed 'before' or 'first interviews' and those that occurred after patients had more chemotherapy, were called, 'after' or 'last' interviews. Al-though not statistically significant, marital status showed a borderline association, n =232; p = 0.059 in the first inter-view, and n = 167; p = 0.078 in the last interview (Tables 2 and 3). A higher proportion of married patients were willing to tolerate chemotherapy for months or years relative to unmarried patients, who tended not to be willing to tolerate side effects of chemotherapy treatment for any period (not shown).

At enrollment, which was their first interview (n = 232), the proportion of patients who answered 'months' (41%) was similar to those who answered 'years' (43%); 16% were not willing to tolerate the side effects for any time period. After more experience with chemotherapy (n = 167), a higher proportion (50%) of patients indicated a tolerability for side effects for a shorter amount of time, as indicated by tolerance level responses of 'months' increasing to 50%, with a corresponding tolerability response of 'years' decreasing to 36%. About 48% of the patients (n = 167) changed their indication as to the length of tolerability of side effects between their first and last interviews (Table 4).

Comparison of changes between first and last interviews on side effect tolerance showed that a higher proportion of patients who had at least two interviews (n = 167), that is, who had more chemotherapy experience, shifted their tolerance level estimate from a longer to a shorter time period: 'years' to 'months,' versus those who changed from a shorter to a longer time period: 'months' to 'years.' Among those who initially answered 'years,' 36% changed their answer to 'months;' 24% who initially answered 'months' changed to 'years' (Table 5).

As described above, patients were asked to rank discriminatory side effects associated with four commonly used chemotherapy drugs in the treatment of advanced metastatic NSCLC. Side effects that patients said they would most like to avoid were called 'worst' or 'worst-ranked.' The top three side effects that subjects would most like to avoid, shortness of breath, bleeding, and fatigue, remained the same between first and last interviews, but the order changed to fatigue, shortness of breath, and bleeding (Table 6). The worst-ranked side effect for each individual was linked with one of four chemotherapy drugs commonly used for advanced NSCLC. Drugs A and B had side effect profiles that matched nearly one-third or more of the patient preferences and tolerance data regarding which side effects they would most like to avoid. This distribution of the drugs to avoid did not change between the first and last interviews (Table 7).

TABLE 2. Tolerance time at FIRST interview by patients' characteristics *(n=232)*[a]

VARIABLE	TOLERANCE TIME AT *FIRST* INTERVIEW (n = 232)[a] NO TIME PERIOD (n = 36) n (%)	MONTHS (n = 96) n (%)	YEARS (n = 100) n (%)	TOTAL n (%)	*P*-VALUE
Age group (years)					
≤ 60	9 (25.0)	20 (20.8)	22 (22.0)	51 (21.7)	.9788
61-70	12 (33.3)	37 (38.5)	36 (36.0)	85 (36.2)	
> 70	15 (41.7)	39 (40.6)	42 (42.0)	96 (41.4)	
Gender					
Male	24 (66.7)	55 (57.3)	50 (50.0)	129 (55.6)	0.2052
Female	12 (33.3)	41 (42.7)	50 (50.0)	103 (44.4)	
Race			.4172*		
White or Caucasion	33 (91.7)	93 (96.9)	95 (95.0)	221 (95.3)	0.5415**
Black/African American	2 (5.6)	2 (2.1)	2 (2.0)	6 (2.6)	
Other	1 (2.8)	1 (1.0)	3 (3.0)	5 (2.2)	
Education[a]			.1445		
Less than high school or high school diploma or GED degree	21 (61.8)	49 (51.6)	49 (50.5)	119 (52.7)	0.5081
Some college or bachelor's or higher degree	13 (38.2)	46 (48.4)	48 (49.5)	107 (47.3)	
Employment					
Working	10 (27.8)	25 (26.0)	25 (25.0)	60 (25.9)	0.9468
Not working	26 (72.2)	71 (74.0)	75 (75.0)	172 (74.1)	
Marital status					
Married	19 (52.8)	68 (71.6)	58 (58.0)	145 (62.8)	0.0588
Not married	17 (47.2)	27 (28.4)	42 (42.0)	86 (37.2)	
Income					
Annual income $45,000 or more	10 (41.7)	34 (50.0)	24 (40.0)	68 (44.7)	0.4971
Annual income less than $45,00	14 (58.3)	34 (50.0)	36 (60.0)	84 (55.3)	
Primary method of payment					
Private insurance	9 (25.0)	33 (34.4)	32 (32.0)	74 (31.9)	0.1993
Medicare	20 (55.6)	50 (52.1)	48 (48.0)	118 (50.9)	
Medicaid	3 (8.3)	11 (11.5)	8 (8.0)	22 (9.5)	
Others	4 (11.1)	2 (2.1)	12 (12.0)	18 (7.8)	
Urban/rural					
Urban	25 (69.4)	66 (68.8)	62 (62.0)	153 (65.9)	0.5418
Rural	11 (30.6)	30 (31.2)	38 (38.0)	79 (34.1)	

