AN OVERALL REPORT ON THE STATUS OF
COMMUNITY MEDICAL CENTERS’
CANCER PROGRAM WITH A SPECIAL
EMPHASIS ON LUNG CANCER
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2016 CANCER COMMITTEE

Haifa Abdulhaq, MD
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Community Regional Medical Center

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Cancer Registry Supervisor, Cancer Services, Community Regional Medical Center

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Director, Palliative Care, 
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Director, Palliative Care, Community Regional Medical Center

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Nurse Coordinator, 
Marjorie E. Radin Breast Care Center, Clovis Community Medical Center

Kathleen Norkunas, RN, BSN, OCN
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Vice President, Cancer Services

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Louis Triana
Business Development, Community Regional Medical Center

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Medical Director, Lung Program, Community Regional Medical Center

Jeff Zweifel, RN
Inpatient Oncology Manager, Clovis Community Medical Center
The Community Medical Centers’ (CMC) Cancer Committee is pleased to introduce its 2016 Annual Report. For several decades, CMC’s Cancer Program has been accredited by the American College of Surgeons – Commission on Cancer (ACoS-CoC). During this time, many achievements have been made possible through the work of a multidisciplinary team and continue today. This year’s report has a special emphasis on our lung cancer program as well as outcomes on ACoS-CoC standards, with the ultimate goal of providing exceptional patient care in an environment that fosters collegiality and excellence. The energy, passion, and determination of our team members are what continue to drive CMC’s Cancer Services program with continuous improvement towards building a world-class cancer care program.

Throughout 2016, CMC’s Leadership and Cancer Committee worked in collaboration with key staff and physicians to focus on several key initiatives including the following:

• Securing $68 million in funding for construction and development of a 100,000-square-foot outpatient cancer facility
• Expanding our survivorship program across disciplines
• Launching disease site specific workgroups for gynecology and neuro-oncology
• Developing and initiating a lung-cancer screening program
• Establishing a Patient Experience Council at the California Cancer Center
• Integrating the Oncology Care Model into our program

Looking ahead, we have established lofty goals to include the ongoing construction and completion of a 100,000-square-foot outpatient cancer facility; transformation of the patient experience workflow; enhancement and transition of the clinical trials program to University of California, San Francisco (UCSF); integration of physician specialty groups under one roof and ongoing development of an infrastructure to support quality and business functions for our growing program. Ultimately, our vision is to become an NCI-Designated Cancer Center and a program that is able to transform the way we deliver cancer care to our community and the entire Central Valley of California.

While our achievements are too many to name, our Cancer Committee acknowledges the valuable contributions of our medical staff and are grateful for their dedication towards the ongoing development and success of our program both now and in the years ahead. I also want to especially thank Dr. Babak “Bobby” Eghbalieh who willingly stepped up to serve as our Interim Cancer Committee Chair in addition to serving as the Clinical Liaison Physician, and Drs. Daya Upadhyay and Patrick MacMillian for their contributions to this report on lung cancer and palliative care, respectively.

As always, I look forward to the accomplishments to come and presenting our achievements in the 2017 Cancer Committee Annual Report.

Paul Ortiz, MS, FACHE
Vice President, Cancer Services
Community Medical Centers
Dear Colleagues,

It is my distinct privilege and honor to report on the status of Community Medical Centers’ Cancer Program and introduce the Cancer Committee’s 2016 Annual Report. The annual report provides an opportunity to reflect on the programmatic achievements and collaboration of teams across our organization. Since 2009, I have served as the Community Medical Centers Cancer Liaison Physician (CLP) to the American College of Surgeons Commission on Cancer, and this past year as the interim Chair of the Cancer Committee. Our program has continued to have steady and exciting growth over this last year. We are proud to continue our legacy and dedication to cancer services as a fully accredited American College of Surgeons Commission on Cancer (ACoS-CoC) program since the 1970s. We received ACoS-CoC accreditation on our 2014 survey and are taking the necessary steps to be ready for next one in 2017. This great achievement has placed us among the top cancer programs in the country. I am extremely proud and grateful to each and every committee member who contributed to the effort, which resulted in re-accreditation with multiple commendations!

