CANCER PROGRAM
2015 ANNUAL REPORT

AN OVERALL REPORT ON THE STATUS OF COMMUNITY MEDICAL CENTERS’ CANCER PROGRAM WITH A SPECIAL EMPHASIS ON NEURO-ONCOLOGY
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## Community’s 2015 Site Table

## Focus on Neuro-Oncology
The 2015 Cancer Committee Members are listed below in alphabetical order:

Haifaa Abdulhaq, MD  
Medical Oncologist, UCSF Fresno

Ibironke Adelaja, MD  
Surgeon  
Community Regional Medical Center

Alec Beach, RTT  
Technical Service Manager  
Oncology Services  
Community Regional Medical Center

Karissa Bouchie, RD, CDE  
Clinical Nutrition Manager  
Community Regional Medical Center

Cynthia Burton, MSW, LSCW  
Psychosocial Oncology  
Oncology Services  
Community Regional Medical Center

Dawn Delozier, PhD  
Genetic Counselor

Babak Eghbalieh, MD, FASC  
Cancer Liaison  
CCFMG/UCSF Fresno

Elisa Foster, MD  
Radiologist

Jennifer Geise  
American Cancer Society

Lynn Gilbank, PT, CLT-LANA  
Lymphedema Clinic  
Clovis Community Medical Center

Deborah Gumina, MD  
Surgeon  
Clovis Community Medical Center

Bonnie Harkins, RN, OCN  
Research Nurse, Oncology Services  
Community Regional Medical Center

Dina Ibrahim, MD  
Medical Oncologist  
Cancer Committee Chairman

Bruce Lepley  
Director, Pharmacy Services  
Community Regional Medical Center

Mary Leyser, CTR  
Cancer Registry Supervisor  
Oncology Services  
Community Regional Medical Center

Dineshi Liyanage, MD  
Director, Palliative Care  
Clovis Community Medical Center

Timothy Lopez  
Inpatient Pharmacy Manager  
Community Regional Medical Center

Patrick Macmillan, MD  
Palliative Care Director  
Community Regional Medical Center

Donna Marqueling, RN  
Risk Management - Patient Safety  
Community Regional Medical Center

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

Kathleen Norkunas, RN, BSN, OCN  
Nurse Coordinator, Lung Nodule Program, Oncology Services  
Community Regional Medical Center

Paul Ortiz  
Cancer Services Vice President

William Pitts, MD  
Pathologist, Pathology Associates

Crystal Rodriguez, MA, CCC-SLP  
Rehabilitation, Oncology Services  
Community Regional Medical Center

Nancy Shuster-Artis, BSN, RN-BC, CPHQ  
Quality Management Coordinator  
Community Regional Medical Center

Lori Soto, RN  
Inpatient Oncology Manager  
Community Regional Medical Center

John Strubert  
Radiology Diagnostic Manager  
Clovis Community Medical Center

Uma Swamy, MD  
Radiation Oncologist  
California Cancer Center

Daya Upadhyay, MD  
Lung Nodule Medical Director  
Community Regional Medical Center

Christine Swift, RN, MSN, CHPN, CCRN  
Palliative Care Manager  
Community Regional Medical Center

Harminder Toor, RN  
Administration  
Home Health Services

Jeff Zweifel, RN  
Oncology Services  
Clovis Community Medical Center
Dear Colleagues,

It is my distinct privilege and honor to report on the status of Community Medical Centers’ (CMC) Cancer Program and introduce the Cancer Committee’s 2015 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 CMC’s Cancer Liaison Physician (CLP) to the American College of Surgeons Commission on Cancer (CoC), and this past year as the interim chair of the Cancer Committee. Our program has had steady and exciting growth over this last year and we are proud to continue our legacy and dedication to cancer services as a fully accredited CoC program since the 1970’s. We have once again received CoC accreditation as of our last survey in October of 2014. This great achievement has yet again placed us among the top programs in the country taking care of cancer. Our cancer committee members worked hard to prepare this institution for its reaccreditation to the CoC. I am extremely proud and grateful to each and every committee member who contributed to the effort, which resulted in reaccreditation 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 CoC but more so, to exceed them on many fronts. These are challenging times in the battle against cancer nationally as well as locally. Cancer care truly requires a cohesive and comprehensive approach. CMC has taken on this challenge and has fully committed to creating a robust cancer system-of-care par excellence for our community.

