

SYNTHESIS

THE MAGAZINE OF UC DAVIS COMPREHENSIVE CANCER CENTER VOL 17 • NO 1 • SPRING/SUMMER 2014

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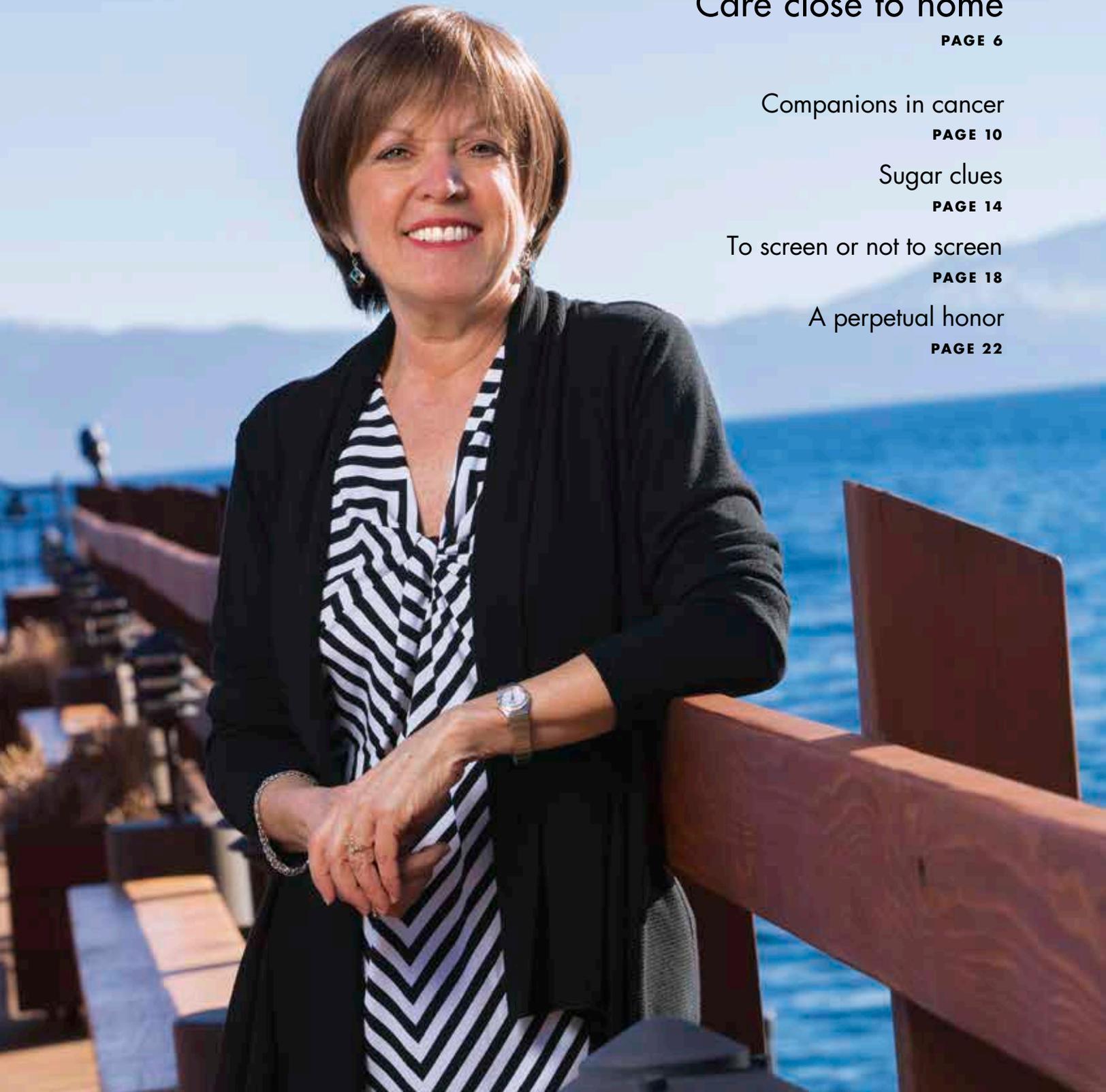
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Dear Reader,

What distinguishes a comprehensive cancer center from other cancer centers is team science — the ability, determination and obligation to link scientists and physicians from distinctly different disciplines to work on tough problems together.

This issue of *Synthesis* covers several projects that engage multidisciplinary teams of professionals, all with the single goal of improving outcomes for patients.

The research partnership between specialists at the UC Davis School of Veterinary Medicine and the UC Davis Department of Radiation Oncology, for example, demonstrates how the trial of an immunotherapy agent combined with radiation can extend life for dogs with melanoma, and may one day offer hope to human melanoma patients, as well. Clinicians and scientists also are pursuing the exciting field of glycomics in their joint search for biomarkers for ovarian and other cancers that are often caught too late for treatment to be effective.

Team science doesn't always take place in laboratories.

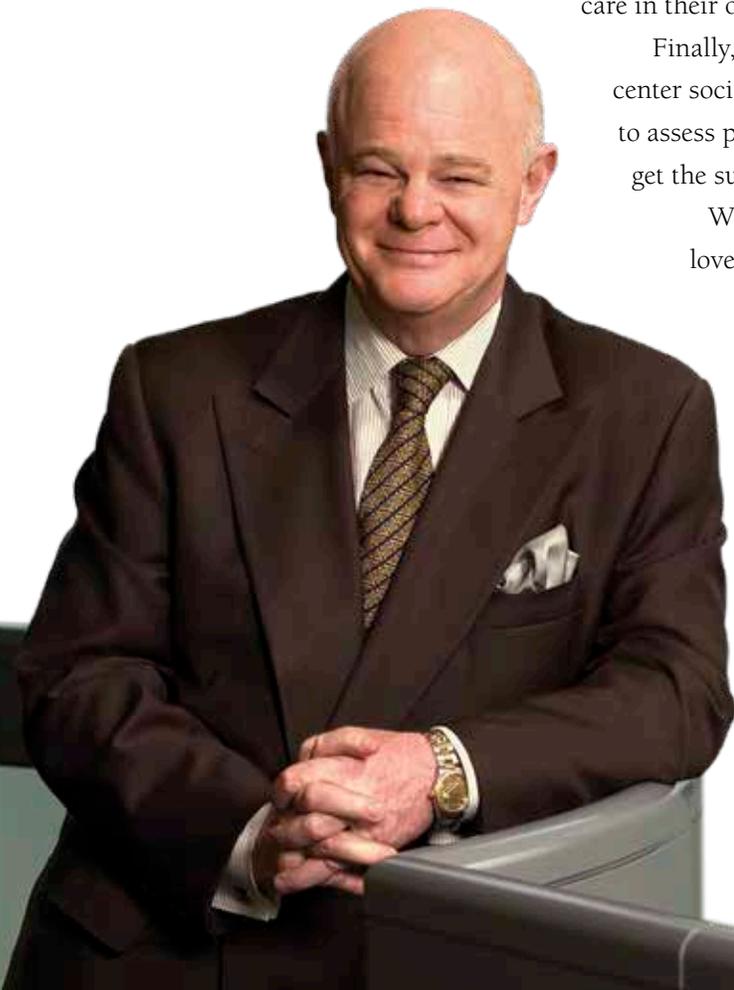
In our story about the Cancer Care Network and Tahoe area resident Lisa Peltier, for example, you will read how teams of physicians from UC Davis and our network hospitals use telemedicine and virtual tumor boards to plan complex treatment and clinical trials participation so that patients can get leading-edge care in their own communities.

Finally, this issue's Outreach feature describes how cancer center social workers are teaming with physicians on a new tool to assess patients' social and emotional needs so that they can get the support they need throughout their care.

We hope you enjoy this issue of *Synthesis*, and we would love your feedback. Contact our editor, Dorsey Griffith, at Dorsey.griffith@ucdmc.ucdavis.edu.