Over the last year, we have continued our commitment to excellence by working across the entire system to not only meet the new standards as required by ACoS, but to exceed them on many fronts. Community Medical Centers has taken on this challenge and has committed to creating a robust cancer system of care for our community. This past year, we created and developed various committees, as well as restructured our cancer care infrastructure across the system. A Vice President of Cancer position was created to oversee this growth and development. I have had the esteemed pleasure to work with Paul Ortiz, who has gone above and beyond to fulfill his role in this position. Under his leadership and guidance we have made significant improvements across the system.

The Oncology Advisory Council (OAC) has been meeting regularly in pursuit of our continued growth to create a cohesive and comprehensive cancer program across the system. The OAC committee is made of both key physician champions as well as CMC administration to further align this vision. Our 2016 CMC community needs assessment shed further light on areas of specific challenges and needs in the Central Valley relating to cancer.

It is with great pride to recognize that our commitment to improve the Central Valley’s cancer care has lead us to spearhead, influence and increase recruitment of medical as well as surgical oncology specialists to the area, where we were once lacking. Furthermore, we have had significant growth and development in the following areas: multidisciplinary tumor boards, cancer-specific nurse navigators, survivorship program, inpatient and outpatient palliative care services, cancer nutrition services, rehabilitation services, cancer genetics, individualized tumor-genetics pathology-driven treatments, community needs assessment and finally a dedicated oncology electronic medical records program.

This year’s report has a special emphasis on lung cancer and palliative care. It is truly exciting to be part of this great achievement for Community Medical Centers. Cancer care in our system has undergone spectacular growth and development in a short period of time, one that has truly put us on the map.

On behalf of the Cancer Committee, I wish to thank all who contributed to this report. Their commitment and hard work has resulted in the program’s continued growth and success, and I look forward to this coming year’s achievements.

Babak (Bobby) Eghbalieh, MD, FACS
Cancer Committee Chairman
Cancer Liaison Physician, American College of Surgeons, Commission on Cancer
Community Medical Centers
CANCER SERVICES

CANCER COMMITTEE

A successful cancer program depends on the effective leadership of a quality cancer committee. Responsibility for goal setting, planning, initiating, implementing, evaluating and improving cancer-related activities for patient care lies in the hands of the facility’s capable leadership. Composed of dedicated and caring professionals, Community’s Cancer Committee is multidisciplinary and represents the full scope of cancer care for our patients. Physicians representing each of the diagnostic and treatment services, along with non-physician representatives from administrative, clinical, and supportive services, round out the leadership team, overseeing care to patients in four facilities: Community Regional Medical Center (CRMC), Clovis Community Medical Center (CCMC), Fresno Heart & Surgical Hospital (FHSN) and the California Cancer Center. In addition to providing direction for cancer program activities, the Cancer Committee also sets annual goals for clinical practice, community outreach, programmatic endeavors and quality improvements.

AMERICAN COLLEGE OF SURGEONS (ACoS) ACCREDITATION

Community’s Cancer Program, which includes all of its facilities, has been accredited by the American College of Surgeons (ACoS) since 1977. The Commission on Cancer Accreditation (CoC) program focuses on quality of care via performance metrics and quality improvement, ensuring patient-centered care. The CoC encourages hospitals, treatment centers and other facilities to demonstrate commitment to quality of care for their patients. The CoC accreditation is nationally recognized by organizations such as The Joint Commission, American Cancer Society, Aetna, CMS, NQF and National Cancer Institute as having established performance measures for the provision of high-quality cancer care. CMC achieved the Teaching Hospital Accreditation in 1999 and we achieved our last accreditation in 2014.