It is with great pride to recognize that our commitment to pursue and improve on 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, rehabilitation services, cancer genetics, individualized tumor-genetics pathology-driven treatments, community needs assessment and finally a dedicated oncology electronic medical record (EMR) program.

This year’s report has a special emphasis on neuro-oncology. It is truly exciting to be part of this great achievement for CMC. This is an area of cancer care in our system that has undergone a 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 everyone who contributed to this report. The Cancer Committee consists of dedicated professionals from multiple disciplines. Their commitment and hard work has resulted in the program’s continued growth and success. 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
OVERVIEW

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), Community Regional Medical Center (CCMC), Fresno Heart & Surgical Hospital 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.

ACOS ACCREDITATION

Community’s Cancer Program, which includes all of its facilities, has been accredited by the American College of Surgeons (ACOS) since 1980. 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. Community achieved the Teaching Hospital Accreditation in 1999. We achieved our last accreditation in 2014 and will be surveyed in 2017.

ONCOLOGY SUPPORT SERVICES

Community’s Oncology Support Services incorporates a transdisciplinary approach to cancer care to address the multidimensional factors associated with a cancer diagnosis. The program enhances biomedical outcomes and promotes quality of life for patients and families. Compass Cancer Care program provides tumor site specific teams of nurse navigators, social workers, dietitians and speech language pathologist that work cohesively to ensure the patient is followed by one team across their cancer journey. To maintain an advantage in a competitive and evolving oncology market, Compass services provide best practice and evidence-based interventions to address quality of life domains impacted by a cancer diagnosis. Compass services follow national guidelines and satisfy several of the ACOS Commission on Cancer accreditation CoC standards and eligibility requirements including distress screening, patient navigation, rehabilitative services, nutritional support, psychosocial services and survivorship.

Nurse Navigation provides oncology patients with a single point of contact for questions and concerns while serving as a vital link between the patient and the healthcare providers to facilitate timely access to care throughout all phases of treatment and into survivorship.

Psychosocial Oncology services are essential to ensure holistic, comprehensive cancer care for patients and their loved ones. Psychosocial support is initiated early in care to address the practical, psychological, social and spiritual needs associated with a cancer diagnosis for patients and families across the illness trajectory.

Nutrition Services provide patients with clinical support and education regarding the variety of complex nutritional needs inherent of cancer treatment, recovery and prevention.
Speech Language Pathology (SLP) rehabilitation is a vital component to multidisciplinary cancer care, providing proactive comprehensive assessments of the multifaceted impact on speech, voice, swallowing, cognition and language associated with radiation therapy, chemotherapy, and surgery. SLP rehabilitation offers a myriad of clinical and rehabilitative interventions both pre- and post-treatment while ensuring patients and families are educated regarding a variety of conditions.

**CYBERKNIFE®**

CyberKnife is a revolutionary tool that allows physicians to perform life-saving surgery where before there was no surgery possible. It uses a robotic arm to pinpoint and destroy tumors in the same way that technology guides cruise missiles. Patients experience no pain, no incision, no anesthesia and require minimal recovery time. The CyberKnife system is proven to be the most accurate, real-time, image-guided robotic radiosurgery system in the world. The combination of the image-guidance system and the multi-jointed robotic arm allows CyberKnife to compensate for patient movement, sparing patients the pain and inconvenience associated with the conventional head frame that is fixed to the patient’s skull. CyberKnife's ability to track and compensate for patient movements (like breathing) also allows this remarkable tool to treat tumors in areas of the body where older systems like Gamma Knife cannot. Since CyberKnife treatment is a simple and painless outpatient procedure, patients can focus on other things and get back to their normal activities quickly. Community Regional has treated more than 850 patients with CyberKnife. Various cancer sites treated are lung, liver, prostate, metastatic melanoma and central nervous system (CNS) tumors, to name a few. If you would like any more information on CyberKnife, please call (559) 459-2500.

