2013 - 2014 Cancer Program Annual Report

Featuring Liver Cancer Quality and Outcomes
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter from the Cancer Program Medical Director</td>
<td>3</td>
</tr>
<tr>
<td>California Pacific Medical Center Cancer Committee</td>
<td>5</td>
</tr>
<tr>
<td>Annual Summary of Program Activities</td>
<td>6</td>
</tr>
<tr>
<td>Breast Center of Excellence</td>
<td>7</td>
</tr>
<tr>
<td>Colorectal Cancer Center of Excellence</td>
<td>8</td>
</tr>
<tr>
<td>Overview of Cancer Services</td>
<td>9</td>
</tr>
<tr>
<td>CPMC Cancer Case Volume</td>
<td>9</td>
</tr>
<tr>
<td>Cancer Research</td>
<td>11</td>
</tr>
<tr>
<td>Philanthropy Support</td>
<td>13</td>
</tr>
<tr>
<td>Quality and Outcomes</td>
<td>14</td>
</tr>
<tr>
<td>Cancer Program Practice Profile Reports 2009-2011</td>
<td>15</td>
</tr>
<tr>
<td>Annual Quality Study: Treatment Patterns and Outcomes of Hepatocellular Carcinoma, 2009-2013</td>
<td>16 - 27</td>
</tr>
<tr>
<td>Overview</td>
<td>16</td>
</tr>
<tr>
<td>Analysis</td>
<td>17</td>
</tr>
<tr>
<td>Conclusion</td>
<td>26</td>
</tr>
</tbody>
</table>
Welcome from the Medical Director

Mohammed Kashani-Sabet, MD
Medical Director, Cancer Program

Dear Colleagues and Friends,

We are pleased to present the 2013 - 2014 Sutter Health CPMC Cancer Program Annual Report. This summary of our program offerings and activities showcases California Pacific Medical Center’s ability to offer the full spectrum of comprehensive cancer care, from diagnosis through treatment and survivorship.

In 2013, we were proud to have our program’s excellence recognized through re-accreditation by the American College of Surgeons (ACS) Commission on Cancer. In addition, ACS has recognized CPMC as one of 37 National Surgical Quality Improvement Program (NSQIP®) participating hospitals that has achieved meritorious outcomes for surgical patient care.

In this report you will find a statistical overview of CPMC Cancer Registry data and a quality report on liver cancer (hepatocellular carcinoma) treatment and outcomes for patients seen at CPMC from 2009-2013.

Some of our 2013 program achievements we would like to highlight include:

- Launch of the Breast Center of Excellence, led by Dr. Peter Richards, to develop an interdisciplinary, patient-centric approach to breast cancer care
- Engaging 12% of our patients in clinical research, including 108 patients enrolled in clinical trials and an additional 145 patients enrolled in other clinical cancer research
Welcome from the Medical Director

- Publication in prestigious journals, such as *Journal of Clinical Oncology*, *Journal of the National Cancer Institute*, and *Cancer Research*
- Installation of a second Rapid Arc® treatment capability in Radiation Oncology
- Launch of the Volunteer Cancer Liaison Program, an innovative program to engage community members as patient navigators and provide cancer patient support
- Addition of a dedicated colorectal cancer nurse navigator to provide education and support
- Successful implementation of Epic at CPMC as the Sutter Electronic Health Record in November 2013, to improve patient safety and quality
- Establishment of a Philanthropy Cancer Leadership Council to guide our Cancer Center campaign

On behalf of our Cancer Committee, we wish to acknowledge the collaboration with our medical staff, an experienced group of subspecialty physicians who always strive to work as a team to meet our patients’ needs. In addition, our cancer program is differentiated by the dedication of our staff, volunteers, and community members who help support our goal of providing high quality, personalized cancer care.

We hope you learn from our report and appreciate the scope of services available at California Pacific Medical Center. For more information, please visit our website at cPMC.org/cancer.
Sutter Health CPMC’s Cancer Committee is a multidisciplinary team with physician representatives from diagnostic and treatment specialties, and staff from administrative and supportive services. The committee meets six times a year to provide leadership in evaluating, monitoring, and coordinating cancer-related activities and programs throughout CPMC.