ONCOLOGY SUPPORT SERVICES

Community’s Oncology Support Services continues to reach more patients using a transdisciplinary approach to address the multidimensional factors associated with a cancer diagnosis. The Compass Cancer Care program offers outpatient oncology support services that include oncology nurse navigation, oncology social work, speech language pathology and nutritional support at a single appointment. These services are a subspecialty of care integrated at diagnosis to improve adherence to treatment, increase patient and provider satisfaction, and enhance quality of life while streamlining overall disease management. Oncology support services infrastructure is being optimized in an effort to better meet the needs of cancer patients as CMC embarks on the development of a comprehensive cancer program. This optimization will allow Community to maintain its advantage in a competitive and evolving market by ensuring accreditation with the CoC, as well as helping to meet the requirements of CMS’ new Oncology Care Model. As we continue to build our support services infrastructure, this will allow oncology support services to expand across CMC to provide quality support services to a greater number of oncology patients and their families. The addition of new navigation and support services staff has increased the number of patients benefiting from navigation services and survivorship education and support. We are confident that the new cancer center will enhance multidisciplinary collaboration and coordination of care for patients under one roof.

RADIATION ONCOLOGY

The California Cancer Center offers the latest in radiation therapy technology providing our patients state-of-the-art radiation therapy. At California Cancer Center, two modern Linear Accelerators provide clinicians with the most advanced tools for image guided-radiation therapy
(IGRT), intensity modulation radiation therapy (IMRT) and volumetric modulated arc therapy (VMAT), ensuring our patients have the best available treatment delivered in a comfortable environment. The pre-treatment planning process is supported by a large bore CT scanner dedicated to radiation therapy utilization only. Our clinicians use treatment planning systems to customize optimal treatments for each patient that not only uses the most current technology, but also considers past doses of radiation that a patient may have received; a scenario that is increasingly common as patients survive longer.

The Charles and Anne Matoian Oncology unit located at Community Regional has a CyberKnife stereotactic radiation therapy system. The Radiation Oncology department has been at the forefront of Stereotactic Radio Surgery (SRS) for two decades, initially utilizing a modified conventional Linear Accelerator platform prior to migrating all SRS services to the most advanced system available — CyberKnife. CyberKnife is the only robotic radiation therapy system in existence that is dedicated to stereotactic radiation therapy delivery. The CyberKnife is the only system that tracks target movement during treatment delivery, target adjusting in real time as needed, so that submillimeter treatment accuracy is assured, all done without the need for invasive head/body frames associated with other systems. The two decades of continuous clinical experience utilizing dedicated SRS systems places CMC as the local leader and provider of choice for complex SRS services.

The Radiation Oncology department also provides brachytherapy services (insertions of radioactive sources directly into the tissue) for prostate, breast and gynecological sites.

Our radiation oncology team has worked proactively in 2016 to ensure that all patients referred can see a radiation oncologist within five business days. By the end of 2016 performance tracking data demonstrated that the average wait time for an appointment post referral was three days.

The following list of advanced radiation therapy treatments are available through the Radiation Oncology department:

- Stereotactic Radio Surgery
- Stereotactic Body Radiation Therapy
- Image-Guided Radiation Therapy
- Volumetric Modulated Radiation Therapy
- Intensity Modulated Radiation Therapy
- 3D Conformal Radiation Therapy
- Brachytherapy
CANCER REGISTRY

The Cancer Registry at CMC was established in 1964 to help monitor trends and outcomes of cancer incidence in our community. The Cancer Registry is made up of professionals responsible for the collection and management of accurate and timely cancer patient information. The registry follows approximately 18,000 patients annually. Quality cancer data is central to the nation’s fight against cancer, and cancer registrars are the first link in capturing that data.

The registry provides members of CMC staff with data which enables them to evaluate diagnostic and treatment approaches, analyze quality of care, study survival rates, and ultimately improve the overall care provided by CMC and the California Cancer Center. Cancer registrars are data information specialists that collect and code patient-level data for cancer registries. The cancer registrars provide essential information to healthcare providers and health officials to better monitor and improve cancer treatment, conduct research and target cancer prevention and screening programs. They manage a wide range of demographics and medical data on those with cancer and some of the benign tumors as well. The information is both submitted and utilized by state and national cancer registries to enable cancer programs to accurately determine cancer patient populations, formulate plans for improvement and measure outcomes of treatment and survival. This data is included in numerous publications including the Annual Report to the Nation on the Status of Cancer, a collaboration of the American Cancer Society, the Centers for Disease Control and Prevention, the National Cancer Institute, and the North American Association of Central Cancer Registries, all of which use cancer registry data to provide up-to-date information on cancer occurrences and trends.