**RADIATION ONCOLOGY**

Community Regional and the California Cancer Center offer 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 computed tomography (CT) scanner dedicated to radiation therapy utilization only. Our clinicians use a state-of-the-art treatment planning systems to customize optimal treatments for each patient that are not only state of the art in terms of most current technology, but also consider past doses of radiation that a patient may have received; a scenario that is increasingly common as patients survive longer.
In addition, the Charles and Anne Matoian Oncology unit located at CRMC has a CyberKnife stereotactic radiation therapy system. 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 can verify tumor locations and track any movements during the treatment process so that adjustments are made as needed. CRMC also has a conventional linear accelerator onsite that provides 3D conformal radiation therapy. The department of radiation oncology also provides brachytherapy services at its locations (treatment of cancer by the insertion of radioactive implants directly into the tissue/cancer). Primary treatment sites for this modality are prostate and breast. The following list of advanced radiation therapy treatments are available through the Community Radiation Oncology departments:

- Stereotactic Radio Surgery (SRS)
- Stereotactic Body Radiation Therapy (SBRT)
- Image-Guided Radiation Therapy (IGRT)
- Volumetric Modulated Radiation Therapy (VMAT)
- Intensity Modulated Radiation Therapy (IMRT)
- 3D Conformal Radiation Therapy (3DCRT)
- Prostate Seed Implants (Brachytherapy)
- Partial Breast Irradiation (Brachytherapy)
- High Dose Rate (HDR) 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 registries 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 five certified cancer registrars and an office assistant that has added over 3,000 new cases each year between our multiple sites.

The Cancer Registry also is responsible for coordinating the multidisciplinary cancer conferences and helping with outpatient screening clinics, along with other educational programs.
CANCER PROGRAM

CANCER SERVICES

CANCER CONFERENCE

CRMC and CCMC provide physicians with many opportunities to present cancer cases in several Cancer Conferences throughout the Community system. Physicians may 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 prospective. Cancer Conferences promote ongoing education for residents and medical staff while providing an opportunity to learn about new treatments and open clinical trials. Speakers are selected from both local and national institutions of excellence to address topics of cancer care and research. CMC, with UCSF Fresno, provides unique access to specialty physicians through Cancer Conferences, research and collaboration.

COMMUNITY REGIONAL MEDICAL CENTER

- General Cancer Conference: Every Wednesday, 7:30 AM
- Hepatobiliary (HPB) Conference: Every Thursday, 7 AM
- Neuro-Oncology: Every Wednesday at noon
- Lung Nodule Conference: Every Monday, 5 PM
- Hematology Oncology Conference: Every third Tuesday at noon

CLOVIS COMMUNITY HOSPITAL

- Clovis Cancer Conference: Every third Thursday, 12:30 PM
- Radin Breast Conference: Every Friday, 1 PM

If you have any questions concerning the Cancer Conferences, please call Mary Leyser, CTR 559-451-3641.

LUNG NODULE PROGRAM

The UCSF Fresno’s Lung Nodule Program at CRMC is a robust program focused on early diagnosis and expedited treatment of lung cancer. This program works on two major mantras: first to speed cancer diagnosis and cancer staging using advanced technology and gene mutation studies; and secondly to 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 treatment plans expeditious. The team includes skilled endoscopists 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.

This kind of treatment is crucial to the central San Joaquin Valley. Per the recent Cancer Statistic Data (CA CANCER J CLIN 2016; 66:7-30), California has the highest number of newly diagnosed lung cancer patients compared to any other state in the country. CRMC and the California Cancer Center provides care to more than 50% of the lung cancer patients diagnosed in the entire Fresno County each year. The American Cancer Society’s “California Cancer Facts and Figures 2016” details cancer diagnoses by counties. A total of 403 patients (see the Table 1 below) were newly diagnosed with lung cancer in Fresno County; of these, 211 patients were diagnosed and cared for at CMC facilities.

<table>
<thead>
<tr>
<th>Year Diagnosed</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Patients</td>
<td>246</td>
<td>221</td>
<td>243</td>
<td>211</td>
<td>213</td>
<td>224</td>
</tr>
</tbody>
</table>

Table 1

California Cancer Facts 2016 Data from American Cancer Society — Observed New Cancer Cases, 2013

<table>
<thead>
<tr>
<th>All Sites</th>
<th>Bladder</th>
<th>Breast</th>
<th>Rectum</th>
<th>Leukemia</th>
<th>Lung</th>
<th>Melanoma</th>
<th>Myeloma</th>
<th>NHL</th>
<th>Oral</th>
<th>Pancreas</th>
<th>Prostate</th>
<th>Cervix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresno</td>
<td>3,511</td>
<td>155</td>
<td>539</td>
<td>299</td>
<td>118</td>
<td>403</td>
<td>161</td>
<td>39</td>
<td>141</td>
<td>112</td>
<td>103</td>
<td>403</td>
</tr>
</tbody>
</table>
This trend has been consistently maintained over several years.