***Uses Fisher's Exact Test*

[a] Excludes cases where values were not reported (n=1, for Marital status; n=2 for Income)

TABLE 3. Tolerance time at LAST interview by patients' characteristics *(n=167)*[a]

VARIABLE	TOLERANCE TIME AT *LAST* INTERVIEW (n = 167)[a] NO TIME PERIOD (n = 23) n (%)	MONTHS (n = 84) n (%)	YEARS (n = 60) n (%)	*P*-VALUE
Age group (years)				
≤ 60	5 (21.7)	16 (19.0)	17 (28.3)	0.5219
61-70	7 (30.4)	33 (39.3)	24 (40.0)	
> 70	11 (47.8)	35 (41.7)	19 (31.7)	
Gender				
Male	14 (60.9	53 (63.1)	30 (50.0)	0.2794
Female	9 (39.1)	31 (36.9)	30 (50.0)	
Race				
White or Caucasion	21 (91.4)	81 (96.4)	58 (96.6)	0.6112**
Black/African American	1 (4.4)	1 (1.2)	1 (1.7)	
Other	1 (4.4)	2 (2.4)	1 (1.7)	
Education				
Less than high school or high school diploma or GED degree	15 (65.2)	47 (58.0)	27 (45.8)	0.1932
Some college or bachelor's or higher degree	13 (38.2)	8 (34.8)	32 (54.2)	
Employment				
Working	7 (30.4)	25 (29.8)	15 (25.0)	0.7939
Not working	16 (69.6)	59 (70.2)	45 (75.0)	
Marital status				
Married	12 (52.2)	63 (75.0)	38 (63.3)	0.0780
Not married	11 (47.8)	21 (25.0)	22 (36.7)	
Income				
Annual income $45,000 or more	6 (42.9)	32 (50.8)	16 (40.0)	0.5443
Annual income less than $45,00	8 (57.1)	31 (49.2)	24 (60.0)	
Primary method of payment				
Private insurance	8 (34.8)	31 (36.9)	22 (36.7)	0.6061
Medicare	13 (56.5)	37 (44.1)	24 (40.0)	
Medicaid	0 (0.0)	9 (10.7)	9 (15.0)	
Others	2 (8.7)	7 (8.3)	5 (8.3)	
Urban/rural				
Urban	15 (65.2)	59 (70.2)	40 (66.7)	0.8520
Rural	8 (34.8)	25 (29.8)	20 (33.3)	

***Uses Fisher's Exact Test*

[a] Excludes cases where values were not reported (n=1, for Marital status; n=2 for Income)

TABLE 4. Length of time patients willing to tolerate side effects

FIRST INTERVIEW	CATEGORY (n = 232)[a]	n (%)
Tolerance time	No time period	36 (15.5)
	Months	96 (41.4)
	Years	100 (43.1)
***LAST* INTERVIEW**	**CATEGORY (n = 167)[b]**	**n (%)**
Tolerance time	No time period	23 (13.8)
	Months	84 (50.3)
	Years	60 (35.9)
Change in tolerance time between FIRST and LAST interview	Yes	80 (47.9)
	No	87 (52.1)

[a] *Excludes missing values (n = 3)*
[b] *Excludes those who did not complete at least 2 interviews and 1 missing value*

Discussion

We utilized a multicenter, prospective, longitudinal, patient-centered research study to explore chemotherapy drug treatment choices for patients diagnosed with advanced NSCLC. To our knowledge, there have been no systematic studies that assess patient preferences in relation to chemotherapy drug treatment choices at the time of treatment planning or for monitoring patient-preference-based tolerance of chemotherapy for advanced-stage lung cancer.