The registry collects all treatment data for diagnosis and/or treatment of patients at our hospitals. This allows for a lifetime follow-up of all patients. We have six certified cancer registrars and an office assistant and each year we abstract over 3,500 cases across our multiple sites.

The Cancer Registry is also responsible for coordinating the multidisciplinary cancer conferences and providing reports on cancer activity. In addition the cancer registry team helps with outpatient screening clinics, along with other educational programs.

Below is a chart depicting RQRS data for breast and colon cancer cases at CRMC, CCMC, and/or FSH in 2015 and 2016.

<table>
<thead>
<tr>
<th>RQRS DATA</th>
<th># OF BREAST CANCER CASES</th>
<th># OF COLON CANCER CASES</th>
</tr>
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<tr>
<td>Analytic</td>
<td>490</td>
<td>449</td>
</tr>
<tr>
<td>Non-Analytic</td>
<td>87</td>
<td>68</td>
</tr>
<tr>
<td>Number of cases</td>
<td>577</td>
<td>517</td>
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</table>

Rapid Quality Reporting System (RQRS) is a tool provided by the American College of Surgeons to hospitals accredited by the Commission on Cancer. This tool is used to ensure patients are being treated in accordance with evidence-based measures of quality. Expedited data collection on incidences of breast and colorectal cancer is required for inclusion into RQRS. The system sends an alert to the Cancer Registry on each case for which anticipated treatment has not been reported so it can be researched. This system is another way we ensure our patients are being treated with the highest quality of care in a timely manner.
CANCER CONFERENCE

Weekly, we provide physicians with many opportunities to present cancer cases in several cancer conferences throughout the Community system. Physicians present individual cases in an open forum to discuss diagnosis and make recommendations for workup and treatment. A full patient presentation includes medical history, pathology, radiology and TNM staging. These meetings are multidisciplinary and contain both prospective and retrospective cases. Cancer conferences promote ongoing education for residents and medical staff while providing an opportunity to learn about new treatments and open clinical trials. In addition, speakers are selected from both local and national institutions of excellence to address topics of cancer care and research. CMC provides unique access to specialty physicians through cancer conferences, research and collaboration.

MEDICAL ONCOLOGY AND INFUSION SERVICES

CMC continues to expand services for patients who require medical oncology and hematology treatment. Chemotherapy is administered at two locations in the Fresno/Clovis area allowing patients to choose a location that is convenient for them. The CMC Ambulatory Infusion Center in Fresno is located at 2335 E. Kashian Lane, Suite 110. It is conveniently located in the same building as CMC’s Community Outpatient Oncology clinic where five medical oncologists see patients. In 2017, an additional medical oncologist will be added to the team. The CMC Ambulatory Infusion Center in Clovis is located at 729 N. Medical Center Drive West, Suite 215, conveniently located by several medical oncologists. We look forward to the opening of CMC’s new cancer center located on the campus of Clovis Community Medical Center in the summer of 2018, which will combine all these services under one roof.

CANCER CONFERENCE CALENDAR

<table>
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<tr>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
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<tr>
<td>Lung Nodule Conference Every Monday, 5:00 PM at Community Regional</td>
<td>Hematology Oncology Conference Every third Tuesday at noon at Community Regional</td>
<td>General Cancer Conference Every Wednesday, 7:30 AM at Community Regional</td>
<td>Hepatobiliary (HPB) Conference Every Thursday, 7:00 AM at Community Regional</td>
<td>Radin Breast Conference Every Friday, 1:00 PM at Clovis Community Medical Center</td>
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<tr>
<td></td>
<td></td>
<td>Neuro-Oncology Every Wednesday at noon at Community Regional</td>
<td>Clovis Cancer Conference Every third Thursday, 12:30 PM at Clovis Community Medical Center</td>
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COMMUNITY OUTREACH
As an accredited ACoS facility, CMC is committed to delivering the very best in oncology care. CMC provides multiple UCSF Fresno physician-led cancer related education lectures and small group physician meetings throughout the year. CMC Cancer Services also provides a minimum of one yearly cancer screening and one prevention program based on community needs assessment for Central Valley residents. The goal for each of these programs is to provide no cost resources to the Valley’s underserved/underinsured population as well as current patients and their families. Direct to consumers efforts involve physicians speaking to local businesses, health fairs and schools educating the community to better understand cancer and its risks including early detection, diagnose, treatment options and support services.