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SYNTHESIS

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Breaking Barriers to Beat CancerSM



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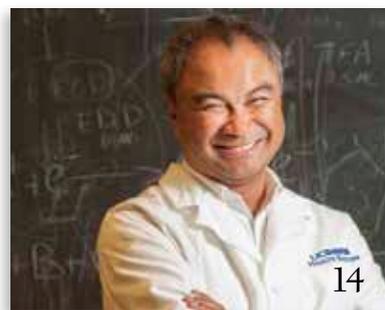
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The **sixth** vital sign

Distress screening critical to patient care

When a patient is diagnosed with cancer, one crucial question typically leaps to mind: Am I going to survive this?

Before long, however, comes a torrent of other worries, from the adequacy of health insurance to questions about caregivers, economic solvency and impacts on family, as well as physical ability, pain and quality of life. Such challenges can create anxiety and depression, undermining patients' ability to focus on their return to health.

In decades past, the oncology community occasionally overlooked these psychosocial issues — sometimes defined as the “soft side of cancer.” However, the focus on patient-centered care has brought to light the need to understand and offer patients and their families support in coping and

adjusting to cancer. In response, the UC Davis Comprehensive Cancer Center is gearing up to formally screen all patients for distress as part of their care, essentially making it the sixth vital sign.

Oncologists say implementing distress screening is critical to enhance the effectiveness of cancer treatment and reduce health care costs. It also reflects the cancer center's holistic view of patient care and support.

"At UC Davis, our goal is to not just treat the disease, but to care for the entire patient, from the time of diagnosis all the way through survivorship," says medical oncologist and associate professor of medicine Kendra Hutchinson. "We need to look at the bigger picture and go beyond our patients' acute cancer issues to consider their psychological, emotional and even spiritual health."

Pilot screening yields stunning findings

Formal distress screening for all patients will begin at the cancer center in early 2015. As a prelude, the cancer center's two social workers recently conducted a pilot project that surveyed the psychosocial status of about 370 patients arriving for clinical appointments.

Using a one-page survey, patients were asked to rate their distress level on a scale from zero to 10, with 10 representing extreme distress. Patients also were asked a series of questions revealing whether they had struggled with practical problems involving transportation, work or insurance, as well as physical, family or emotional issues.

Project leaders Angela Usher and Jena Cooreman are still analyzing results. But one finding was undeniably clear: Thirty-eight percent of patients screened reported experiencing significant distress.

For many, this distress is related to physical problems, such as pain. But a startling 82 percent of patients who reported significant distress attributed it to emotional factors, such as anxiety, fear or depression.

"We've often operated under the assumption that most patients need

help with practical concerns, like getting to appointments, coordinating insurance and arranging housing," Cooreman says. "Those are very real problems, but it's really the fear, anxiety and depression that drive a lot of the distress."

Emotional toll of cancer heavy

Discussion of emotional distress in cancer patients is not new, and oncologists, policy makers and hospital administrators have increasingly come to recognize



"We need to look at the bigger picture and go beyond our patients' acute cancer issues to consider their psychological, emotional and even spiritual health."

~ Kendra Hutchinson

that there are both clinical and economic benefits to addressing the psychosocial needs of patients and their families.

Depression and anxiety, for example, can interfere with a patient's adherence to treatment, undermining the effectiveness of care, and resulting in poorer patient outcomes and higher costs. A lack of transportation — to medical appointments, pharmacies and support groups — is another barrier to disease management and recovery.

When it comes to logistical and economic hurdles, UC Davis patient Don Kilbourne, 75, of El Dorado Hills admits he's one of the lucky ones. He has a pension, health insurance and a dedicated wife, named Wanda, to care for him as he battles a rare form of lymphoma.

Still, distress comes in many forms. Kilbourne says that when he first heard he had “the big C” back in early 2011, he felt “pretty disheartened, as you might imagine.” He also feels terrible about the burden his care has placed on Wanda, a petite

woman of 66 whose efforts to help the fragile Don were complicated when she fell, broke her kneecap and required surgery last fall.

In terms of acute distress, the toughest stretch for Kilbourne was being confined for three weeks in an isolation room during a stem cell transplant: “I am claustrophobic, so when I heard about this isolation treatment I thought, ‘Oh God, I'm going to die,’” recalls Kilbourne, a retired librarian.

Usher and Kilbourne discussed his feelings and developed a self-care plan. Usher also gave him a tour of the inpatient area where he would be staying during a transplant. There, he visualized himself in the hospital room, a place where he could bring his collection of old black-and-white horror movies, books, Scrabble game and free weights. He chose to have the transplant. During the hospitalization Usher visited him once a week and continued to check in with both him and his wife.

The strain of caring for Don has taken a toll on Wanda, causing

weight loss and, at one point, feelings of extreme depression and desperation when her husband's cancer returned after a two-year remission.

“There's certainly anxiety, not being able to sleep, pushing myself beyond where I should, all of that,” she says. “Mostly I don't deal with the emotions behind all of it. I just have to hold it together for him.”

Usher says she is the couple's sounding board. “I recently had a long talk with Wanda in the hospital about how Don's decline has been very sudden, that quality of life discussions were needed, and how I could help,” she says.

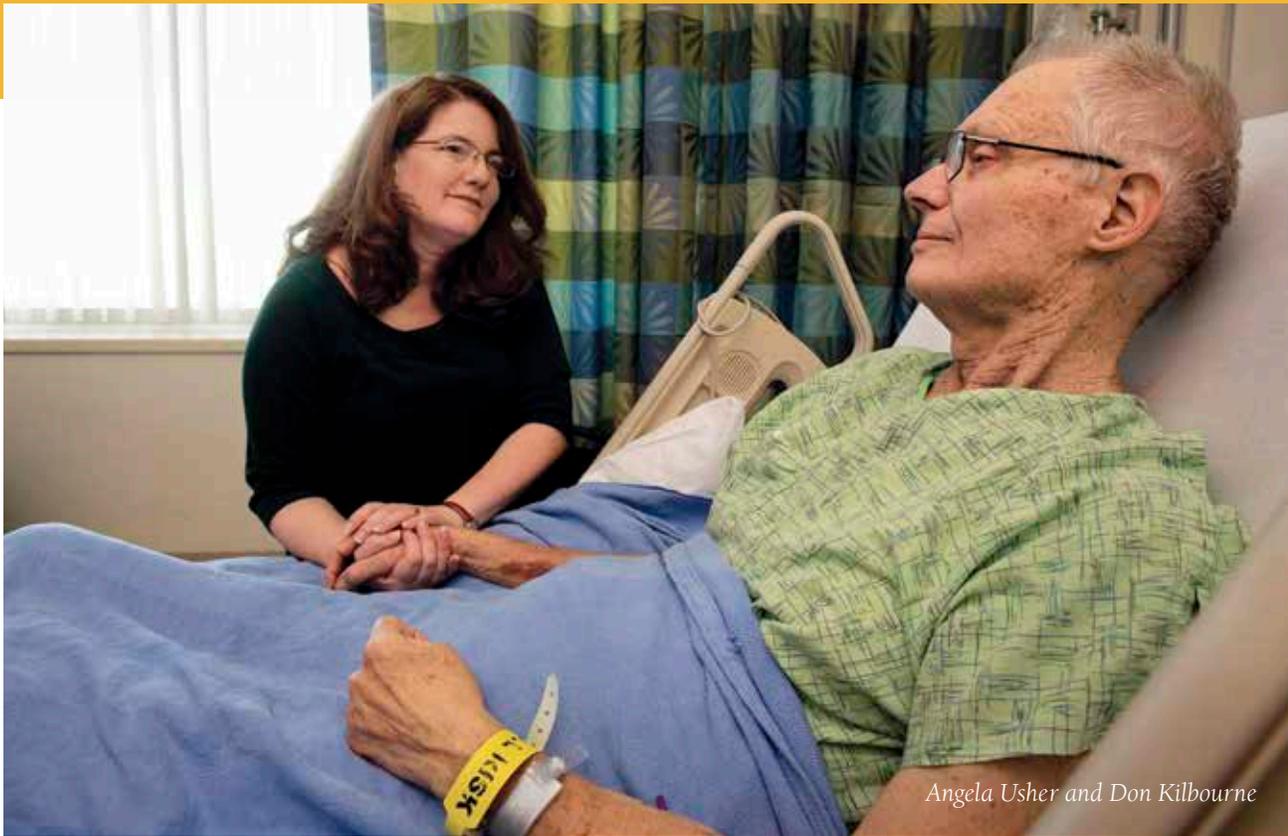
Interest in distress screening growing

In the late 1990s, the National Comprehensive Cancer Center Network convened a panel to create clinical practice guidelines for distress management. The panel chose the word “distress” rather than “depression” or “anxiety” to describe psychological, social and other nonphysical aspects of care



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~ Jena Cooreman



Angela Usher and Don Kilbourne

because of the stigma attached to the latter two terms.