Since the conception of the Lung Nodule Program in 2009, we have progressively advanced the care of lung nodule and lung cancer patients expeditiously. Nearly half of all lung cancer patients now cared for at CRMC have been diagnosed and followed in the Lung Nodule Program. Multi-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 1 has significantly increased from 19% in 2010 to 58% in 2015. (See the Table 2 above.)

Early detection and early management are the only factors that have been shown to improve 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 in the Lung Nodule Program to assess responses to treatment and any evidence of recurrence.

Success of our program lies in the high speed coordinated patient care network between our extremely dedicated medical oncologist, radiation oncologist, thoracic surgeon and the diagnostic Lung Nodule Program team who meticulously follow the American Cancer Society and NCCN guidelines in the diagnosis, staging and management of lung cancer. Our patients have a strong oncology navigation care coordination support which ensures adherence to physician determined treatment and 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.

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 order to diagnose those 108 patients with lung cancer in 2015, we had to provide care for more than 1,500 patients with lung nodules to detect the nodules which were in fact lung cancer. However, this investment in the 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. To help catch even more lung cancers at these early, more curable stages, we’re encouraging primary care physicians with patients who are long-time smokers, or who have smoked significant years in the past, to order lung screenings and refer these patients right away when lung lesions are found. Working together we can increase our cure rates.

![Lung cancer is the #1 cause of cancer death in California](image)

Since the Weekly Lung Nodule Clinic was established:

87 days to 7 days

The reduction in average waiting time to see a cancer specialist after an abnormal lung scan.

| Table 2: Lung Cancer Stage at the Diagnosis |
|-----------------|-----|-----|-----|-----|-----|-----|
|                  | I   | II  | III | IV  | Unknown | All Stages |
| Lung Nodule Program – in year 2015 | 58% | 6%  | 20% | 16% | 0%      | 108        | 100%       |
| Lung Nodule Program – in year 2010 | 19% | 8%  | 15% | 53% | 5%      | 45         | 100%       |
This year, we have further extended our program of early detection of lung cancer by initiating a Lung Screening Program at CRMC and UCSF Fresno. Based on the National Lung Screening Guidelines by CMS guidelines, U.S. Preventative Services Task Force, and the National Comprehensive Cancer Network, eligible patients are screened by low dose CT chest for early detection of lung cancer. Our Lung Screening Program has been setup to do rapid evaluation with a continued follow-up by annual CT screening. Patients referred for screening by the primary care provider are set to go through a rapid process of triage evaluation, imaging and result review. Then based on their CT results, they are either sent to Lung Nodule Specialty for management of lung nodules and to rule out cancer; or the patients with normal CT studies are streamed into annual CT screening per above guidelines. Early detection of lung cancer in high-risk patients saves lives. Our Lung Screening Program has been geared to take these additional steps towards saving lives in our patients.

MARJORIE E. RADIN
BREAST CARE CENTER

The Marjorie E. Radin Breast Care Center at CCMC is a comprehensive breast center offering services from screening mammogram through survivorship care planning for those diagnosed with breast cancer. We continue to maintain two Breast Center of Excellence awards. We have achieved the prestigious certification awarded by the American College of Radiology (ACR) in mammography, ultrasound guided breast biopsy and stereotactic guided breast biopsy. Our newest certification from ACR is for breast MRI. We also have certification for National Quality Measures of Breast Centers (NQMoBC). This certification includes passing many high-quality measures involving data collection and review as well as benchmark compliance. These certifications help confirm our standing as a Breast Center of Excellence.

New to Radin is the installation of latest generation of bone densitometers. The new Dual Energy X-ray Absorptiometry (DXA) affords us the ability to measure a wide range of clinical patients. This system is designed to assess the osteoporosis, body composition and cardiovascular risk. DXA has long been the gold standard to measure bone density. The following is a summary of screening recommendations by the International Society for Clinical Densitometry:

• Women aged 65 and older
  • For post-menopausal women younger than age 65 a bone density test is indicated if they have a risk factor for low bone mass such as:
    - Low body weight
    - Prior fracture
    - High-risk medication use
    - Disease or condition associated with bone loss
  • Women during the menopausal transition with clinical risk factors for fracture, such as low body weight, prior fracture, or high-risk medication use
  • Men aged 70 and older
  • For men less than 70 years of age a bone density test is indicated if they have a risk factor for low bone mass such as:
    - Low body weight
    - Prior fracture
    - High-risk medication use
    - Disease or condition associated with bone loss
  • Adults with a fragility fracture
  • Adults with a disease or condition associated with low bone mass or bone loss
  • Adults taking medications associated with low bone mass or bone loss
  • Anyone being considered for pharmacologic therapy
  • Anyone being treated, to monitor treatment effect
  • Anyone not receiving therapy in whom evidence of bone loss would lead to treatment
The navigation team has a new member, Melissa Costi, MSW. The addition of Melissa to our staff has improved our resource availability for patients. Melissa is able to help with insurance concerns, travel to treatment, and financial support during treatment as well as other support services. She has started a caregiver support group meeting every second Monday of the month.