Although there are reports on chemotherapy-related adverse side effects, treatment difficulties concerning side effects, and increased treatment cost due to management of side effects, there is apparently none that examined patients' preferences regarding chemotherapy-related side effects. When we assessed treatment choices of patients based on their ranking of unwanted drug side effects, the results revealed that patients who were married were more willing to tolerate treatment side effects for longer periods of time than those who were not married. Perhaps the willingness of married patients to tolerate these side effects is because they wish to avoid leaving a spouse alone in case of their demise. An alternative possibility relates to the support provided by a spouse. In either case, our findings indicate that familial factors and the involvement of a spouse in the development of a treatment plan may help in ensuring adherence to the plan and higher levels of tolerability of side effects.

Between the first and last interviews, about half of the participants changed their indication as to the length of tolerability of side effects, with a large pro-portion of them redefining their level of tolerance in months versus years. This emphasizes the importance of clinicians re-evaluating a treatment plan using a patient-centered approach throughout the course of the treatment. The top three side effects that patients would most like to avoid, shortness of breath, bleeding, and fatigue, remained stable between their first and last interview, after more experience with chemotherapy. However, fatigue was elevated in prominence, pushing shortness of breath and excessive bleeding to the number two and number three. One reason for these changes may have been the actual side effects experienced by the patients while going through chemotherapy. For instance, fatigue is a common side effect of cytotoxic chemotherapy. Hence, patients who experienced fatigue may have been more likely to want to avoid fatigue when questioned after their chemotherapy experience. Because fatigue is a subjective experience, patients who have not gone through chemotherapy treatment may not have clear idea about how troubling fatigue is. Strategies that monitor and try to control the effects of fatigue during chemotherapy appear to be warranted.

TABLE 5. Changes in tolerance between FIRST and LAST interview (*n = 167*)[a]

FIRST INTERVIEW	NO TIME PERIOD n = 23 (% OF 167)	MONTHS n = 84 (% OF 167)	YEARS n = 60 (% OF 167)	*P*-VALUE**
No time period	5 (20.0)	13 (52.0)	7 (28.0)	0.4751
Months	9 (12.5)	46 (63.9)	17 (23.6)	
Years	9 (12.9)	25 (35.7)	36 (51.4)	

** *Uses Bowker's Test*
[a] *Excludes 1 missing value*

Two of the four drugs included at least one-third of the side effects, showing that patients would most like to avoid using them if possible. Most of the patients did not receive those drugs whose side effects they were trying to avoid (table not shown). However, a higher proportion of patients with a risk profile indicative of poorer economic and social support (i.e., with no more than a high school education, single, on Medicaid, and living in rural areas) received drugs whose drug side effects they would rather have avoided. Whether or not this observation relates to their lower ability to bargain or to less effective provider-client communication is not clear; this point needs further investigation. The findings indicate a need for clinicians to be cognizant of this particular group and to be proactive in discussing their treatment plan and the options and possibilities that are available. For all patients, our findings are helpful in highlighting the importance of incorporating their views throughout treatment as a way of improving patient-clinician communication and implementing more patient-centeredness into clinical care. The results indicate that many patients could benefit from clinical care tailored to their characteristics and preferences.

In making treatment decisions, patients consider toxicity [13], as outlined by the National Cancer Institute [3]. When faced with two chemotherapy regimens with similar efficacy, most NSCLC patients are willing to consider their side effects [14]. The present study confirmed theimportance of toxicities in treatment planning, from the perspective of patients and oncologists, and indicated that the perception of patients about chemotherapy side effects changes over the course of treatment.

Previous studies of patients' preferences for chemotherapy for NSCLC found that baseline and treatment-related characteristics are not predictive of their individual preferences regarding chemotherapy, as has been suggested for other cancers [15]. The present study corroborated these findings in the case of NSCLC and indicated that age, gender, and marital status of patients influence their definition of treatment success. The results point to the need for patient-provider communication to allow decisions to be made that are congruent with and respectful of patient's values and circumstances.

There is limited research involving patients with advanced-stage lung cancer for examination of their involvement in making treatment decisions [16]. However, there is evidence that patients are confident in their role in clinical decision-making and that their confidence can be improved by involving them early in treatment planning [17]. Only half of cancer patients undergoing chemotherapy and/or radiation therapy perceive that they are offered treatment choices [18]. The present results show the feasibility, effectiveness, and importance of utilizing a patient-centered approach to engage patients by enrolling them in an study of something that affects them and to engage them in improving study design, execution, translation, and dissemination of the results.