In 2008, the topic received a boost with publication of a report by the Institute of Medicine called *Cancer Care for the Whole Patient: Meeting Psychosocial Health Needs*. It concluded that by failing to address the psychological and social problems created or exacerbated by cancer, the oncology community was compromising the effectiveness of care and, ultimately, the health of patients.

Despite that loud warning and growing awareness of distress as a critical factor in cancer care, less than 5 percent of distressed patients in busy clinics are recognized and receive any psychosocial treatment, Usher says.

“The research tells us that when patients have the resources to help them cope with their psychosocial problems, it frees them up to focus on fighting their cancer,” she adds. “But we just haven’t had a cohesive approach to this, so we end up doing crisis intervention,

and at that point it’s much harder to be effective and helpful.”

Usher and Cooreman say that’s about to change. In 2012, the American College of Surgeons Commission on Cancer published new program standards, one of which mandated routine distress screening for patients at all comprehensive cancer centers by January 2015. Usher and Cooreman

are moving full speed ahead to ensure UC Davis is ready.

They also are laying a solid foundation for what may come next — the eventual creation of a Supportive Oncology Program at the cancer center.

Shortly after this story was reported and written, Don Kilbourne entered the UC Davis Hospice Program. He died peacefully at home with Wanda at his side a month later, on April 14.

“The research tells us that **when patients have the resources** to help them **cope with their psychosocial problems**, it **frees them up to focus on fighting** their cancer.”

~ Angela Usher

Care close to home

Network benefits ease patient's journey

Lisa Peltier is all smiles as she breezes into the cancer center at Tahoe Forest Hospital. Everyone she passes says hello; some stop for hugs. Her doctor kisses her cheek. From the receptionist to the infusion nurse to the oncologists, these are neighbors, friends. They are, on many levels, family.

The petite, wide-eyed patient would not have it any other way. Fortunately, because the Gene Upshaw Memorial Tahoe Forest Cancer Center in Truckee is part of the UC Davis Cancer Care Network, she doesn't have to.

Diagnosed with lung cancer, the Incline Village resident has been able to get most of her cancer care in her own community with oversight from a "virtual tumor board" of experts 100 miles southwest at a National Cancer Institute-designated comprehensive cancer center.

"Early on, I thought about going elsewhere for care," she says. "Some even advised me — 'You have to go somewhere else.' They said, 'You can't

get good care locally.' But another friend, a nurse, said, 'There's a lot to be said about getting your care locally. Part of the healing process is being at home. Your family is there.'"

At the time, Peltier was unaware that Tahoe Forest was affiliated with the UC Davis Comprehensive Cancer Center, an arrangement that would bring a multidisciplinary army of experts and resources to bear against her individual tumor.

The unique partnership, which utilizes telemedicine to link community oncologists with UC Davis cancer specialists, brings more than prestige to the community hospitals in the network.



In a study on the network's virtual tumor boards published late last year in the journal *Community Oncology*, researchers reported that providers share rapidly evolving cancer treatment information with their colleagues in more remote areas. That collaboration enables clinicians to make more informed treatment decisions for their patients, resulting in higher-quality care.

"Since most Americans receive their cancer care from community-based hospitals, it is the mission of NCI-designated comprehensive cancer centers to be the regional resource for dissemination of new knowledge and therapy to community partners," says Richard Bold, UC Davis chief of

"Early on, I thought about going elsewhere for care. ... There's a lot to be said about getting your care locally. Part of the healing process is being at home. Your family is there."

~ Lisa Peltier

surgical oncology and lead author of the study. "Telemedicine tumor boards allow for open discussion of patients prior to treatment initiation, ensuring that our community oncologists have the most up-to-date information for treatment decision-making."

A non-smoker, physically fit with a very active lifestyle, Peltier had no reason to suspect anything when she noticed pain in her shoulder in early 2013. But a follow-up X-ray revealed a lesion in her lung, and a biopsy a few weeks later confirmed it was cancer.

Laurence Heifetz, the Tahoe Forest cancer center's medical director and Peltier's oncologist, brought her case to the weekly virtual tumor board, which includes UC Davis specialists in pathology, hematology-oncology, radiation oncology and thoracic surgery linked by teleconferencing technology with Tahoe Forest and physicians at three other hospital-based community cancer centers.

"I presented Lisa's case within the first week of meeting her because I anticipated the need for surgery," Heifetz says.

"It is very challenging for a physician in a remote area to be able to honestly feel secure that he or she is up-to-date at all times," says Heifetz, who trained at MD Anderson Cancer Center in Houston. "An advantage to me and my partners is the real-time interaction, face-to-face, using technology with the UC Davis Comprehensive Cancer Center. It allows me to double-check myself to make sure I am doing the right thing."

That sense of security, he says, is



Lisa (bottom row, fourth from right) with 'Lisa's Army'

communicated to patients like Peltier in subtle ways. "Patients realize there is a doctor who is not frightened to ask for help, who is transparent, who recognizes that while we may be in a remote area, we feel most comfortable sending patients for additional help to thought leaders."

UC Davis thoracic surgeon Elizabeth David was at the tumor board meeting where Peltier's case was discussed.

"Our intention was to do tri-modality therapy — she would receive chemotherapy and radiation up front in an

effort to control the disease," she explains. "After that, if her disease hadn't progressed, we would go on to surgery for local control of the tumor."

Peltier, 60, spent most of the summer undergoing chemotherapy and radiation treatments in Truckee. Throughout, she continued regular exercise, walking or hiking every morning with her yellow lab, Charlie, near and around Lake Tahoe — the rugged Flume Trail, bucolic Sheep Flats meadow and serene Incline Lake. She put in between 55 and 60 miles per month.

In early August, toward the end of her treatments and just weeks before her planned surgery, she was a special guest in the Squaw Mountain Run/Walk, a 2,000-foot climb over a 3.6-mile course to benefit the Tahoe Forest Cancer Center. And while Peltier had to take a cable car to the top this time, she was there to cheer on "Lisa's Army," a group who ascended the mountain in her honor.

Unfortunately, what she and her doctors had hoped was a tumor confined to her lung had, in fact, progressed; a scan later detected a spot on her femur. The tumor had metastasized, so surgery would no longer be an option. Instead, her doctor ordered more chemotherapy and radiation treatments.



"It's just so **calming for me to be here.** Even coming down the road, when I see the lake, it gives me an **immediate sense of peace.**"

~ Lisa Peltier



Lisa Peltier and Laurence Heifetz

Peltier would receive those treatments in Truckee, close to home, her job and family.

“A key goal for the UC Davis Cancer Care Network is to provide state-of-the-art care in an environment that is the most familiar and supportive for patients, surrounded by people they trust and care for,” says Scott Christensen, a UC Davis oncologist and network medical director. “Our relationships with our community-based partners allow for this to happen.”

Peltier was able to participate in two clinical trials through UC Davis. For the first, she takes a bone-strengthening drug for patients with metastatic disease. The drug is designed to preserve bone and diminish the progression of the disease. She is also on a trial of Tarceva, a drug that targets a certain genetic mutation for which her tumor tested positive.

Without the Cancer Care Network affiliation, says Heifetz, his patients would not have access to these or most other trials.

“Access to clinical trials is another measure of being at a quality institution,” he says. “But we don’t have enough patients to offer our own clinical trials; we have to participate on a cooperative basis.”

Peltier, for her part, says she is doing well. She is back to work full time as the vice president of a successful health-care consulting firm in Incline Village, where she lives

with her husband. She spends a lot of time with her daughter, who also works at her firm, and her son, who lives in town and works as a helicopter pilot. She continues to indulge her passion for long walks, and feels grateful for her ability to take them in her own community.