Michael Abel, MD
Surgeon

Linda Blum, RN, MS, GNP
Palliative Care Representative

Ari Baron, MD
Quality Improvement Coordinator
Medical Oncologist

Jeremy Bornstein, PhD
Psychosocial Services Coordinator

Caroline Behler, MD
Cancer Registry Quality Coordinator
Medical Oncologist

Colleen Ferguson, RN, MS, CNS
Oncology Nursing Representative

Melissa Carassus, RN
Oncology Nursing Representative

Benson Chen, MD
Cancer Liaison Physician, Pulmonologist

Shruti Iyer, RN
Quality Improvement Representative

Judy Doyle, MD
Case Conference Coordinator, Pathologist

Hamila Kownacki, RN
CAO/VP Operations

Kathleen Grant, MD
Community Outreach Coordinator, Medical Oncologist

Joyce Louie, CTR, RHIT
Cancer Registrar

Mohammed Kashani-Sabet, MD
Medical Director, Cancer Programs

Karen Sein
Cancer Services Director

John Lee, MD
Cancer Committee Chairman
Radiation Oncologist

Jamey Schmidt, RD
Clinical Research Coordinator

Myron Marx, MD
Radiologist

Jessica Stuhl, MSW
Oncology Social Worker
California Pacific Medical Center has a long tradition of providing state-of-the-art, multidisciplinary cancer care with a personalized approach. The Cancer Committee's accomplishments in 2013 have helped advance the quality of our cancer services:

- Conducted our first triennial Community Health Needs Assessment to identify areas where we can provide patient navigation resources and improved community cancer screening, education and outreach
- Expanded distress screening to patients in outpatient chemotherapy infusion
- Achieved certification for 24% of our oncology nursing staff as an Oncology Certified Nurse®
- Implemented a policy to ensure adequate lymph node resection for colon cancer cases
- Launched a colorectal cancer screening campaign, in partnership with the Sutter West Bay Physician Advisory Committee, by sending more than 4,300 educational letters to Sutter West Bay employees over age 50, and promoting colorectal cancer screening awareness with posters and screensavers
- Maintained a 93% overall follow-up rate and 100% five-year follow up rate of patient status tracked in our cancer registry

CPMC’s multidisciplinary care is best evidenced by our high volume of cancer case conferences (tumor boards). Case conferences provide a forum for physicians from various disciplines to discuss complex cases and share their expertise to arrive at the best options for the patient’s treatment. In 2013, CPMC held 201 cancer case conferences across thirteen areas: breast, colorectal, endocrine, gastrointestinal, general cancer, gynecologic oncology, head and neck, liver, melanoma, neuro-oncology, thoracic, urologic, and cases focused on St. Luke’s campus. The 969 cases presented represent 46% of our analytic case load.

To improve community education on cancer prevention and treatment, CPMC presented educational talks in conjunction with the Community Health Resource Center on breast cancer, lung cancer, and Non-Hodgkin’s Lymphoma. We provided a free one-day conference for cancer survivors and partnered with AIM at Melanoma to host a Melanoma Patient and Caregiver Symposium.

Lastly, we have proudly continued our long-standing African American and Sister to Sister Breast Health Programs, which provide free breast cancer screenings to underserved community members. Through this program, we provided 425 free patient visits in 2013. Five women screened received a cancer diagnosis and follow-up care.
The CPMC Breast Center of Excellence (COE) Program launched in March 2013 to institute evidence-based practices and standard processes, and ensure high-quality patient-centered breast care. The program’s goal is to attain accreditation by the National Accreditation for Program Breast Centers (NAPBC) in 2015.

The Steering Committee has developed clinical guidelines for: patient follow up, use of multigene assays in prognostic determination, cancer genetic risk assessment, pre-surgery protocol, and use of MRI. As the inaugural quality improvement study, the COE also analyzed patient retention and timeliness of care from breast cancer diagnosis to surgery to identify opportunities for improvement. Lastly, the Breast COE also met with several CPMC Research Institute (CPMCRI) investigators interested in breast cancer to further the cross-collaboration between scientists and clinical practice.