TABLE 6. Proportion of patients ranked side effect that they would most like to avoid (*n = 168*)[a]

WORST-RANKED SIDE EFFECT	*FIRST* INTERVIEW (%)	*LAST* INTERVIEW (%)
Shortness of breath	28.7	20.8
Bleeding	20.9	14.3
Fatigue	11.9	25.6
Dizziness	10.8	10.7
A lot more expensive	8.4	9.5
Jaundice	8.4	7.7
More trips to clinic for treatment	7.2	7.1
Numbness/tingling	1.8	1.2
Brittle nails	1.8	2.9

[a] *Excludes those who did not complete at least 2 interviews*

TABLE 7. Comparison of drug to avoid based on match between drug's side effect profile and patients' ranking[a]

DRUG TO AVOID	*FIRST* INTERVIEW n = 167[b] (%)	*LAST* INTERVIEW n = 166[b] (%)
Drug A	56 (33.5)	42 (25.3)
Drug B	71 (42.5)	82 (49.4)
Drug C	26 (15.6)	25 (15.1)
Drug D	14 (8.4)	17 (10.2)

[a] *Excludes those who did not complete at least 2 interviews*
[b] *Excludes those who did not complete the Ranking Exercise section*

Preferences of patients for treatment reflect their values, their understanding of their illness, and their understanding of the risks and benefits associated with treatment choices. Their participation in treatment decision-making is more appropriate than giving them information and choices. We developed patient-centered tools for the clinicians (ranking exercise and distress scale) to identify patients' preferences for incorporation in the treatment plan. Our data and tools will help patients and their caregivers make informed treatment choices for the care of lung cancer. This research corroborates the statement by Barry and Edgman-Leviant that "shared decision-making is the pinnacle of patient-centered care" [19].

Although there is a potential for selection bias due to voluntary participation of the patients, its impact on the study is likely minimal since we recruited more than 80% of the patients invited to enroll. Thus, our results should be generalizable to advanced-stage lung cancer patients with characteristics similar to those in our study, which included mostly patients residing in the Midwestern area of the U.S. Another potential limitation is that this study was con-ducted before the approval of checkpoint inhibitors for first-line treatment of advanced NSCLC; however, the findings are still relevant for those patients who are not candidates for up-front immunotherapy.

The study findings can be used to improve patient care by enhancing physician-patient communication, screening patients for comorbidity, identifying patient preferences for chemotherapy side effects by using our patient-centered tools, monitoring and taking appropriate actions to ameliorate the effects of adverse side effects, and conducting further patient-centered clinical research. The study results, which support patient-centered cancer care, are available to clinicians and to patients and their caregivers. Further, the fact that the clinicians involved in our study were willing to incorporate patients' preferences into their treatment plan adds to the current knowledge base in how to improve patient-centered clinical care.

Conclusions

Our patient-centered outcomes study describes the feasibility of linking patient- supplied preference and tolerance levels information about side effects patients would most like to avoid with available drug choices and including this information in treatment planning and implementation. Conclusions of the study include that patients' characteristics were not significantly associated with the period that they were willing to tolerate chemotherapy drug side effects and that nearly half (48%) changed their indication as to the length of tolerating side effects between their first inter-view and their last interview. In addition, patients were willing and capable of ranking nine discriminatory drug side effects to identify which side effects they would most like to avoid. Thus, clinicians could use this information in creating and implementing a patient-informed plan for chemo-therapy treatment. We demonstrated how to link the patient-supplied preference information to specific profiles of commonly used chemotherapy drugs for the treatment of advanced-stage NSCLC. With the study results, clinicians may create and implement, and re-evaluate and ad-just, a more patient-centered treatment plan using patient-derived communication throughout the course of their clinical care.

Abbreviation

NSCLC: Non-small cell lung cancer

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Authors' contributions

KMI and CH developed the presented idea, design, and implemented the study. KMI supervised the project and led the writing of the final version of the manuscript. KMI and AF developed and reviewed the analytical methods. KMI, TA, PED, JER, AF, DB, MSC, AT, IV, HAM, SD, JEG, CH patients' recruitment, informed consents, data collection, and reviewed the manuscript. TA, PED, JER, AF data collection, entry, management, and quality control, preliminary analysis, interpretation, and drafted the manuscript. JER coordinated the data collection and project activities under the supervision of KMI. PED, JER edited the paper for English grammar and writing. KMI, TA, PED, JER, AF, DB, MSC, AT, IV, HAM, SD, JEG, CH critically revised the article and provided final approval. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets generated and/or analyzed during the

current study are not publicly available due patients' confidentiality but are available from the corresponding author on reasonable request.