“It’s just so calming for me to be here,” she says. “Even coming down the road, when I see the lake, it gives me an immediate sense of peace.”

“An **advantage** to me and my partners is the **real-time interaction**, face-to-face, using technology with the UC Davis Comprehensive Cancer Center. It **allows me to double-check myself** to make sure I am doing the right thing.”

~ Laurence Heifetz

Companions in cancer



Rohan

Melanoma treatment in dogs provides hope for humans

When Krista DeZerega-Thomson and her family learned that Rohan, their beloved Labrador retriever, had melanoma — an aggressive cancer that affects both people and dogs — their hearts fell.

Because it had already spread to Rohan's lungs and lymph nodes, their veterinarian told them that with no conventional treatment options available, he likely had only two more months to live.

Then the vet mentioned that Michael Kent, an associate professor of radiation oncology in surgical and radiological sciences at the UC Davis School of Veterinary Medicine, was conducting a unique clinical trial to treat cancers like Rohan's.



Arta Monjazeb



Michael Kent

Kent, director of the UC Davis Center for Companion Animal Health, remembers Rohan as a perfect candidate for the trial, part of a remarkable collaboration with Arta Monjazeb, assistant professor of radiation oncology at the UC Davis Comprehensive Cancer Center.

“We are addressing the most challenging presentation in cancer medicine: a tumor that has already metastasized,” says Kent. “The Cancer Center-Vet Med partnership is a great strategy to simultaneously advance treatments for animals and humans.”

Blending radiation with immunotherapy

The novel treatment approach blends radiation and immune therapies to break up the cancer, then stimulate a dog’s or a person’s own defenses to recognize the tumor fragments as foreign and mount an attack to destroy them. According to Monjazeb, it

“Marrying radiotherapy with immunology is bringing about a **revolution in cancer therapy**. Based on advances we are seeing now, we should be able to **effectively treat patients who were previously considered incurable.**”

~ Arta Monjazeb

effectively helps create an individualized vaccine against the cancer.

Monjazeb has been fascinated with immunology since he participated in research as an undergraduate at UC Berkeley. During medical school he also obtained a Ph.D. in cancer biology, focusing on the role of inflammation and immunology in cancer. After medical school he specialized in radiation oncology. His interest in the role of the immune system in

human disease continued, and he performed a research fellowship in cancer immunotherapy.

“Marrying radiotherapy with immunology is bringing about a revolution in cancer therapy,” says Monjazeb. “Based on advances we are seeing now, we should be able to effectively treat patients who were previously considered incurable.”

At the Center for Companion Animal Health in Davis, Rohan underwent four radiation treatments

aimed at his tumor and lymph nodes. Radiation therapy on its own has many immunological effects, Monjazez explains. For one, it kills tumor cells, making them more recognizable by the person's immune system. Dying cancer cells release a surge of proteins that activate the host's immune defenses, which generate cancer-specific white blood cells to fight the cancer. Secondly, radiation breaks up the tumor, allowing the body's circulating immune cells in the blood to gain better access to the remaining tumor. In addition, radiation destroys immune-suppressive cells recruited by the cancer that have kept the host's immune system at bay.

In addition to giving him radiation treatments, veterinarians injected immune-enhancing drugs into Rohan's tumor site to stimulate his immune system to mount a local response to the tumor.

At home in between treatments, Rohan received oral drugs that helped stop the immune suppression caused by his tumor. The drugs put a damper on regulatory T-cells that normally lower the body's immune response — a safeguard that keeps our immune system from recognizing our body as foreign, but also hampers fighting a tumor.

"The combination of radiotherapy and immunotherapies is like putting one foot on the gas and taking the other off the brake at the same time," says Monjazez. "This strategy promotes a maximal response against the cancer."

Both Kent and Monjazez were very pleased with how Rohan and the other dogs in the trial responded to the unique therapy. Rohan lived another six months, three times longer than had been predicted without therapy.



"The Cancer Center-Vet Med **partnership** is a **great strategy** to **simultaneously advance treatments for animals and humans.**"

~ Michael Kent

“The **combination of radiotherapy and immunotherapies** is like putting **one foot on the gas** and **taking the other off the brake** at the same time.”

~ Arta Monjazez

Michael Kent and Arta Monjazez credit a multidisciplinary team of experts at the UC Davis School of Veterinary Medicine and the Comprehensive Cancer Center for making sure Rohan’s trial ran smoothly and productively. William J. Murphy, professor and chair of dermatology, and an internationally recognized expert in cancer immunotherapy, was integral to the study concept development and immune analysis. William Culp, assistant professor of surgical and radiological sciences, performed the biopsies and surgical procedures. Erik Wisner, professor of diagnostic imaging and chair of the Department of Surgical and Radiological Sciences, interpreted the computed tomography images. Liz Sparger, recall-associate adjunct professor, conducted analyses on the immune responses to therapy. In addition, multiple veterinarians provided patient care to all the special pets involved, and many graduate students and technicians participated in the research activities.

And, as importantly, his quality of life remained good throughout the treatment.

“Every time he came out of treatment, he had more energy,” recalls DeZerega-Thomson, whose family includes her husband and two children, ages 8 and 10. “We took him to the lake and hiking — he really enjoyed his last months.”

Dogs as models

Monjazez notes that dogs make excellent experimental models for human cancers, and that the collaboration with the vet school has allowed him to rapidly advance his research. Spontaneous cancers in dogs behave much more like those in humans than do cancers induced in lab mice, he explains. This makes results from dog trials much more likely to predict outcomes in people with cancer. The fact that dogs with such advanced disease responded so well to even a short course of therapy is extremely encouraging, and he hopes to soon begin safety trials in human patients who have metastatic melanoma.

“Partnerships of this kind can be done only at UC Davis, where there is strong medical and

veterinary clinical research on people and animals being done in such close proximity,” Monjazez says. “I know of no other place in the country that provides this opportunity.”

Kent agrees, and looks forward to collaborating more often with the Comprehensive Cancer Center. He emphasizes that clinical trials for pets carry similar ethical concerns and require safeguards similar to those for humans.

“Research in companion animals must not diminish quality of life,” he says. “Treatments must be safe, and they must not cause harm.”

When Rohan did poorly several months after finishing his treatment, and it was clear that the cancer had spread throughout his lungs, everyone agreed that it was time to let him go.

DeZerega-Thomson relates how as soon as they realized that Rohan would not survive much longer, Kent met the family outdoors, where Rohan was happiest, and very peacefully put him to sleep.

“We would definitely do it all again,” says DeZerega-Thomson. “It was a privilege to participate in research that not only helped Rohan, but might one day also help others — pets, as well as people.”

Sugar clues

Glycan research yielding potential biomarkers



Cancer arises from changes to genes.

When exposed to chemicals, UV light, pathogens or other carcinogens, DNA can mutate, allowing cells to become malignant and invade other tissues. These changes get passed on to proteins that, along with tumor DNA, circulate in blood.

For many years, the medical and research communities have tried to use these proteins and DNA fragments as disease markers to find cancer early. Unfortunately, these approaches have not produced the diagnostic tests researchers anticipated. While scientists have had some success finding markers, such as the BRCA genes — which can identify women at increased risk for breast or ovarian tumors — these genetic changes by themselves cannot predict whether a patient will develop cancer.

But there may be other molecular markers researchers can pursue to detect cancer, including glycans — sugars attached to proteins. These complex carbohydrates help guide the formation and function of proteins. They also become altered by cancer. Could these be the markers scientists have been seeking?

The art of post-translational modification

When professor of analytical chemistry Carlito Lebrilla first started investigating glycans, the research field was sparse. Compared to studying proteins, glycans offered a far more difficult road.

“Glycans are challenging because they’re not templated,” says Lebrilla. “For example, in DNA a gene is a

template for RNA, which is a template for a protein. There are no specific genes for glycans; they're added on afterward."

This process, called post-translational modification, is kind of like adding aftermarket features to a car. After the changes are made, information about the make and model might not indicate how the car performs or even what it looks like.