I would like to thank the Steering Committee members and their dedication to the development of the breast program: Roy Abendroth, MD, Margo Cusack, Judy Doyle, MD, Kathleen Grant, MD, William Goodson, MD, Kevin Knopf, MD, Jessica Leung, MD, Karen Sein, and Wei Wang, MD.

Peter Richards, MD, FACS
Medical Director, Breast Center of Excellence
In 2013 the Colorectal Cancer Center of Excellence continued to review quarterly data on our colorectal cancer patients, including process measures and outcomes data to improve our care. We have found that standardizing clinical care and following established pathways leads to a decrease in infectious complications. One example is our collaborative effort to ensure analysis of an appropriate number of harvested lymph nodes during surgical resection.

In 2013 we implemented a nurse navigator position to provide support and education solely for colorectal cancer patients. The nurse navigator meets with each patient prior to surgery to assist, inform and educate. Our navigators follow each patient during his/her hospital stay and following discharge to ensure access to follow up care with medical oncology and radiation oncology if appropriate. We have seen a significant increase in patient satisfaction due to the personalized care our nurse navigator offers.

We look forward to continuing to improve our clinical outcomes in 2014 by implementing an enhanced recovery protocol for our surgical patients.
Offering comprehensive cancer care to more than 2,300 individuals each year, CPMC’s Cancer Program provides a full spectrum of cancer services, from diagnosis through treatment and research. We bring together leading-edge medicine with personal care and support. Our goal is to partner with each patient, from cancer diagnosis through survivorship. In 2013 our cancer registry reported 2,708 patients seen at our facility, of which 2,213 were analytic cases.

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Cases</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>483</td>
<td>21.8%</td>
</tr>
<tr>
<td>Colorectal</td>
<td>204</td>
<td>9.2%</td>
</tr>
<tr>
<td>Melanoma</td>
<td>197</td>
<td>8.9%</td>
</tr>
<tr>
<td>Pancreas</td>
<td>181</td>
<td>8.2%</td>
</tr>
<tr>
<td>Digestive</td>
<td>159</td>
<td>7.2%</td>
</tr>
<tr>
<td>Thoracic</td>
<td>147</td>
<td>6.6%</td>
</tr>
<tr>
<td>Liver</td>
<td>141</td>
<td>6.4%</td>
</tr>
<tr>
<td>Gynecologic</td>
<td>111</td>
<td>5.0%</td>
</tr>
<tr>
<td>Head &amp; Neck</td>
<td>105</td>
<td>4.7%</td>
</tr>
<tr>
<td>Lymphatic</td>
<td>84</td>
<td>3.8%</td>
</tr>
<tr>
<td>All Other Cancers</td>
<td>401</td>
<td>18.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,213</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Our comprehensive cancer services and programs include:

- **Cancer Registry**: tumor boards and in-house registry
- **Cancer Surgery**: minimally invasive surgery
- **Interventional Radiology**: ablation, chemoembolization, and radioembolization
- **Clinical Trials and Research**
- **Community Services**: cancer education programs, cancer prevention and screening
- **Imaging Services**, accredited by the American College of Radiology: computed tomography (CT)*, breast ultrasound*, breast MRI*, mammography*, MRI*, position emission tomography (PET), stereotactic breast biopsy*, ultrasound*, and ultrasound core needle biopsy*
- **Pediatric Cancer Services**
- **Radiation Oncology Services**: brachytherapy, intensity-modulated radiation therapy (IMRT), image-guided radiation therapy (IGRT), intraoperative radiation therapy (IORT), stereotactic radiosurgery and radiotherapy (SRS/SRT)
- **Patient Navigation**: nurse navigators, oncology social workers, volunteer cancer patient liaison program, and psychosocial counseling
- **Support Groups**: breast cancer, colorectal cancer, cancer caregivers, liver cancer, and melanoma; Cancer Buddy program
- **Supportive Services**: Advanced Illness Management, chaplaincy, health psychology, integrative medicine, home care, hospice, lymphedema support, massage therapy, nutrition, palliative care, and pain management
- **Therapeutic Services**: chemotherapy and targeted therapy infusions, physical therapy and rehabilitative services

*accredited as a Breast Center of Excellence service by American College of Radiology
The CPMC Research Institute (CPMCRI) brings clinicians and researchers together to discover improved treatments and diagnostic technologies in all cancer areas. The connection between research and clinical care is especially important within cancer, as clinical trials can be an important treatment option for patients with specific health needs. CPMCRI maintains biorepositories that help predict the risk of breast cancer, pinpoint early molecular events underlying glioblastoma, and identify aggressive melanomas before onset of disease. Our clinical and translational scientists help make research an integral foundation for improved patient care at CPMC.