Ethics approval and consent to participate
The study was approved by the Institutional Review Board of UNMC with IRB # 318-13-EP. All participants provided written informed consent.

Consent for publication
Study participants signed informed consent to publish the results in peer review journal. The team has also consent to publish study findings.

Competing interests
The authors declare that they have no competing interests.

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References

1. Howlader N, Noone AM, Krapcho M, Miller D, Bishop K, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER cancer statistics review, 1975–2013, National Cancer Institute. Bethesda, https://seer.cancer.gov/csr/1975_2013/, based on November 2015 SEER data submission, posted to the SEER web site, April 2016.
2. American Cancer Society. Cancer facts & figures 2016. Atlanta: American Cancer Society; 2016.
3. Goodwin PJ, Shepherd FA. Economic issues in lung cancer: a review. J Clin Oncol. 1998;16(12):3900–12.
4. Kutikova L, Bowman L, Chang S, Long SR, Obasaju C, Crown WH. The economic burden of lung cancer and the associated costs of treatment failure in the United States. Lung Cancer. 2005;50(2):143–54.
5. American Cancer Society. Treatment choices for non-small cell lung cancer, by stage, 2017. Atlanta: American Cancer Society. https://www.cancer.org/cancer/non-small-cell-lung-cancer/treating/by-stage.html. Accessed 7 Nov 2017
6. Schiller JH, Harrington D, Belani CP, Langer C, Sandler A, Krook J, Zhu J, Johnson DH, Eastern Cooperative Oncology Group. Comparison of four chemotherapy regimens for advanced non-small-cell lung cancer. N Engl J Med. 2002;346(2):92–8.
7. National Comprehensive Cancer Network. https://www.nccn.org/store/login/login.aspx?ReturnURL=https://www.nccn.org/professionals/physician_ gls/pdf/nscl.pdf. Accessed 19 Feb 2018.
8. Maher AR, Miake-Lye IM, Beroes JM, Shekelle PG. Treatment of metastatic non-small cell lung cancer: a systematic review of comparative effectiveness and cost-effectiveness. VA-ESP Project #05-226; 2012.
9. American Cancer Society: Cancer treatment and survivorship facts & figures 2014–2015. Atlanta: American Cancer Society. https://www.cancer.org/research/cancer-facts-statistics/survivor-facts-figures.html. Accessed 26 June 2018.
10. Dubey S, Brown RL, Esmond SL, Bowers BJ, Healy JM, Schiller JH. Patient preferences in choosing chemotherapy regimens for advanced non-small cell lung cancer. J Support Oncol. 2005;3(2):149–54.
11. Bruera E, Willey JS, Palmer JL, Rosales M. Treatment decisions for breast carcinoma: patient preferences and physician perceptions. Cancer. 2002; 94(7):2076–80.
12. Balogh EP, Ganz PA, Murphy SB, Nass SJ, Ferrell BR, Stovall E. Patient-centered cancer treatment planning: improving the quality of oncology care. Summary of an Institute of Medicine workshop. Oncologist. 2011;16(12):1800–5.

13. Coulter A, Elwyn G. What do patients want from high-quality general practice and how do we involve them in improvement? Br J Gen Pract. 2002;52(Suppl):S22–6.

14. National Cancer Institute. SEER data, 1973-2008. (2010, May 5). Available from: http://seer.cancer.gov/data/.

15. Choy ET, Chiu A, Butow P, Young J, Spillane A. A pilot study to evaluate the impact of involving breast cancer patients in the multidisciplinary discussion of their disease and treatment plan. Breast. 2007;16(2):178–89.

16. Burton D, Blundell N, Jones M, Fraser A, Elwyn G. Shared decision-making in cardiology: do patients want it and do doctors provide it? Patient Educ Couns. 2010;80(2):173–9.

17. Stacey D, Paquet L, Samant R. Exploring cancer treatment decision-making by patients: a descriptive study. Curr Oncol. 2010;17(4):85–93.

18. Cassileth BR, Soloway MS, Vogelzang NJ, Schellhammer PS, Seidmon EJ, Hait HI, Kennealey GT. Patients' choice of treatment in stage D prostate cancer. Urology. 1989;33(5 Suppl):57–62.