CANCER RESEARCH
Clinical trials are vital in studying all aspects of medicine, not just cancer. The stakes may seem higher when researching medicines to treat cancer, but all new treatments, drugs and medical devices included, must go through clinical trials before being approved by the FDA. CMC belongs to three large Cooperative Groups sponsored by the National Cancer Institute (NCI). Participating in these large cooperative groups allows our patients more options which may include remaining close to home during their treatment or keeping their own physician during their treatment. CMC has clinical trials available for cancers in breast, cervical/endometrial, lung, pancreatic, prostate, renal cell, colon, rectal, HCC and anaplastic glioma tumors. In addition, our partners at the UCSF clinical research program are pursuing research opportunities in Hodgkin’s Lymphoma and NHL, multiple myeloma, AML, metastatic NSCLC, and brain tumors.

CMC is dedicated to providing the latest cancer treatments to its patients. The Cancer Research staff is supervised by a certified clinical research nurse and reviews new patient records for eligibility for enrollment into clinical trials. In 2016 our office had 13 clinical trials available through the NCI Cooperative Groups and a CyberKnife Registry. We were able to enroll 107 patients into these studies. Our Radiation Oncology department continued to look at the efficacy of fiducial placement for prostate cancer and their data was submitted for future publication. In addition to the Cooperative Groups, UCSF was able to place 157 patients onto pharmaceutical trials or epidemiological studies. CMC also saw 57 patients that were enrolled onto a clinical trials outside of the CMC system. Medical Oncology clinical trials continue to focus on the latest in chemotherapy and biotherapy agents and diagnostic tests to improve the outcomes and quality of life of patients. Radiation trials utilize the latest technology to also improve the outcomes and quality of life of patients. Treatment modalities include 3DCRT, IMRT, IGRT, brachytherapy and CyberKnife.

For more information on clinical trials, please call our Clinical Trials office at the California Cancer Center at (559) 499-6638.
Early Palliative Care Consults Reduce Length of Stay and Hospital Charges

AUTHORS: JOHN THOMPSON, MD; SHANE LIEBERMAN, MD; SUSAN HUGHES, MS; CHRISTINE SWIFT, MSN; PATRICK MACMILLAN, MD
AFFILIATIONS: UCSF FRESNO HOSPICE & PALLIATIVE MEDICINE FELLOWSHIP, COMMUNITY MEDICAL CENTERS

BACKGROUND/OBJECTIVE: The benefits of early palliative care (PC) consults are well documented. Overall, PC consultation services can play a role in reducing hospital length of stay, helping facilitate better communication with the family, helping establish goals of care, and reducing cost. This study investigated differences in outcomes based on when the PC consults was placed comparing consults within 24 hours to those placed after 24 hours.

METHODS: Retrospective case-controlled study of PC consults from April 2014 to May 2015. Cases were patients who had a PC consult ordered within 24 hours. Controls were patients matched on diagnosis of chronic condition, consultation within +/- six months, and Charlson Comorbidity Index score +/- 3. Outcome measures were: length of stay, total hospital charges, change in code status, and discharge disposition.

RESULTS: One hundred sixty-five patients had a PC consult ordered within 24 hours from admission. They were diagnosed with cancer 39%, dementia/frailty 21%, and both chronic heart failure and cerebral vascular disease 12%, respectively. Cases were 53% female, 78% White, and median age 72 years. Controls were 43% female, 79% White, and median age 69 years. Discharge disposition did not differ significantly; 25% of cases entered hospice compared to 31% of controls, and 37% of cases went home compared to 31% of controls (p=0.52). Hospital length of stay differed significantly between cases and controls (5.0 to 10.5 respectively, p<0.001). Total median charges for patients seen by PC also differed significantly, $39,500 compared to $101,300 (p<0.001).