In 2013, cancer researchers at CPMCRI collectively published 44 articles in peer-reviewed journals. Some of our noteworthy publications include:


For more information about CPMCRI, please visit [cpmc.org/research](http://cpmc.org/research)
Philanthropy Support

As a not-for-profit medical center, Sutter Health CPMC relies on grateful patients and friends to help us fulfill our promise of delivering exceptional, compassionate care to everyone in our community. Donations to CPMC cancer programs help fund crucial scientific research, patient services, programs, and equipment. In 2013, generous donors contributed more than 850 gifts totaling nearly $2.1 million. For more information about giving opportunities, please visit cpmc.org/giving

Grateful patient, generous friend

The late Bill Payden worked for many years in journalism and media education, but when he got the news he had melanoma, it was a story of which he wanted no part. And though he lived in Southern California, Bill chose CPMC’s Center for Melanoma Research and Treatment because its multidisciplinary approach offered him choices other facilities did not.

Bill was impressed with the personalized care he received and often credited it with extending his life. Because of that, he and his sister Joan made multiple gifts to the center through their family foundation. “It’s our way of helping others get the same great care I did,” Bill used to say.

When he passed away in 2013, Bill also left CPMC with a very generous estate gift, bringing his family’s philanthropic investment to nearly $1.5 million. “People like the Paydens are crucial to our ongoing success,” says the center’s director Mohammed Kashani-Sabet, M.D. “Gifts like theirs are helping make it possible for us to develop new and better ways to fight melanoma.”
Quality and Outcomes

As part of our commitment to quality performance and continuous improvement, CPMC publicly shares cancer patient volumes and quality measures. The following section of our annual report represents our ongoing efforts to collect data and measure results to improve quality, safety, and patient outcomes. Over time, we hope that this data helps showcase our strengths in clinical excellence and patient-centered care.

**Cancer Program Practice Profile Reports (CP3R) 2009-2011**

As an American College of Surgeons Commission on Cancer (CoC) accredited institution, CPMC participates in the Cancer Program Practice Profile Reports (CP3R). CoC provides the performance rates shown below as an estimate of the proportion of patients concordant with measure criteria by diagnosis year. If appropriate, the CoC Standard and benchmark compliance rate is provided.

Each year, our cancer committee reviews the CP3R data to evaluate care and how processes can be improved to promote evidenced-based practice. Overall, we are pleased to share that CPMC meets or exceeds the compliance rate in nearly all measures. In the areas that did not meet the standard, our cancer committee researched the reasons why performance rates were not achieved and developed action plans to improve our processes.
## Cancer Program Practice Profile Reports (CP3R) 2009-2011