19. Forrow L, Wartman SA, Brock DW. Science, ethics, and the making of clinical decisions. Implications for risk factor intervention. JAMA. 1988;259(21):3161–7.

Medical, Financial and Insurance Related Concerns of Metastatic Breast Cancer Patients

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Background

The medical, financial and insurance concerns of patients throughout the cancer trajectory are well documented. Over a quarter of patients report at least one financial problem. Due to the financial burden of cancer care, patients report that they delay filling prescriptions, have difficulty making ends meet, are concerned about their household's financial situation and skip doses of medication. These are significant findings as consistent use of medication is necessary for treatment and those with increased financial problems also have lower scores on physical and mental health quality of life measures. While most providers agree that the burden of metastatic breast cancer (MBC) is also significant, little information is known about the specific medical, financial and insurance needs of those with MBC.

Methods

Saint Luke's Cancer Institute (SLCI) employs providers in the fields of medical and surgical oncology, gynecologic oncology, hematology and radiation oncology who subspecialize in every type of cancer. In October of 2016, the Koontz Center for Advanced Breast Cancer was established within the Saint Luke's Cancer Institute. This center focuses exclusively on patients with MBC with a dual focus of improving outcomes and quality of life of those with MBC. In addition to a robust therapeutic research program, genomics, and immunotherapy, a comprehensive supportive/integrative team, including social worker, is imbedded in the center. Social workers see patients throughout the entirety of SLCI and the Koontz Center for Advanced Breast Cancer. As part of their interactions with patients, social workers document the date of intervention, patients' name, concern addressed, and length of every interaction. The following data compares the reported needs of those with MBC in the Koontz Center for Advanced Breast Cancer to the non-MBC patients within the SLCI population from September 1st of 2017 to August 31st of 2018.

Results

In total, there were 2,072 interactions with non-MBC patients during this period. The top three reported concerns were medication assistance (n=335, 16.15%), being uninsured (n=298, 14.37%) and transportation (n=284, 13.69%). For those with MBC, there were a total of 476 interactions within the same time frame and the top three reported concerns were medication assistance (n=166, 34.87%), insurance issues (n=75, 15.76%) and financial distress (n=66, 13.87%). Forty-four percent of non-MBC patients have repeat appointments and meet with social work on average 5 times. Of MBC patients, 39.32% have repeat appointments and meet with social work on average 7 times.

Conclusion

Results indicate differences and similarities for MBC patients compared to non-MBC patients. This could be explained by the fact that both populations share several concerns such as financial barriers to medications, high insurance premiums and decreased ability to work. However, due to the nature of MBC, patients with MBC often deal with these concerns for longer periods of time and are often required to utilize expensive specialty medication. The top three concerns of MBC patients including medication assistance, insurance issues, and financial distress, are closely related to one another as it relates to gaps in healthcare coverage. The high cost of treatment for advanced disease, coupled with the specific and unique needs of those living with MBC, can directly impact patients' ability to access necessary care. These potential causes, as well as how the Koontz Center for Advanced Breast Cancer works to mitigate these issues, will be addressed in further detail.

Additional Research

Publications

Sperry BW, Saeed IM, **Raza S**, Kennedy KF, Hanna M, Spertus JA. Increasing Rate of Hospital Admissions in Patients With Amyloidosis (from the National Inpatient Sample).Am J Cardiol. 2019 Dec 1;124(11):1765-1769. PMID: 316073

Asif S, Fatima R, Krc R, Bennett J, **Raza S.** Comparative proteogenomic characterization of glioblastoma. CNS Oncol. 2019 Jun;8(2):CNS37. PMID:31290679

Asif S, Begemann M, **Raza S.** Polycythemia in Patients With Hereditary Hemochromatosis: Real or Myth? J Clin Med Res. 2019 Jun;11(6):422-427. PMID: 31143309

Asif S, Begemann M, Bennett J, Fatima R, **Masood A**, **Raza S.** Pembrolizumab in newly diagnosed EBV-negative extranodal natural killer/T-cell lymphoma: A case report. Mol Clin Oncol. 2019 Mar;10(3):397-400. PMID: 30847181

Kaur A, Jacobs M, **Raza S.** Characteristics of Sweet's syndrome associated with novel acute myeloid leukemia targeted drugs—Midostaurin and Enasidenib. Advances in Cell and Gene Therapy. 0.1007/s40278-019-71638-7, 1780, 1, (147-147), (2019). https://doi.org/10.1002/acg2.61