CONCLUSION: Earlier PC consults lead to significant hospital cost savings and reduced length of stay.
PALLIATIVE CARE IN ONCOLOGY CONTINUED

METHODS
Retrospective study of PC consults from April 2014 to May 2015 at one Central California hospital
165 early consults matched to routine consults (1:1) based on:
- Underlying diagnosis
- Consultation within +/-6 months of cases
- Charlson Comorbidity Index score +/-3
- Scores 17 conditions; ranges from 0 to 36

MEASURES
- ED visit without admission
- Code status change
- Last code status
- Discharge disposition
- Total hospital charges
- Hospital length of stay
- Demographics: age, gender, race

DEMOGRAPHICS

DIAGNOSES
- Cancer
- Dementia/frailty
- CHF
- CVD
- COPD
- Cirrhosis
- ESRD
- HIV/AIDS
- Multi-System Organ Failure
- Neurologic Injury

CHARLSON COMORBIDITY INDEX

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Early</th>
<th>Routine</th>
<th>P-value</th>
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<tr>
<td>Age, median years</td>
<td>72</td>
<td>69</td>
<td>0.10</td>
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<tr>
<td>Gender, % female</td>
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<td>43</td>
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<tr>
<td>Race, %</td>
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<tr>
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<td>78</td>
<td>79</td>
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</tr>
<tr>
<td>Other</td>
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</table>
RESULTS

LENGTH OF STAY

![Boxplot showing comparison between early and routine consults for length of stay. Median length of stay for early consults is 5 days, and for routine consults is 11 days. P < 0.001.]

TOTAL CHARGES

![Boxplot showing comparison between early and routine consults for total charges. Median total charges for early consults is $39,500, and for routine consults is $101,300. P < 0.001.]

OTHER FINDINGS

- Timing of PC consult did not affect discharge disposition (hospice, home, died, SNF, etc.)
- Timing of PC consult did not affect patients’ code status choice at time of discharge nor result in more changes in code status
- Only 2 patients in the early consult cohort were discharged directly from the ED (not statistically significant)

CONCLUSIONS

- Earlier PC consultations lead to:
  - Significant hospital cost savings
  - Reduced length of stay
FOCUS ON LUNG CANCER

THE CENTER OF EXCELLENCE FOR LUNG CANCER

In 2016, CMC applied for the Bonnie J. Addario Lung Cancer Foundation (ACLF) Center of Excellence. In January 2017, the Lung Nodule Program received a national designation as a Center of Excellence for the Bonnie J. Addario Lung Cancer Foundation (ACLF). The ALCF Center of Excellence for Lung Cancer includes Lung Nodule Program, Lung Screening Program and Lung Cancer Navigation Program at Community Regional Medical Center (CRMC), affiliated with UCSF Fresno. This designation is offered to centers who have a robust program for multidisciplinary care for patients with lung cancer that meet national standards and recognizes the success of the program. Our program has been rooted to provide state-of-the-art advanced care based on national guidelines, the kind of investigative approach and management that is crucial to the residents of Central San Joaquin Valley suffering from lung cancer.

Lung cancer continues to be the leading cause of cancer-related death in the US with a very poor five-year survival rate of 18.1%. An estimated 222,500 Americans will be diagnosed and 155,870 will die of lung cancer this year. Early diagnosis was shown to improve survival in lung cancer. However, the diagnosis of lung cancer is often delayed due to an absence of symptoms and lack of biological tests for early detection, which reduces the chances of curative therapy. The first successful National Lung Screen Trial in 2011 showed a 20% survival benefit in high risk patients who were screened using Low Dose Computed Tomography; and the advances in Interventional Pulmonary technology enhanced the diagnostic arena in early detection of lung cancer.

California has the highest number of newly diagnosed lung cancer patients compared to any other state in the country (CA CANCER J CLIN 2016; 66:7-30). CRMC and the California Cancer Center provides care to more than half of the lung cancer patients diagnosed in the entire Fresno County each year. This trend has been consistently maintained over several years (Fig 1). The American Cancer Society’s California Cancer Facts and Figures 2016 details cancer diagnoses by counties. In 2013, a total of 403 patients were newly diagnosed with lung cancer in Fresno County, and of these, 211 patients were diagnosed and cared for at Community facilities, and nearly half of these lung cancer patients were diagnosed and followed in the Lung Nodule Program.