### Estimated Performance Rates (%)

<table>
<thead>
<tr>
<th>Measure</th>
<th>CoC Standard (%)</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast conservation surgery rate for woman with AJCC clinical stage 0, I, or II breast cancer</td>
<td>Not Applicable</td>
<td>72.6</td>
<td>72.6</td>
<td>74.9</td>
</tr>
<tr>
<td>Image or palpation-guided needle biopsy (core or FNA) is performed to establish diagnosis of breast cancer</td>
<td>80%</td>
<td>74.0</td>
<td>88.6</td>
<td>84.5</td>
</tr>
<tr>
<td>Radiation therapy is considered or administered following any mastectomy within 1 year (365 days) of diagnosis of breast cancer for women with $\geq 4$ positive regional lymph nodes</td>
<td>90%</td>
<td>66.7</td>
<td>85.7</td>
<td>66.7</td>
</tr>
<tr>
<td>Radiation is administered within 1 year (365 days) of diagnosis for women under the age of 70 receiving breast conservation surgery for breast cancer</td>
<td>90%</td>
<td>93.9</td>
<td>93.0</td>
<td>94.2</td>
</tr>
<tr>
<td>Combination chemotherapy is considered or administered within 4 months (120 Days) of diagnosis for women under 70 with AJCC T1cNO, or stage IB - III hormone receptor negative breast cancer</td>
<td>90%</td>
<td>100</td>
<td>92.3</td>
<td>95.0</td>
</tr>
<tr>
<td>Tamoxifen or third generation aromatase inhibitor is considered or administered with 1 year (365 days) of diagnosis for women with AJCC T1c or stage IB-III hormone receptor positive breast cancer</td>
<td>90%</td>
<td>92.2</td>
<td>94.8</td>
<td>94.4</td>
</tr>
<tr>
<td>Adjuvant chemotherapy is considered or administered within 4 months (120 Days) of diagnosis for patients under the age of 80 with AJCC stage III (lymph node positive) colon cancer</td>
<td>90%</td>
<td>100</td>
<td>86.7</td>
<td>100</td>
</tr>
<tr>
<td>At least 12 regional lymph nodes are removed and pathologically examined for resected colon cancer</td>
<td>85%</td>
<td>88.1</td>
<td>86.3</td>
<td>78.1</td>
</tr>
<tr>
<td>Radiation therapy is considered or administered within 6 months (180 days) of diagnosis for patients under the age of 80 with clinical or pathologic AJCC T4N0M0 or stage III receiving surgical resection for rectal cancer</td>
<td>Not Applicable</td>
<td>100</td>
<td>100</td>
<td>91.7</td>
</tr>
</tbody>
</table>

Estimated 2009 performance rates are current as of January 2014, and 2010 and 2011 estimated rates are current as of December 2014. For more information about CP3R, see: http://www.facs.org/cancer/qualitymeasures.html
Annual Quality Study

California Pacific Medical Center: Treatment Patterns and Outcomes of Hepatocellular Carcinoma, 2009-2013
By Jennifer Lee, MD, Jennifer Guy, MD, Karen Sein, Ari Baron, MD

Overview

Hepatocellular carcinoma (HCC) is the fourth most common cancer in the world, with an estimated 33,190 new cases diagnosed in the U.S. in 2014 and 23,000 deaths. Chronic hepatitis B (HBV) and hepatitis C (HCV) are recognized as major risk factors for HCC, and account for about 30-40% of HCC in the United States. Other major risk factors include alcoholic cirrhosis and nonalcoholic fatty liver disease.

Epidemiological studies show racial, ethnic, gender and geographic differences in HCC incidence. The American Association for the Study of Liver Disease (AASLD) recommends screening for HCC in high-risk populations, including patients with hepatitis C cirrhosis, certain at-risk groups with hepatitis B, and patients with cirrhosis due to other causes.

Diagnosis of HCC is based on imaging studies, with biopsy reserved for indeterminate lesions. Radiological diagnosis requires contrast-enhanced study with either CT scan or MRI. If typical imaging features of arterial enhancement and portal venous washout are present, HCC can be diagnosed radiologically with high sensitivity and specificity.

The most commonly employed staging systems for HCC are tumor, node, metastasis (TNM) and Barcelona Clinic Liver Cancer (BCLC). The TNM system recognizes the prognostic importance of the number of tumors and the presence and extent of vascular invasion within the tumor. The BCLC staging system classifies patients with HCC into five categories (very early, early, intermediate, advanced, and terminal), and takes into account tumor stage, liver function, and the patient’s functional status (using the Eastern Cooperative Oncology Group (ECOG) classification). The BCLC classification is the most commonly applied treatment algorithm for patients with HCC, and we will refer to this algorithm in this site study.

In general, treatment is guided by resectability of the tumor, underlying liver function, and patient performance status. In patients with preserved liver function without advanced cirrhosis or portal hypertension, surgical resection is advocated for resectable HCC. In patients who are not candidates for resection either due to tumor burden, technical reasons, or advanced liver disease, liver transplantation can be considered assuming there is limited tumor burden meeting Milan criteria (one lesion less than five centimeters or three lesions...
Locoregional therapy with ablative therapies or arterially directed chemoembolization or radioembolization improves survival in patients with nonsurgical disease. These therapies are also used as bridging therapy to treat HCC while patients are awaiting transplantation. Rarely is external-beam radiation therapy used as a treatment modality.