We continue our weekly Multidisciplinary Breast Cancer Conference and Clinic. Our patients with a new diagnosis of breast cancer are able to meet with the treatment on one afternoon to kick start their treatment process. This also allows for collaboration among the treatment team thus insuring the patient is receive the highest level of care.

The nurse navigators at Radin begin working with our patients when they receive the diagnosis and follow them throughout treatment. A recent addition to the follow-up process is the establishment of their survivorship care plan to prepare the patient for post treatment life.

We are continuing to expand our service locations in order to meeting the growing needs of the community.

**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 Oncology 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.

**MEDICAL ONCOLOGY AND INFUSION SERVICES**

Medical Oncology and Hematology Services are provided by several medical oncology groups at CMC. Chemotherapy is administered at Community Ambulatory Infusion Centers, with two locations for patient convenience. The infusion services are located in the East Medical Plaza Building, 2335 E. Kashian Lane, Suite 110, Fresno, CA and at the Alder Medical Office Building, 729 N. Medical Center Drive West, Suite 215, Clovis, CA. The infusion center in Clovis opened in October, 2015.

University Oncology Associates, became part of Community Outpatient Oncology Clinic in December 2015. This moved Medical Oncology and Hematology services into the East Medical Plaza Building for easy convenience for patients who also needed infusion 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 keep their own physician during their treatment. CMC had clinical trials available for cancers in breast, cervical/endometrial, lung, pancreatic, prostate, renal cell, colon, rectal, hepatocellular carcinoma and anaplastic glioma tumors. The UCSF clinical research program looked at 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 2015 our office had 15 clinical trials available through the NCI Cooperative Groups, CyberKnife Registry and ASTRO. We were able to enroll 84 patients into these studies. In addition to the Cooperative Groups, UCSF was able to place 349 patients onto pharmaceutical trials or epidemiological studies. Our Radiation Department looked at the efficacy of fiducial placement for prostate cancer and is analyzing their data for future publication.

Medical Oncology clinical trials 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 for patients. Treatment modalities include 3DCRT, IMRT, IGRT, brachytherapy and CyberKnife.

For more information on clinical trials, please call Bonnie Harkins, RN, OCN, CCRP at the California Cancer Center at (559) 451-3647.

Bonnie Harkins,
RN, OCN, CCRP
Cancer Research Nurse
## Community's 2015 Site Table

Sorted from Most to Least Common

<table>
<thead>
<tr>
<th>Site Group</th>
<th>Total</th>
<th>Class</th>
<th>NonAn</th>
<th>Sex</th>
<th>TNM Stage</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Cases</td>
<td>Analytic</td>
<td>M</td>
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<td>ALL SITES</td>
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<td>1339</td>
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<td>NON-HODGKIN'S LYMPHOMA</td>
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FOCUS ON NEURO-ONCOLOGY

OVERVIEW

The field of neuro-oncology encompasses the treatment of primary and metastatic lesions involving the brain, spine and peripheral nerves. Central nervous system (CNS) tumors are the seventh most frequent tumor in the adult (>20 years of age) population nationwide. Both malignant and non-malignant primary CNS tumors together occur at an age-adjusted incidence rate of 28.57 per 100,000 population. Approximately one quarter of CNS tumors are malignant for an age adjusted incidence rate of 7.23 per 100,000. Between 2005 and 2014, a total of 881 patients were admitted to CRMC with a diagnosis of an oncologic lesion involving the brain or spinal cord. There was a growth in patient volume over the first six years which has recently stabilized (Figure 1). A slightly greater portion of the patients were female than males (Figure 2 – see next page). When compared to the Central Brain Tumor Registry of the United States (CBTRUS) report of patient diagnosed with CNS tumors between 2009-2013, the gender distribution of patients seen at CRMC is similar to the national population of the United States. The majority of the patients were over age 50 with a median age of 58 (Figure 3 – see next page). The average age adjusted mortality rate for all CNS tumors is 5.78 per 100,000, significantly lower than the leading cause of cancer mortality in the US, lung cancer at 66.21 per 100,000. However, the five year survival rates for glioblastomas is extremely poor at 5.1%.