Talal Asif, Samia Asif and **Shahzad Raza** INCREASED RISK OF CARDIAC ALLOGRAFT REJECTION WITH NEW CHEMOTHERAPEUTIC REGIMENS: A CALL FOR CAUTION. Journal of the American College of CardiologyDOI: 10.1016/S0735-1097(19)33197-3

Asif S, **Raza S.** Long-term time trends in incidence, survival and mortality of Hodgkin lymphoma in the United States: A surveillance, epidemiology, and end results (SEER) database study 1975-2015. American Society of Clinical Oncology Abstract e19014

Mateos MV,.., KEYNOTE-183 Investigators et al. Pembrolizumab plus pomalidomide and dexamethasone for patients with relapsed or refractory multiple myeloma (KEYNOTE-183): a randomised, open-label, phase 3 trial. Lancet Haematol. 2019 Sep;6(9):e459-e469. PMID: 31327687

Cathcart-Rake EJ, O'Connor JM, Ridgeway JL, Radecki Breitkopf C, McGuire L, Olson EA, Kaur JS, Jatoi A. Querying cancer patients about sexual health and sexual and gender minority status: A qualitative study of healthcare providers. American Journal of Hospice and Palliative Care. 2019 Oct [epub ahead of print].

*Zayas J, Ruddy K, Loprinzi CL, **Cathcart-Rake EJ**. Acupuncture among breast cancer patients: a cross-sectional survey study. Journal of Supportive Care in Cancer, revisions requested submitted for review Nov 2019.

Cathcart-Rake EJ, O'Connor JM, Jacobson A, McGuire L, Jatoi A. How (and why) to ask the older cancer patient about sexual health and sexual minority status. Journal of Geriatric Oncology 2019 Aug 22 [Epub ahead of print].

Gast KC, **Cathcart-Rake EJ**, Norman A, et al. Accuracy of self-reported cancer treatment data in young breast cancer survivors. J Patient Rep Outcomes, 2019 May 1;3(1):24.

Cathcart-Rake EJ, Radecki Breitkopf C, Kaur J, O' Connor J, Ridgeway JL, Jatoi A.. Teaching healthcare providers to query cancer patients about sexual and gender minority status and sexual health. American Journal of Hospice and Palliative Medicine, 2019 Jun;36(6):533-537.

Cathcart-Rake EJ, Zemla T, Jatoi A, Weaver KE, Neuman H, Kazak AE, Carlos R, Gansauer L, Unger JM, Pajewski NM, Kamen C. Acquisition of Sexual Orientation and Gender Identity (SOGI) Data Among NCI Community Oncology Research Program (NCORP) Practice Groups. Cancer, 2019 Apr 15;125(8):1313-1318.

Cathcart-Rake EJ, Ruddy KJ, Gupta R, Kremers W, Gast K, Su HI, Partridge AH, Steward EA, Liu H, He Y, Yang P. Amenorrhea after lung cancer treatment. Menopause 2019 Mar;26(3):306-310.

Cathcart-Rake E, Gast KC, Ruddy KJ. What can we learn from menstrual patterns after treatment for HER2-positive breast cancer? J Natl Cancer Inst. 2019 Jan 1;111(1):9-10.

Faruqi F, **Cathcart-Rake E**, Ruddy KJ. We need to educate young lung cancer patients about menopause risk. Lung Cancer Manag. 2019 Feb 12;8(1):LMT08.

Alliance Cancer in the Older Adult Committee, Adjei A, Buckner JC, **Cathcart-Rake E**, et al. Arti Hurria, M.D.: A tribute to her shining legacy in the Alliance for Clinical Trials in oncology. J Geriatr Oncol. 2019 Jun 11. [Epub ahead of print].

Leventakos K, Schwecke AJ, Deering E, **Cathcart-Rake E**, Sanh AC, Jatoi A. The need to prioritize and re-prioritize palliative care options: Smoking cessation as a case-in-point. Curr Treat Options Oncol. 2019 Mar 22;20(4):33.

Higgins A, Khan Z, Coddington CC, Hashmi SK, Hefazi M, Alkhateeb H, Litzow MR, Hogan WJ, **Cathcart-Rake E**, Thompson CA, Patnaik MM. Utilization and outcomes of fertility preservation techniques in women undergoing allogeneic hematopoietic cell transplant. Biol Blood Marrow Transplant. 2019 Jun;25(6):1232-1239.