This report focuses on the epidemiology, treatment, and outcomes of HCC at Sutter Health CPMC from 2009-2013. CPMC is a comprehensive community cancer program and tertiary referral center with an active liver transplant program. Patients with liver cancer are evaluated and treated through the liver cancer program which includes a weekly multidisciplinary liver cancer clinic and tumor board.

Analysis

Incidence, Epidemiology

The Centers for Disease Control’s National Program of Cancer Registries (NPCR) and the National Cancer Institute’s Surveillance, Epidemiology, and End Results (SEER) surveillance system reported the average annual incidence rate of HCC for 2001-2006 was 3.0 per 100,000 persons. The annual incidence rate over this six-year period increased, from 2.7 per 100,000 persons in 2001 to 3.2 in 2006. HCC incidence rates widely varied among geographic sites as well as racial and ethnic groups.

From 2001-2006, California’s average annual number of cases was 1,264, which equated to an average annual incidence rate of 3.9 per 100,000; higher than the U.S. average annual incidence rate.
At CPMC, we saw 815 HCC cases from 2009-2013. The racial/ethnic breakdown in diagnoses showed the majority of cases occurred in whites (56%), followed by Asian/Pacific Islanders (24%) and Hispanics (10%). This is compared to the incidence rates reported by the CDC, in which Asians/Pacific Islanders comprised the majority at 7.8 per 100,000 persons, followed by blacks, American Indians/Alaska Natives, and whites.

Risk Factors

Important risk factors for HCC include chronic HBV infection and cirrhosis due to chronic HCV infection, as well as alcohol and nonalcoholic liver disease. At CPMC, HBV-positive status was seen in 19% of HCC cases and HCV seen in 58%. Also significant was the presence of heavy alcohol use (37%) and history of fatty liver disease (25%) in our population.
Presentation

Among the numerous systems in place to stage HCC, the TNM and BCLC staging systems are the most commonly utilized. The BCLC system includes the extent of the primary lesion, patient performance status, and severity of liver disease. This system divides disease into five stages: very early (O), early (A), intermediate (B), advanced (C), and terminal (D). The TNM system is useful in classifying disease into four stages associated with well-studied prognostic outcomes.

- Stage 1 disease requires a solitary tumor without vascular invasion;
- Stage 2 disease is a solitary tumor with vascular invasion or multiple tumors less than or equal to 5 centimeters without regional lymph node involvement;
- Stage 3 disease includes large tumors or invasive tumors without nodal metastasis;
- Stage 4 disease includes tumors with invasion of adjacent organs or nodal or distant metastasis.
In CPMC, the majority of patients with HCC diagnosed 2009-2013 presented with stage 1 disease (44%). Stage 2 disease comprised 23% of cases, stage 3 disease 16%, and stage 4 disease 6%. This is contrasted to the National Cancer Data Base (NCDB) summary from 2000-2011, which shows a fairly even distribution of stages 1, 2, 3, and 4 at time of diagnosis (20%, 16%, 21%, 20% respectively). The NCDB data includes 23% of patients with unknown stage, whereas CPMC data has only 5% of cases with unknown stage. This demonstrates our institution’s value placed on completeness of care, beginning at the time of diagnosis and staging.
Evaluation of Treatment

There are several guidelines used to direct treatment of HCC, including those by the National Comprehensive Cancer Network (NCCN) and the American Association of Liver Disease (AASLD). BCLC staging classification and treatment algorithm is shown in the figure below and is the most commonly applied treatment algorithm.

![Figure 4: BCLC Staging and Treatment Algorithm](chart)

Treatment guidelines for HCC differentiate groups based on resectability of disease, extent of disease, and patient status/comorbidities. The degree of cirrhosis and hepatic reserve, quantified by the Child-Pugh Score, is also taken into account when determining HCC treatment.

- Treatment for stage A disease is resection or transplantation unless surgery is not feasible due to underlying liver disease or associated comorbidities. It is notable that invasive procedures with curative intent are reserved for early stage disease.
- Stage B disease is treated with transarterial chemoembolization (TACE and TABE) and radioembolization. While the choice of chemotherapeutic agent is not standardized, TACE with doxorubicin or a mixture of doxorubicin, cisplatin, and mitomycin C is used. TABE with doxorubicin has shown lower rates of hepatobiliary toxicity with similar rates of tumor control.
- In stage C disease, systemic therapy with sorafenib, a multiple kinase inhibitor, is recommended.
- Supportive care is offered for terminal stage D.