The largest portion of the tumors seen at CRMC were benign meningiomas (Figure 4 – see page 15). For malignant tumors, glioblastomas represented approximately 60% of the malignant brain tumor patients seen at CRMC and all gliomas combined are 86%. In the CBTRUS report, the most frequent malignant brain tumor is glioblastoma at 46.1%, and all gliomas together account for 80% of malignant CNS tumors. When compared to the national statistic of the CBTRUS report, there is a higher percentage of meningiomas and glioblastomas seen at CRMC compared to other pathologies. This may reflect a difference in the referral pattern or statistical reporting as there is a higher percentage of “other” tu-

YU-HUNG KUO, MD, PhD
Neurosurgeon

FIGURE 1: NUMBER OF PATIENTS ADMITTED BY YEAR TO CRMC WITH A DIAGNOSIS OF A PRIMARY BRAIN TUMOR.
FIGURE 2: DISTRIBUTION OF PATIENTS BY GENDER SEEN AT (A) CRMC FROM 2005-2014 AND (B) IN THE UNITED STATES FROM 2009-2013.

FIGURE 3: AGE OF PATIENTS ON ADMISSION TO CRMC.

Patients afflicted with CNS cancers present unique challenges not present with other cancer sites. Surgical resection of primary brain tumors does not involve resection of a “margin” of normal tissue due to the functional significance of the surrounding brain parenchyma. As such, surgical cure is typically not possible and adjuvant therapy, particularly radiation therapy, is necessary to treat the cancer. If the cancer involves critical locations of the brain, patients can suffer from functional deficits that significantly limit their functionality and lifestyle. This causes an immense impact on the various quality of life domains for both the patient and family.

While the focus of this review will be on primary brain tumors, it is worth noting that the frequency of metastatic spread of systemic cancer to the CNS is approximately tenfold that of primary CNS disease. The blood-brain barrier naturally diminishes the efficacy of chemotherapeutic agents in the CNS and thus may function
as a “safe haven” for metastatic disease seed new lesions. There are an increasing frequency of CNS metastases now as compared to the past. Factors contributing to this rise in CNS metastases include the improved efficacy of systemic therapies and the increasing use and sensitivity of CNS imaging. The neuro-oncology service line works in coordination with the primary disease site teams to coordinate the patient’s cancer treatment.

**NEUROSURGICAL ONCOLOGY**

Approximately 80% of the patients who undergo surgical intervention come to attention via the CRMC emergency room and the neurosurgical service is often the initial point of contact. Surgical intervention is performed to obtain tissue for diagnosis and for oncologic treatment or control. The aim of neurosurgical resection of both primary...
and metastatic lesions is to attempt a gross total resection of the lesion without damage to the surrounding brain or spinal cord. Unlike surgery in other sites of the body, obtaining a “margin” is not possible secondary to the critical functional roles played by those areas of the brain. At times, a remnant tumor is purposefully left behind with an aim to preserve neurologic function.

The neurosurgeons at CRMC utilize a number of preoperative and intraoperative tools to maximize the extent of resection while minimizing the risk to patient neurologic function. A preoperative high resolution magnetic resonance imaging (MRI) is used to build a three-dimensional reconstruction of the patient’s cranial anatomy. The patient is then registered to this reconstruction using facial surface mapping. During the operation, the neurosurgeon can then point to any part of the patient’s brain and identify that area on the MRI. Real-time image guidance can be obtained through the use of intraoperative ultrasonography or computed tomography (CT). Instruments like the operating microscope and endoscope allow for better visualization of structure through small openings. By utilizing these tools, we can maximize resection of the tumor while minimizing damage to normal brain tissues resulting in improved preservation of neurologic function and less postoperative pain.

CRMC has developed a multidisciplinary team to accelerate and patient’s postoperative recovery and decrease their risk of developing complications. Typically, patients are admitted to the Neuro-Critical Care unit after their surgery. By postoperative day one, most will transfer to a stepdown or regular hospital bed on a specialized neurologic hospital floor. Patients are mobilized with assistance of the nurses, physical therapist and occupational therapists to prevent postoperative complications and assess their needs upon discharge. The use of a nurse navigator to transition care from the inpatient to outpatient setting, follow-up on test results, and coordinate follow-up appointments has also allowed for shortening of the patient’s hospitalization time. Through this multidisciplinary approach, although the number of patients who underwent a neurosurgical operation at CRMC has increased in the past few years, we have been able to decrease the patient’s length of stay.