Proteins also travel through an assembly line, in which enzymes called transferases attach glycans to them, sometimes hundreds. As many as 80 percent of all proteins go through this process. But if a sugar chain isn't attached properly, the

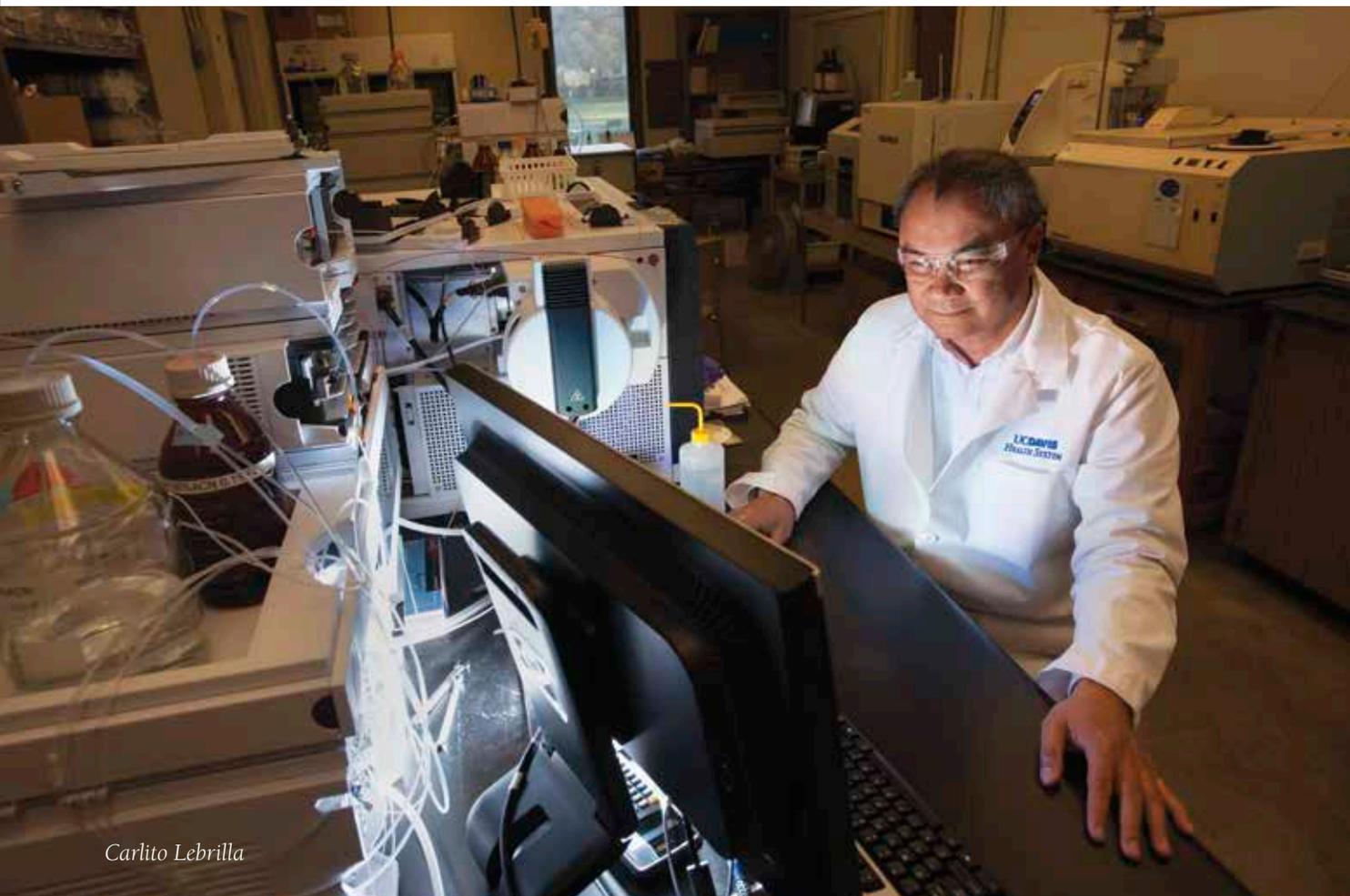
protein won't function as it should. The hard part is figuring out how the process has gone awry.

Lebrilla's team has adopted sophisticated methods to break glycans away from their proteins and analyze the fragments. They use a technique called mass spectrometry, which weighs molecules by determining how far a magnetic field can deflect them; heavier molecules

just don't go as far. These measurements are fed through a computer algorithm that compares the masses of these molecules to a library of known glycans. Given these sugars' complexity, simply crunching the data is a huge task.

When Lebrilla first started working on glycans, mass spectrometry was mostly used to investigate proteins, but the technology lacked

When professor of analytical chemistry Carlito Lebrilla first started **investigating glycans**, the research field **was sparse.**



Carlito Lebrilla

Building on basics>>

the finer definition needed to discriminate between glycans. In some cases, his lab had to devise new techniques to attain the resolution they needed.

“There aren’t many scientists who can do this work,” says Jay Solnick, a cancer researcher and professor in the Center for Comparative Medicine. “Carlito Lebrilla is one of the few people researching glycans.”

Sugars and disease

Understanding glycans could help researchers illuminate a

number of critical biological processes. Lebrilla and colleagues are investigating glycans in breast milk and how they help infants establish beneficial gut bacteria. Also, because immune cells can be heavily glycosylated, his work could yield insights into autoimmune disorders, HIV and other conditions.

But the prize is cancer, and isolating glycan markers could help detect lung, prostate, gastric, ovarian and other tumors.

“We need better tests to detect cancer,” notes Lebrilla. “There are

high false positive rates and unnecessary biopsies. We want to minimize these unneeded procedures.”

The Lebrilla lab scientists are collaborating with others, using their glycan expertise to detect specific cancers. They have been working closely with Solnick, who has been investigating the ramifications of *Helicobacter pylori* (*H. pylori*) infection, which affects 50 percent of the world’s population. *H. pylori* can cause ulcers, gastritis and gastric cancer, but determination of who will develop cancer is difficult. Finding a marker that indicates which *H. pylori* patients are at highest risk could improve care.

“There’s evidence that if you detect gastric cancer precursors early enough, you can treat the patient’s *Helicobacter* and prevent gastric cancer,” says Solnick.

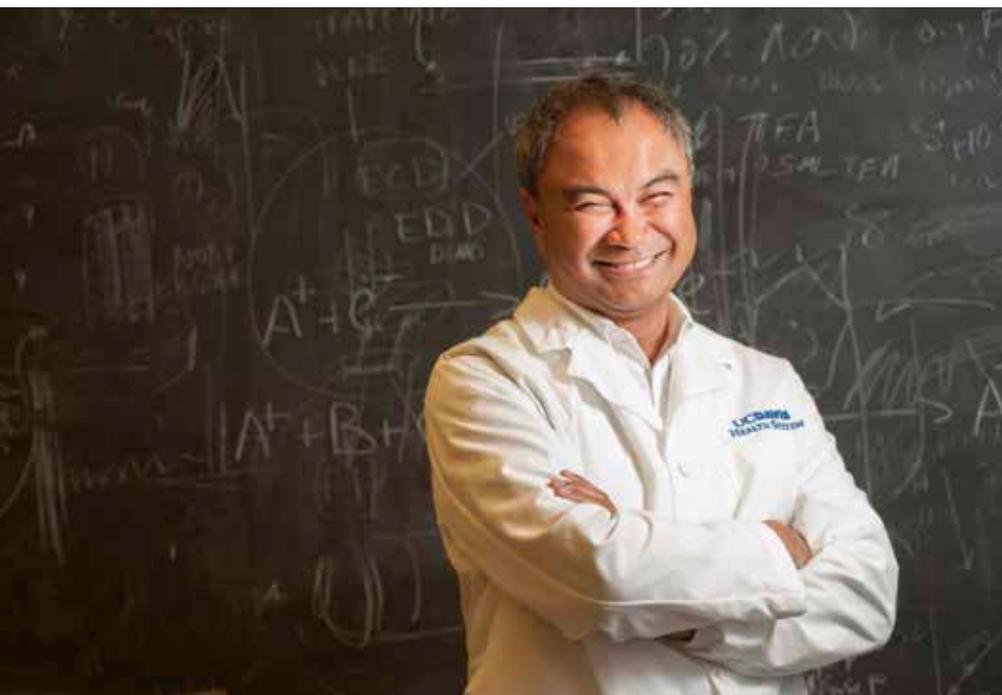
Early research has been promising. Solnick, Lebrilla and colleagues recently published a paper that showed significant differences between glycan profiles for patients with gastritis and those with gastric cancer. This is good news, but it’s only a start.