CPMC treatment data is organized according to TNM stage, which creates some difficulty when comparing with treatment groups described above. In general, however, treatment of stage 1 and 2 disease were similar, as well as treatment of stage 3 and 4 disease. Among surgical treatments, transplantation or resection occurred in 22% of stage 1 and 24% of stage 2 disease. This is contrasted to surgical treatment in stage 3 and 4 disease, in which transplantation or resection was performed in 5% and 2% of cases, respectively. Of note, these surgical modalities are utilized in 8-14% of cases nationally.

Ablative therapies were used in 16% of stage 1 and 12% of stage 2 disease, while use was minimal in stages 3 and 4.
With regards to treatment by radiation therapy, no radiation therapy comprised 98% and 97% patients in stage 1 and 2 disease, respectively. Radiation therapy was more often used in patients with stage 3 (11%) and stage 4 disease (12%). While HCC is a radiosensitive tumor, radiation therapies are often reserved for symptom palliation given its toxicity in the liver, an extremely radiosensitive organ. The relatively more frequent use of radiation in advanced stages likely reflect the treatment of more extensive disease.

CPMC data shows that in HCC stages 1 and 2, treatment consisted of systemic therapy in 65% and 79% of cases, respectively. At CPMC, systemic therapy includes locoregional treatment with chemoembolization (TACE and TABE). Analysis of chemotherapy agents used revealed that all single-agent chemotherapy cases used chemoembolization with doxorubicin directly or by drug-eluting beads. When multi-agent chemotherapy or chemotherapy not otherwise specified (NOS) was utilized, it consisted of chemoembolization with a doxorubicin, mitomycin-C, and carboplatin/cisplatin, and some use of sorafenib. When sorafenib use is alone or in addition to above agents is not discernible in our data. In contrast, systemic therapy use in stage 3 disease was 51%, in stage 4 disease 41%; many of these later stage patients represent those that are received treatments from clinical trials.

<table>
<thead>
<tr>
<th>Figure 6: CPMC HCC Patients 2009-2013: Systemic Therapy by TNM Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systemic Therapy</strong></td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Chemoembolization</td>
</tr>
<tr>
<td>Sorafenib (only)</td>
</tr>
<tr>
<td>Other chemotherapy agent(s)</td>
</tr>
<tr>
<td><strong>No Systemic Therapy</strong></td>
</tr>
<tr>
<td>None, not planned</td>
</tr>
<tr>
<td>Contraindicated</td>
</tr>
<tr>
<td>Patient Expired</td>
</tr>
<tr>
<td>Patient Refused</td>
</tr>
<tr>
<td>Recommended, not given</td>
</tr>
<tr>
<td>Recommended, unknown if given</td>
</tr>
<tr>
<td>Unknown status</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>
In regards to clinical trial participation, 9% of CPMC’s HCC total patient population were enrolled in clinical trials from 2009-2013. Of stage 3 and 4 disease, 38% of patients were placed in clinical trials. Considering that only patients with Child-Pugh A disease are candidates for HCC clinical trials and Child-Pugh A patients represent about less than half of the stage 3 and 4 population, CPMC’s enrollment of late-stage HCC patients in clinical trials is quite high. In comparison, less than 5% of cancer patients are enrolled in clinical trials nationally.

In determining whether CPMC is compliant with evidence-based guidelines for HCC treatment, one of the limitations of this study is the ability to analyze the treatments received by our patients by BCLC stage. The CPMC treatment data collected for this study is organized by AJCC TNM stage, which does not directly correlate with the algorithmic treatment design of the BCLC guideline. While this makes it difficult to compare our data with BCLC guidelines, organization of data by disease stage is the most practical and objective, and it can be implied that stage 1 disease correlates with stage 0 and some stage A, stage 2 disease with stage A and some stage B, and stage 3 with stage B.