FIGURE 1 – NUMBER OF FRESNO COUNTY LUNG CANCER CASES DIAGNOSED AT CMC.
The Lung Program — The ALCF Center of Excellence for Lung Cancer at CRMC, affiliated with UCSF Fresno, is one of the largest programs in the nation focused on early diagnosis and expedited treatment of lung cancer. This program works on three major mantras:

1. Enhance early diagnosis of cancer by using Ultra Low Dose CT screening in high risk smokers
2. Speed-up the cancer diagnosis and cancer staging using advanced technology and gene mutation studies
3. Improve survival by rapid treatment access and a meticulous periodic follow-up of these patients for five years

The key is a multidisciplinary team that meets weekly to decide diagnostic work-ups and then expediting treatment plans. The team includes skilled interventional pulmonologist who both biopsy lung nodules and sample suspicious regional nodes at the same time for diagnosis and staging, reducing the need for follow-up procedures. And a 315-gene mutations studies based on standard of care helps us to detect possible targetable mutations for direction of treatment in these patients.

Since the conception of the Lung Nodule Program in 2009, we have progressively advanced the care of lung nodule and lung cancer patients expeditiously. A multidisciplinary team approach coupled with an emphasis on expedited diagnosis, follow-up and treatment, has dropped the time from referral for an abnormal lung scan to cancer treatment from an average of 87 days to 7-10 days. Moreover, because of the aggressive approach to early detection of cancer in the Lung Nodule Program, the percentage of lung cancer diagnosed at Stage I has significantly increased from 19% in 2010 to 58% in 2015 (Figure 2: Percentage of Patients Distribution by stages diagnosed in CMC vs. Lung Nodule Program).

Early detection and early management improves survival in lung cancer. Therefore, the change in the diagnostic paradigm to detection of lung cancer at Stage 1 in over two-thirds of our patients will have significant impact on improved survival over the next five years. All of these patients are periodically followed-up on in the Lung Nodule Program (LNP) to assess responses to treatment and any evidence of recurrence.

This impact of early stage diagnosis and survival is the result of hard work and invested time put in by the Lung Nodule Program’s care team. In 2016, our mortality was 11% while 89% patients survived. In order to diagnose those 117 patients with cancer in 2016, we had to provide care for more than 1,356 patients with lung nodules to detect the nodules which were in fact cancers (Fig. 3 — next page). This investment in time and work is critically essential to save lives in lung cancer. This is because early stage lung cancer patients are completely asymptomatic and usually early stage lung cancer presents as a small lung nodule or a spot in the lung. It takes the expertise of the Lung Nodule Program team to differentiate nodules from infections such as Valley Fever to that of cancer etiology.
Predominantly, the patients diagnosed with cancer were smokers (81%) although, we had a significantly high percentage (19%) of nonsmokers diagnosed with lung cancer. Over half of patients (58%) were diagnosed by a bronchoscopic or endoscopic biopsy techniques while 42% patients were diagnosed by a CT guided biopsy procedure (Fig. 4). However, several patients diagnosed by a CT guided biopsy route further require a bronchoscopy with endobronchial ultrasound guided biopsy (EBUS) for cancer staging. Non-small cell lung cancer was the predominant histopathology in 69% of patients (Fig. 5).

Analysis of molecular marker by 315-gene next generation sequencing studies based on standard of care, demonstrated significant variability in tumor specific mutation profiles in our patients as compared to national lung cancer mutation consortium data. Five specific targetable mutations were identified predominantly including EGFR (21%) and KRAS (28%). Of which, PTEN (15%), PIK3CA (18%) and MET1 (6%) were detected with high frequency in our patients. While ALK (3%), BRAF (3%), FGFR1 (3%), RET (2%), ROS1 (1%) were found to be less frequent (Fig. 6 — next page). Of these, ALK, EGFR, ROS1, BRAF, RET have FDA approved targeted therapy that can help in individualizing treatment in respective patients. While for others, drugs are in the phase of clinical development. As compared to historical data, our patients had significantly higher percentage of PTEN and PIK3CA mutation in our patients. There was no significant association found between gender, ethnicity, tobacco use, and mutation profile in our patients in most tumor mutation except for EGFR.