“Right now we have statistical significance but not predictive value,” says Solnick. “If we can improve the predictability, we could create a diagnostic test with real clinical value.”

Finding ovarian cancer

Few people could benefit more from early detection than women with ovarian cancer. Like pancreatic cancer, ovarian cancer produces indistinct symptoms. Abdominal bloating and other gastrointestinal problems often lead physicians to investigate the intestinal tract rather than the pelvis.

“The biology of these cancers is such that by the time you figure out the patient has cancer, they have advanced disease, and it’s difficult to



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“If we can improve the predictability, we could create a diagnostic test with real clinical value.”

~ Jay Solnick

cure,” says Gary Leiserowitz, chief of the Division of Gynecologic Oncology.

Lebrilla’s research team had noted significant differences between the glycans in ovarian cancer cells and those in healthy cells. He contacted Leiserowitz, and they began looking for cancer markers.

Again, preliminary results have been promising. In recently published research, they tested samples from healthy women, patients with borderline ovarian tumors with minimal risk to become cancer, and patients with full-blown ovarian cancer. The glycan

profiles distinguished patients among the three groups.

The first test, called a “training set,” measured different glycan expression in the serum samples and helped determine which sugars would help them differentiate between patient groups. The glycan-based biomarker panel developed with the training set distinguished women with ovarian cancer from healthy controls with 86 percent accuracy.

The researchers then conducted a “test set,” applying those measurements to entirely new patient samples. This also produced excellent results, detecting cancer with 70 percent accuracy, including both early- and late-stage cancers. The glycan markers distinguished between healthy and early-stage cancers as well as the standard diagnostic blood test for ovarian cancer, CA 125.

Because sample selection can bias results, they then swapped samples, creating a new training

set with the patients from the previous testing set and vice versa. The results showed that the method works well, and that the developed markers are robust enough to be not overly influenced by patient selection.

Leiserowitz says the study is important because it replicates the real-life situations physicians often face, but he urges caution.

“Developing an actual diagnostic test is a long and tedious road,” he says. “Many studies look good at first but then aren’t reproducible. We are going through a very rigorous process to validate these results.”

However, if these glycan tests continue to bear fruit, they offer a tantalizing possibility — a single diagnostic tool that could test for many cancers.

“The approach doesn’t change among cancers,” says Lebrilla. “Ideally, we would develop a single panel that includes markers for several forms of cancer.”



“The biology of these cancers is such that by the time you figure out the patient has cancer, they have advanced disease, and it’s difficult to cure.”

~ Gary Leiserowitz



To screen or not to screen

Can the PSA test diagnose prostate cancer without leading to unnecessary treatments?

Medical choices can be confusing.

For years, men have relied on the prostate-specific antigen (PSA) test to warn them if they are at higher than normal risk for cancer. It's become a rite of passage: as men enter middle age, the PSA is added to their annual test regimen. An elevated reading might indicate cancer, leading to a biopsy and possibly treatment.

In recent years, some physicians have **questioned the benefits of the PSA test.**

While **it can signal cancer**, an elevated PSA also **might indicate nothing more than** prostatitis or benign prostatic hyperplasia — **serious conditions, but hardly lethal.**

But in recent years, some physicians have questioned the benefits of the PSA test. While it can signal cancer, an elevated PSA also might indicate nothing more than prostatitis or benign prostatic hyperplasia — serious conditions, but hardly lethal. And even when the PSA does indicate the potential presence of cancer, it cannot determine if the disease is aggressive, requiring immediate treatment, or slow-growing.

In 2012, the United States Preventive Services Task Force (USPSTF) advised against routine PSA testing. That independent panel, consisting of experts in prevention and evidence-based medicine, determined that the test's imprecision was leading to unnecessary prostate biopsies, prostate cancer over-diagnosis and over-treatment. The panel advised that the serious and unnecessary side effects, such as pain, urinary incontinence or sexual dysfunction some men experience following treatment might outweigh their risks of dying from prostate cancer.

But do the task force recommendations go too far? UC Davis researchers have entered the fray, and their findings may indicate an important role for the PSA.

PSA pros and cons

All men with a prostate have some PSA in their blood. However, those levels tend to rise when disease hits. In 1994, the U.S. Food and Drug Administration (FDA) approved the PSA test to measure these levels in men who, due to age, ethnicity or both, are at higher risk for prostate cancer. There was much enthusiasm for the test — perhaps too much.

“When the PSA first came out, it wasn't studied in the way it should have been,” says Marc Dall’Era, assistant professor and vice chair of urology at the UC Davis Comprehensive Cancer Center. “A big group of cancers are extremely slow growing and are better off undiagnosed. However, we do diagnose them through PSA screening and biopsies. As a result, men get treated aggressively, regardless of the risk their cancer may pose.”

One explanation for reduced prostate cancer mortality could be more effective treatments. Dall’Era and colleagues decided to **investigate whether survival rates for men initially diagnosed with metastatic prostate cancer have improved.**

These and other concerns helped lead to the USPSTF's decision to recommend against widespread PSA testing. But Dall’Era and others believe the PSA can still be a valid diagnostic tool. While the test is clearly imperfect, the task force may have relied on bad evidence to make their decision.

“If you're designing a good study, you have a group that gets screened for prostate cancer and a group that doesn't,” says Dall’Era. “But in the U.S., the vast majority of men get screened at some point. The American study, which led to the [USPSTF's] PSA test recommendations, had a group that got a lot of screening and a control group that was screened less often.”

As a result, more than half the men in the control group were still getting screened. So it's no surprise that the test showed only marginal differences in survival rates between these two samples. In addition, other research has shown that prostate cancer deaths have declined by as much as 42 percent since the PSA's introduction. What could be driving these declines?

Doing the research

One explanation for reduced prostate cancer mortality could be more effective treatments. Dall’Era and colleagues decided to investigate whether survival rates for men initially diagnosed with metastatic prostate cancer have improved.

“Let's assume PSA screening isn't working. But if that's not reducing prostate cancer mortality, what is?”

First steps>>

asks Dall’Era. “What if we’re doing a lot better treating men with advanced disease?”

Fortunately, they have an amazing resource to answer that question: the California Cancer Registry. Managed by UC Davis, the database is a veritable gold mine for researchers, containing information on more than 2.5 million cancer cases. The registry includes data on demographics, cancer types, disease status, patient diagnosis dates, treatments and survival. Dall’Era’s team dove deep into the registry to determine if improved treatments had led to reduced mortality. Unfortunately, they hadn’t.

“There was no survival improvement for men with metastatic disease to account for the overall mortality decline,” says Dall’Era.

Instead, the study confirmed what previous research had shown: over the past 20 years, 65 percent fewer men have been initially diagnosed with metastatic prostate cancer. PSA screening has caused a major shift in diagnostic staging. That is, cancers are now being diagnosed at a much earlier stage.



“This is the **direction** we want to go. I don’t think we should abandon the PSA; we **just need to rethink** which patients should receive **aggressive treatment**.”

~ Marc Dall’Era

“As far as I’m concerned, a major portion of this decline is coming from the PSA,” says Ralph de Vere White, UC Davis urologist, director of the UC Davis Comprehensive Cancer Center and a co-author on the Dall’Era paper. “Imperfect as it is, the PSA is

likely detecting cancers that, if left untreated, would go on to metastasize and kill people.”

What’s next?

While these findings do not prove the PSA is lowering cancer



“We have to **talk** to patients **before the biopsy**. They **need to know** that if we find prostate cancer and that cancer does not seem to threaten their life, we **will suggest** they go on **active surveillance**.”

~ Ralph de Vere White

mortality, they constitute powerful evidence to support that hypothesis. But the question remains: Should men get the PSA test?

One train of thought suggests the problem may not be the test but rather how physicians and patients respond to the results. Men with elevated PSA levels often get a biopsy. If the biopsy indicates cancer, they often receive aggressive treatment, whether they need it or not.