RADIATION THERAPY

Radiation therapy for malignant and benign processes in the CNS typically utilizes high energy, intense electromagnetic radiation in the form of photons to break the DNA within the abnormal cells. The primary goal of radiotherapy is to maximize treatment effect to abnormal cells and simultaneously minimize the collateral effects on the surrounding normal tissue (Figure 6). Normal tissues repair themselves more efficiently, hence the differential action of radiation therapy towards damaging abnormal cells. It is often delivered con-

**FIGURE 6:** BEFORE (LEFT) AND AFTER (RIGHT) WHOLE BRAIN RADIATION THERAPY FOR METASTATIC BREAST CANCER WITH A HEAVY DISEASE BURDEN IN THE BRAIN. SAGITTAL POST-GADOLINIUM MAGNETIC RESONANCE IMAGING DEMONSTRATES AND EXCELLENT RESPONSE TO RADIOTHERAPY.
current with chemotherapy, which can sensitize the cells to the effects of radiation. Unlike chemotherapy, which interacts with the entire body, radiation therapy affects an area within the intended treatment volume. In addition, radiation therapy is not hindered by the blood-brain barrier for treatment of diseases of the CNS, a unique advantage for this vital treatment modality.

The planning and delivery of radiation therapy is a complex technical process. It includes a team consisting of an oncologist specializing in radiation therapy (a radiation oncologist), dosimetrist and physicist. A radiation therapist delivers the treatment with precision and safety. The radiation oncology nurses, specializing in the effects of radiation therapy, and the treating radiation oncologist help the patient through the treatment process by closely monitoring and managing treatment effects. The radiation oncologist determines the need and prescribed dose of radiation to be delivered. This is done within a multidisciplinary team and each case is discussed at a neuro-oncology tumor board with the presence and input of neurosurgery, medical oncology, radiology and pathology.

At the California Cancer Center, we are able to deliver the most sophisticated types of external beam radiation therapy (EBRT), including intensity modulated radiation therapy (IMRT) and volumetric arc therapy (VMAT) when necessary. Often, when treating brain tumors, critical structures such as the optic nerves, chiasm and brainstem must be spared, which is all easily achieved while maximizing tumor control with the technology available at our facility. We can also deliver more simple treatment with three-dimensional conformal radiation therapy (3DCRT) when appropriate for less complex clinical situations.

Radiation therapy plays a key role in definitive, adjuvant and palliative settings for almost all benign and malignant diseases of the CNS. Currently, our multidisciplinary team commonly treats a variety of benign diseases including pituitary adenoma, acoustic neuroma, meningioma, arteriovenous malformation (AVM) and trigeminal neuralgia. We also have considerable experience treating low and high grade glioma, including glioblastoma multiforme, typically after surgical resection when possible.

Stereotactic radiosurgery (SRS) is a technique in which a high dose of radiation is delivered to a target very accurately with a sharp reduction in dose outside of a target (Figures 7 (below), 8 (next page). Treatment can be delivered in a single session, but may be up to five treatment sessions. The dose of radiation delivered is very efficacious. Because of the high dose, sub-millimeter accuracy is necessary. Radiosurgery is delivered via CyberKnife at CRMC.

**Figure 7:** BEFORE (LEFT) AND AFTER (RIGHT) STEREOTACTIC RADIOSURGERY, DELIVERED BY CYBERKNIFE, FOR A SOLITARY BRAIN METASTASIS FROM LUNG CANCER. AXIAL TI POST-GADOLINIUM MAGNETIC RESONANCE IMAGING DEMONSTRATES AN EXCELLENT RESPONSE. THE RADIOSURGICAL PLAN IS SUPERIMPOSED AND SHOWN ON THE LEFT, WITH SPARING OF THE BRAINSTEM.
Our team of radiation oncologists, neurosurgeons, physicists, and radiation therapists work together to help deliver the highest quality radiosurgical plans for brain metastases, meningiomas, pituitary adenoma, arteriovenous malformations (AVMs), trigeminal neuralgia and spinal tumors. Brain metastases from sites including lung, breast, colon, rectal and many other cancers can also be addressed with CyberKnife when appropriate.