Mutations in the epidermal growth factor receptor (EGFR) gene occur in a subset of non-small cell lung cancer (NSCLC) and are highly predictive of the clinical response to selective EGFR
kinase inhibitors. EGFR mutations are more prevalent in non-smoking women of Asian ethnicity with NSCLC. Although EGFR mutations have been identified to have a predilection for ethnicity, there is no data on prevalence of EGFR mutations in the Hispanic population with lung cancer. We conducted a study to examine the prevalence of EGFR mutations in the non-smoking Hispanic population presenting with NSCLC. Our study revealed that there is high prevalence of EGFR mutations in females and Hispanics with NSCLC in Central California. The odds of having EGFR mutation was four times greater for Hispanic non-smoking females compared to the rest of the study group. Over half of the patient population cared at our program is Hispanic; therefore these data points are valuable in utilizing risk stratification in the management of our Hispanic patients with lung cancer as well as the Hispanic population worldwide.

Success of our program lies in the high speed coordinated patient care network between our extremely dedicated Medical Oncologists, Radiation Oncologists, Thoracic Surgeons, Pathologists, Radiologists and the diagnostic Lung Nodule Program team who follow the American Cancer Society and NCCN guidelines in the diagnosis, staging and management of lung cancer. All cases are discussed at the multidisciplinary team conference with 100% compliance and the treatment plans are selected using meticulous national guidelines. In 2016, surgery was selected as a therapeutic option in 50% of our patients with early stage lung cancer, while the remaining 50% received CyberKnife therapy based on their pulmonary function tests data and presence of comorbidities. Advance stage patients go through rapid evaluation and treatment initiation by our esteemed medical and radiation oncology colleagues. All patients receive a Quality of Life for Lung Cancer Questionnaire and we have initiated a survivorship care plan for our patient population. Our patients have Oncology Navigation care coordination support which ensures adherence to physician determined treatment and

FIGURE 6 — LUNG CANCER BY TYPE AND MUTATIONS

![Graph of Lung Cancer by Type and Mutations](image)
plan of care. Timely administration of Compass Care and Palliative Care in conjunction with Oncology Navigation helps to relieve cancer-related stress, enhances supportive care, improves compliance and helps improve survival in lung cancer.

Our program is a University teaching program of UCSF Fresno. Physician faculty in all of our disciplines perform teaching and robust clinical and translational research in lung cancer, molecular studies, liquid biopsies, lung nodule, coccidioidomycosis and interventional pulmonary minimally invasive diagnostic procedures, quality improvement studies in clinical care and lung cancer survivorship, as well as clinical trials.

Since the era of early diagnosis by lung screening and interventional pulmonology began, increasingly, pulmonologists are playing a primary role in the implementation of advances for the purposes of identifying high-risk individuals who may benefit from:

- Screening
- Managing pulmonary nodules detected on screening CT scans
- Early diagnosis and staging lung cancer by techniques such as bronchoscopy with endobronchial ultrasound guided biopsy (EBUS)
- Endoesophageal Ultrasound (EUS)
- Electromagnetic navigational bronchoscopic biopsy (EMN)
- Procuring and processing cancer specimens for molecular analysis
- Fiducial placement for CyberKnife or stereotactic radiotherapy
- Running multidisciplinary lung cancer tumor boards and partnering with oncology in patient care

CRMC is highly equipped with the latest state-of-the-art equipment to perform these procedures by highly skilled interventional pulmonologists who complete one-stop diagnosis and staging in most cases reducing the need for additional procedures (Fig 7 — see previous page). Pulmonologists also play a critical role in clinical trial development, implementation for novel agents directed toward chemoprevention and treatment of lung cancer, and in the management of comorbidities, such as dyspnea and respiratory failure, and side effects from both the cancer and treatment.

Early detection, prompt diagnosis and rapid initiation of treatment appear to be the key factors in saving lives in lung cancer. We urge all providers to consider lung-cancer screening in high risk smokers for early detection followed by prompt evaluation by lung nodule specialists for speedy work-up and management. Together, we can help improve survival in lung cancer.