Vairo FPE, Ferrer A, **Cathcart-Rake E**, King RL, Howard MT, Viswanatha DS, Klee EW, Mangaonkar AA, Patnaik MM. Novel germline missense DDX41 variant in a patient with an adult-onset myeloid neoplasm with excess blasts without dysplasia. Leuk Lymphoma. 2019 May;60(5):1337-1339.

LOCATIONS

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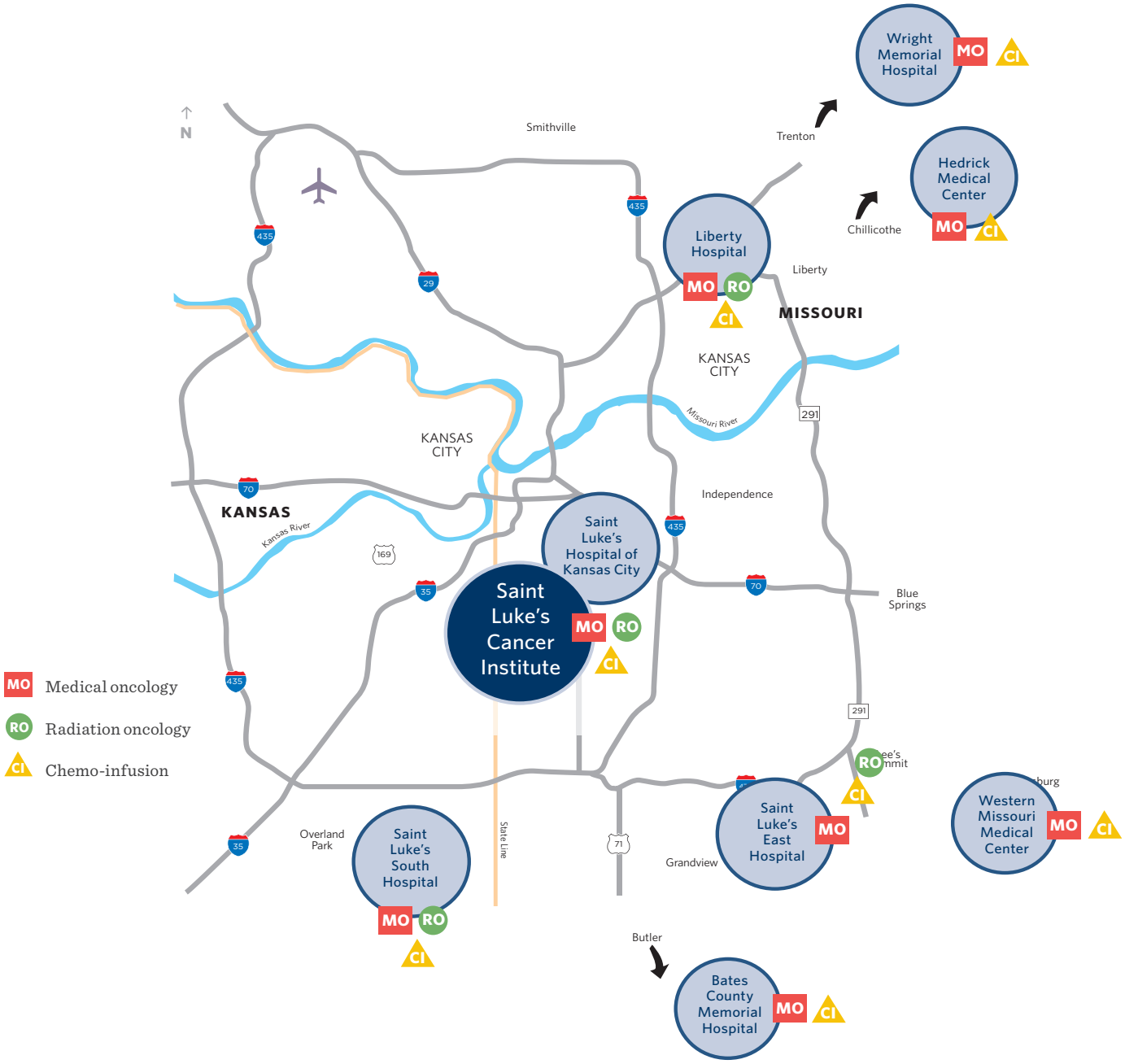

Our Locations

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Lee's Summit, MO 64086

Bates County Memorial Hospital
615 W. Nursery St.
Butler, MO 64730

Hedrick Medical Center
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