Our data demonstrates that CPMC is compliant with treatment guidelines recommending that curative therapies be used for early disease and palliative therapies like chemoembolization and systemic chemotherapy for late stage disease. At CPMC one-third of patients in early stage disease received resection or transplant, as compared to national data showing that 8-14% of all patients receive resection or transplant. Likewise we are appropriately selecting patients for treatment by stage, in that less than 10% of patients with advanced stage are receiving surgical procedures. In addition, consistent with national guidelines, radiation therapy is minimally used at CPMC, and is appropriately provided to patients with more advanced disease, likely reflecting the need for symptom palliation in advanced stages. CPMC data on systemic therapy shows that a majority of patients with early and intermediate disease are appropriately treated with chemoembolization and sorafenib use alone was appropriately used in patients with advanced disease.
Outcomes

The national cumulative survival rate for HCC from 2003-2006, as reported by 1,373 programs in the National Cancer Data Base (NCDB), shows that 5-year survival rate for HCC declines significantly with stage: 33% 5-year survival at stage 1; 26% stage 2; 6% stage 3; and 2% stage 4. When comparing national 5-year survival rates to those at CPMC from 2009-2013, patients treated at CPMC have statistically significantly longer survival rates overall and for stage 1 and stage 2 disease. Compared to the national 5-year survival rate at stage 1 (33%), CPMC demonstrated a 5-year survival rate of 54%. CPMC also had better outcomes for stage 2 disease (33%) than seen nationally (26%).

**Figure 7:** Five Year Survival: CPMC HCC Patients 2009-2013 compared to NCDB 2003-2006
Conclusion

We performed our HCC site study to monitor treatment compliance with evidence-based guidelines. In addition to demonstrating that Sutter Health CPMC follows national guidelines, our data shows that patients with HCC fare better at CPMC than at the average institution nationally.

Survival data from 2003-2006 shows that CPMC’s 5-year survival rate for liver cancer cases overall and, most strikingly, for stage 1 disease, exceed the survival outcomes in the National Cancer Database, a difference that is statistically significant. CPMC’s overall 5-year survival rate was 27% compared to 17% nationally; CPMC stage 1 patients had a 54% 5-year survival rate, compared to 33% nationally. Stage 3 and 4 survival rates between CPMC and national data were more similar, due to the lack of effective therapies for advanced HCC as well as the important contributor of underlying cirrhosis and progressive liver dysfunction.

A reason for CPMC’s favorable outcomes is that the medical center has an active multidisciplinary team of experienced clinicians who provide comprehensive cancer treatments and care, including an active liver transplant center, a high-volume
interventional radiology department, and a commitment to clinical trials of new cancer drugs. Hepatologists, surgeons, oncologists and radiologists have weekly conferences to discuss cases, and we can initiate treatment rapidly, in a multidisciplinary and longitudinal manner.

HCC patients treated at CPMC also tend to have early stage disease at diagnosis when compared to national data. This reflects that CPMC is a referral center that offers transplant, resection, and locoregional therapies.

Given CPMC’s strength in effectively applying early-stage curative therapies, a focus of improvement and growth includes improved education of referring providers on HCC surveillance and diagnosis to enhance the diagnosis of HCC at early stage disease. Likewise, given our high rates of clinical trial enrollment, ongoing collaboration to enhance clinical trials access for patients with advanced stage disease is an area we can build upon. An understanding of where and why practice variation in application of surgical and nonsurgical procedures exists can help us understand limitations to treatments and develop programs to improve access to and quality of care. Lastly, better data tracking of treatment modalities, especially for patients receiving both locoregional and surgical therapy, will be helpful in analyzing outcomes in the future.

In summary, this site study has helped us gain insight into the presentation, treatment, and outcomes of HCC at CPMC. Patients at our institution tend to present with early stage disease but also experience more favorable outcomes at early stage disease as compared to national data. Our understanding of why we experience these improved outcomes helps us identify what factors are important in successful treatment of HCC and will help us continue to improve.

References
4. National Cancer Data Base, Commission on Cancer. Hospital Comparison Benchmark Reports and Survival Reports.
Cancer Program
California Pacific Medical Center
2333 Buchanan Street
San Francisco, CA 94115
Tel. 415-600-6000
www.cpmc.org/cancer

For patient referrals and transfers please call 1-888-637-2762.