“Men who are at low to medium risk may be good candidates for surveillance rather than treatment,” says Dall’Era. “If they have a slow-growing cancer, we may not need to intervene at all. Right now, only about 20 percent of men who are candidates for surveillance are getting it.”

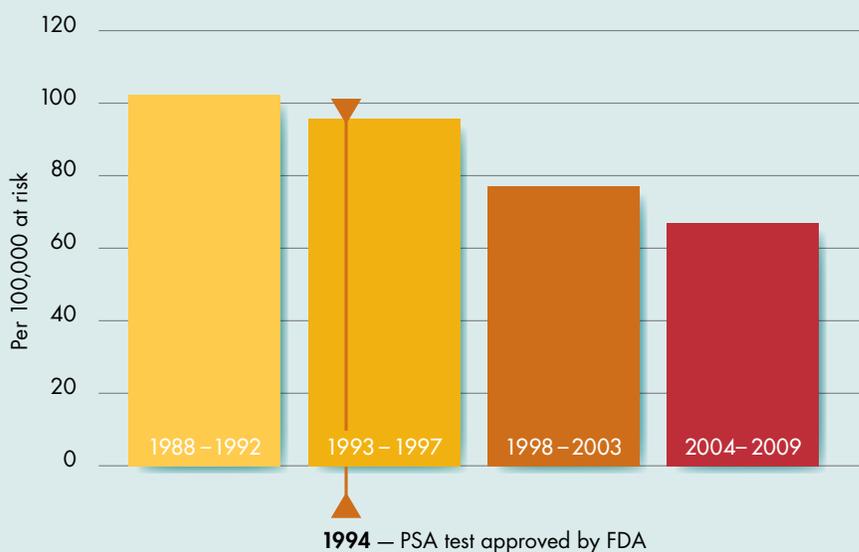
This nuanced approach offers many advantages, such as reducing unnecessary surgeries and radiation treatments, but it can be a hard sell for a patient who only wants to be cancer-free.

“If we tell patients they need early detection, but then tell them we’re not going to treat their cancer — it seems counterintuitive,” says de Vere White. “We have to talk to patients before the biopsy. They need to know that if we find prostate cancer and that cancer does not seem to threaten their life, we will suggest they go on active surveillance.”

In the meantime, new genetic tests that are emerging could help physicians and patients decide whether to choose treatment or surveillance. These diagnostics could potentially highlight tough cancers that require an immediate response.

“This is the direction we want to go,” says Dall’Era. “I don’t think we should abandon the PSA; we just need to rethink which patients should receive aggressive treatment.”

Prostate Cancer Mortality Rate | California, 1988 – 2009



One train of thought **suggests the problem may not be the test** but rather **how physicians and patients respond** to the results. Men with elevated PSA levels often get a biopsy. If the biopsy indicates cancer, **they often receive aggressive treatment, whether they need it or not.**

A perpetual honor

Endowment will boost lung cancer drug research

[Donna Kato watched her father die of lung cancer in 2010.

Her heartache was accompanied by frustration that too few drug therapies were available for lung cancer patients. So she set out to change that.

Last year, Kato established a \$25,000 endowment to help fund clinical lung cancer research at the UC Davis Comprehensive Cancer Center. As a pharmaceutical regulatory professional with more than 25 years of experience, Kato knows firsthand how new drugs and therapies have transformed cancer care and saved lives. But so much more needs to be done, Kato says, especially in lung cancer.

“When Dad was diagnosed, I did

research and realized there really wasn't anything that could help treat his illness or prolong his life,” says Kato, founder of the Bay Area-based Regulatory Professionals Inc. “There were very limited options available to him, and it was frustrating.

“Better treatments for lung cancer are going to be found through research,” Kato adds. “And I know there are things that could be done but aren't being done because the money's not there.”

Kato has a long history with UC Davis. She graduated in 1978 with a degree in biochemistry, and her two sons graduated from the university in



“Ms. Kato’s **generous investment** will advance the learning environment for the **next generation of clinicians** and **help us get results.**”

~ Karen Kelly

2012 — Sean Kato with a B.S. in engineering and Jason Kato with a Ph.D. in pharmacology and toxicology.

Kato's strong ties to UC Davis played a key role in her decision to donate to the cancer center, but ultimately it was her deep respect for the university's research that became the deciding factor.

"It all converged and felt like the right thing at the right time," she says.

Kato worked with the cancer center and its development officers to establish the Kato-Summers Family Research Fund, named to honor her late father, Cecil Summers. The fund will help support training for young physician scientists in the design, execution and completion of Phase I cancer treatment studies.

Phase I studies are the first evaluation of promising new drugs and provide valuable insight into tumor-drug interaction. The increasing number of new agents in the pipeline intensifies demand for physicians to evaluate them as quickly as possible.

"Clinical research fellows are a priority for the UC Davis Phase I clinical trials program," says Karen Kelly, UC Davis professor and associate director for clinical research.

"Ms. Kato's generous investment will advance the learning environment for the next generation of clinicians and help us get results."

Kato says the fund will grow over time. "It's nice that it is perpetual. I can donate from my estate, and so can my kids," she says. "When my dad passed away, I wanted to honor him in some way that would be perpetual and forever. This is how I can do that."

Sunny Mason, a director of development for the UC Davis Comprehensive Cancer Center, says gifts such as the one made by Kato are critical to the operation of the cancer center.



"When my dad passed away, I wanted to honor him in some way that would be perpetual and forever. This is how I can do that."

~ Donna Kato

"A gift to the UC Davis Health System is a meaningful investment in our progress, research and technology," says Mason.

Cecil Summers ran an electrical contracting business in the Bay Area and is remembered by his family for his inspiring curiosity and thirst for knowledge. Kato believes her dad's lung cancer may have been caused by exposure to asbestos. Despite the prevalence of lung cancer, Kato

believes the disease doesn't get the same public attention and research contributions that other cancers do.

"There's a pretty high prevalence of the disease, but you never hear of a lung cancer walk," she says.

Kato is not organizing a lung cancer walk, but hopes to lead by example by using her money to help in the search for better treatments — if not one day a cure — for lung cancer.

Six-year-old cancer patient “adopted” by UC Davis gymnasts

Six-year-old Alyssa Kalb, a UC Davis brain tumor patient, was “adopted” recently by the Aggie women’s gymnastics team through the Friends of Jaclyn Foundation, a remarkable organization that links children diagnosed with brain tumors with high school and college sports teams. These connections are designed to not only bring awareness to the problem of pediatric brain tumors, but also to provide hope, support and friendship to the patients and their families.

“It’s like she has 17 big sisters,” said Terry Kalb, Alyssa’s mom. “They are opening their hearts. They are very genuine. It’s another support system for her.”

Alyssa was diagnosed in 2011 with juvenile pilocytic astrocytoma, an inoperable tumor near her brain stem. The Foresthill child completed her chemotherapy treatment for the tumor in October of last year.

“This has been very uplifting for the whole team,” said Coach John Lavallee.

Gymnast Jamie Yamashita, 19, agreed. “Alyssa can have such an impact on us. She is probably one of the strongest girls I have ever met going through cancer at such a young age. I want to show her that everything is going to be OK, and let her know that she has other people here to help her.”

Alyssa and her brother and sister attend the team meets, can play in the gym at practices and stay in contact with individual gymnasts. Mom Terry is giving back through fundraising efforts to support pediatric brain tumor research and to purchase some goodies for the pediatric infusion center. She also hopes to start a family brain tumor support group.

Below, top: Alyssa gets the key to her own locker. Below, bottom: Alyssa and her siblings attend gymnastics practices and meets.



“It’s like she has 17 big sisters. They are opening their hearts. They are very genuine. It’s another support system for her.”

~ Terry Kalb, Alyssa’s mom

Breast Health Center open

The UC Davis Breast Health Center has opened with comprehensive breast health services for women throughout the region. **The center offers women quick access to a cohesive, multidisciplinary team of breast health experts, leading-edge imaging technologies and rapid delivery of results.** The program also offers cancer prevention strategies and genetic counseling, and cancer risk assessment and care, as needed.