**MEDICAL NEURO-ONCOLOGY**

After surgical resection of a patient’s tumor, the medical oncologist takes the lead role in coordinating care between the multidisciplinary services for those patients who have a malignant lesion. With most malignant gliomas, patients undergo treatment with an oral chemotherapy agent (temazolamide) concurrent with their radiation therapy. After completion of radiation, the patient continues on monthly maintenance chemotherapy. The medical oncologist follows these patients with imaging to determine control or progression of the tumor. When recurrence or progression occurs, the medical oncologists can change therapeutic regimens and involve neurosurgery and/or radiation oncology as needed. Clinical trials are often another option for brain tumor patients, and most are run by the medical oncologists.

Metastatic lesions to the CNS are more frequent than primary brain tumors, and the incidence of metastases are increasing. The oncologist will often be the one to discover the metastasis during the course of treatment for systemic disease, and will make the referral to the neurosurgeon or radiation oncologist for treatment of the metastasis. After the subspecialists complete their treatment, the oncologist will typically take over primary treatment of the patient.

**NEURO-ONCOLOGY TUMOR BOARD**

With the involvement of multiple services in the care of the patient, there is a premium placed on communication and coordination of care. The weekly neuro-oncology tumor board held at CRMC provides a venue in which cases are discussed and a plan of care for the patient developed. This is attended by not only the physicians of the service lines mentioned above, but also by the neuroradiologists, neuropathologists, palliative care services, rehabilitation medicine and ancillary support services and social workers. All newly diagnosed patients are discussed at the tumor board to establish their course of therapy. Clinicians can also bring in cases with complex problems or challenging treatment questions to receive a multidisciplinary discussion and formulation of a consensus treatment recommendation. The neuro-oncology nurse navigator summarizes the recommendations of the tumor board in a formal report and helps to expedite care by the multiple service lines involved. The tumor board also serves as a forum to review the current literature and new
therapeutic modalities. It is open to all members of the medical community and provides continuing medical education (CME) credits to participants.

COMPASS CLINIC

A comprehensive approach to support patients and their families is crucial due to the medically complex nature of CNS cancers. Compass Cancer Care offers outpatient, transdisciplinary oncology support services that include nurse navigation, social work, speech language pathology and dietary. These services are a subspecialty of care integrated at the time of diagnosis to improve adherence to treatment, increase patient and provider satisfaction, and enhance quality of life while streamlining overall disease management. Compass Cancer Care is based on the premise of several Institute of Medicine reports (Cancer Care for the Whole Patient, Survivorship Lost in Transition), National Comprehensive Cancer Network guidelines, and accreditation standards of the CoC.

The Neuro-Oncology Compass team works cohesively to build a relationship with the patient and family across the illness trajectory to ensure synergistic care coordination during treatment and continued support once treatment is over; when support is often most vital. Proactive assessments and evidence-based interventions by each discipline optimize biomedical outcomes and overall patient experience. Each member of the team monitors and addresses the myriad of difficulties and distress patients and families experience from the time they are informed they have a cancer diagnosis.

Compass services for neuro-oncology patients includes the following:

- Patient navigation
- Education and assistance with managing pain, symptom and treatment side effects
- Instrumental assessments for swallowing and voice including videostroboscopy, fiberoptic endoscopic evaluation of swallowing (FEES) modified barium swallow studies (MBSS)
- Cognitive assessment and therapy, including peri-operative language assessment
- Awake craniotomies
- Dysphagia therapy
- Speech, language, voice, and dysphagia assessment and treatment including voice prosthesis management
- Augmentative and alternative communication (AAC)
- Nutritional assessment and interventions
- Individual and family counseling
- Assistance with advanced care planning, advanced directives and power of attorney
- Support with anticipatory grief and bereavement

SUMMARY

Cancer of the nervous system may be less common than cancers of other organ systems, but is particularly devastating due to its aggressive nature. Furthermore, neuro-oncologic disease often has a devastating impact on the quality of life due to the neurologic deficits and loss of function it causes. For patients whose mobility is affected, their ability to travel to receive medical care may be limited. Coordination of care is critical to ensure that these patients receive the maximal level of care while limiting the impact on not only the patient, but also their family and caregivers. By expanding its neuro-oncologic service line, CMC brings to its patients in California’s Central Valley the same high level, multidisciplinary care available at the top academic institutions nationwide.

BIBLIOGRAPHY