The center brings together teams of radiologists with expertise in mammography and other imaging technologies, genetic counselors with experience in assessing breast cancer risk, and scientists and physicians who specialize in breast abnormalities, including cancer. The center is located in the Lawrence J. Ellison Ambulatory Care Center on the UC Davis Health System Sacramento campus. Screening mammography also is offered at the Placer Center for Health and at UC Davis' medical offices in Folsom.

James Purdy receives MD Anderson Distinguished Alumnus Award

James A. Purdy, UC Davis professor emeritus in the Department of Radiation Oncology, received the Distinguished Alumnus Award from the University of Texas MD Anderson Cancer Center.

After receiving his master's and Ph.D. degrees in physics from the University of Texas, Austin, Purdy completed his post-doctoral fellowship in the Department of Medical Physics at MD Anderson. **He joined UC Davis in 2004 as professor and vice chair of the Department of Radiation Oncology, and served in that position until his retirement in 2011.** In 2012, Purdy was

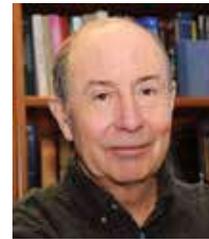


James Purdy

appointed professor emeritus at Washington University, where he had spent more than 31 years.

In granting the award to Purdy, the MD Anderson Alumni & Faculty Association Steering Committee said that his research efforts in three-dimensional treatment planning and delivery and work in quality assurance have had a profound effect on radiation oncology. They also cited his training of hundreds of resident physicians and medical physicists, and his valuable mentorship of junior faculty throughout his career.

Bruce Hammock receives 2014 Brodie Award



Bruce Hammock

Bruce D. Hammock, UC Davis Distinguished Professor of Entomology and scientific member of the UC Davis Comprehensive Cancer Center, has received the 2014 Bernard B. Brodie Award from the American Society for Pharmacology and Experimental Therapeutics.

The award recognizes his outstanding original research contributions to the understanding of human drug metabolism and transport, and the continued impact of his research in the area of drug discovery and development.

Hammock, who directs a laboratory of more than 40 scientists and students in the UC Davis Department of Entomology and Nematology, explores the biochemical basis of human and environment interactions, and their implications for improving both human and environmental health.

For more than 35 years, Hammock has worked on the mechanism of certain hydrolytic enzymes and their effect on human health. His work has helped identify new targets for the action of drugs and other compounds to improve health and predict risk from various environmental chemicals.

UC Davis physician featured in national health equity project

UC Davis professor Christopher Bowlus of the Division of Gastroenterology and Hepatology, and his liver cancer disparity research, were featured on the Health Equity Research Snapshot of the Association of American Medical Colleges (AAMC) in March.

Bowlus' research was selected as one of seven newly funded projects underway at AAMC member institutions to represent the rich variety of populations and health outcomes that health equity researchers investigate. The projects demonstrate how research



Christopher Bowlus

at every stage contributes to closing or narrowing gaps in health and health care.

Each team produced a video describing their research projects.

Asian-Americans have disproportionately high rates of liver cancer and liver cancer mortality, primarily because of the prevalence of hepatitis B virus, which can lead to the disease. Bowlus and colleagues with expertise in molecular and genomic diagnostics, biostatistics and cancer health disparities aim to discover potential biological reasons why some Asian-American ethnicities have higher liver cancer mortality rates and present at younger ages with late-stage disease.

Physicians urge new model of prostate cancer care

In an article published in the journal *Urologic Oncology*, urologist Ralph de Vere White and medical oncologist Primo Lara Jr. argue for a new model of care for advanced prostate cancer that emphasizes collaboration between urologists and medical oncologists.

The physicians explain that while both types of specialists can prescribe many available medications, including newer drugs that can be taken by mouth and do not require infusion, often the two specialties do not collaborate in their care of prostate cancer patients.

The need for collaboration is especially critical now, the authors argue, because five new drugs have recently come on the market for patients with castrate-resistant disease – more than were approved for the disease in the previous 10 years.



Primo "Lucky" Lara

De Vere White and Lara argue that in such an environment, the patient should never get lost.

"It is in the best interest of the patient with castrate-resistant prostate cancer for all his caregivers to buy into an integrated and comprehensive approach, one that dissolves artificial boundaries and establishes seamless transitions of care," they write.

Potential lung cancer vaccine shows renewed promise

UC Davis researchers have found that the investigational cancer vaccine tecemotide, when administered with the chemotherapeutic cisplatin, boosted immune response and reduced the number of tumors in mice with lung cancer. The study also found that radiation treatments did not significantly impair the immune response. The paper was published on March 10 in the journal *Cancer Immunology Research*, an American Association for Cancer Research (AACR) publication.

Though tecemotide, also known as Stimuvax, has shown great potential at times, the recent Phase III trial found no overall survival benefit for patients with non-small cell lung

cancer (NSCLC). However, further analysis showed one group of patients, who received concurrent chemotherapy and radiation followed by tecemotide, did benefit from the



Michael DeGregorio

vaccine. As a result, tecemotide's manufacturer, Merck KGaA, is sponsoring additional post-clinical animal and human studies, so far with good results.

"There aren't any good options for patients with inoperable stage III lung cancer following mainline chemotherapies," said UC Davis Professor of Medicine and lead author Michael DeGregorio. "We are looking at tecemotide as a potential maintenance therapy to prolong survival and improve quality of life."

While this study revives hope for tecemotide as a potential NSCLC therapy, there are still questions to be answered. Researchers need to further refine these therapies to determine which protocols provide the best survival benefits. In addition, tecemotide can only be effective if it does not exhaust the immune system in the process. Still, the research provides a ray of hope for patients with few options.

Nine-year effort concludes to fund breast cancer endowment at UC Davis

After nine years and countless fund raising events, the Placer Breast Cancer Endowment reached its goal of \$1.5 million for breast cancer research at UC Davis Comprehensive Cancer Center. The effort concluded at an annual event



Teri Munger, Carol Garcia and Laura Tyrrell with Ralph de Vere White at ACRE event

sponsored by the Association of Commercial Real Estate (ACRE).

"We owe a debt of gratitude to the selfless women of the Placer Breast Cancer Endowment, who tirelessly fought to fund a position dedicated to breast cancer research at UC Davis," said Ralph de Vere White, cancer center director.

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MERCY UC DAVIS CANCER CENTER

New support group inspires complementary programs

Mercy UC Davis Cancer Center has established a support group for patients, caregivers and family members affected by cancer throughout the community. Each monthly meeting kicks off with an informative presentation by a guest speaker and continues with a group discussion.

Feedback from the group has inspired development of new programs, including art and massage therapy, yoga and a program designed to help patients suffering from pain, strength, and balance issues related to chemotherapy-induced peripheral neuropathy.

Mercy cancer center welcomes new clinician-scientist

Mercy UC Davis Cancer Center welcomed a new radiation oncologist in August 2013. Eric Ko, who also has a Ph.D., is focused on making radiation therapy clinical trials more

accessible to patients.

"With our link to UC Davis, I think there are a lot of radiation clinical trials that could be initiated either at the main site, with participation of our cancer center, or right here in Merced," Ko said.

Ko completed the M.D./Ph.D. program at the University at Buffalo School of Medicine and



Eric Ko

Biomedical Sciences. He completed his training at Mount Sinai Medical Center in New York City.

RIDEOUT CANCER CENTER

Rideout Health offers new lung technology

Rideout Health now offers electromagnetic navigation bronchoscopy, a minimally invasive approach to location, biopsy and treatment planning for a lesion detected deep in the lung. The procedure combines GPS-like technology with a catheter-based system that uses the patient's natural

airways to access lesions that were previously hard to reach.

Typically, a patient with a spot on their lung is limited to major surgery to remove a section of the lung, bronchoscopy (which does not reach lesions deep in the lung), needle biopsy, or watchful waiting. The new procedure is typically performed in an outpatient setting.

"We are pleased to offer a minimally invasive alternative for patients who have a lesion on their lung that is hard to reach or cannot tolerate a more invasive procedure," said Royce Calhoun, a cardiothoracic surgeon at Rideout Health. "This is an option that will help many patients."



Royce Calhoun

SAN JOAQUIN COMMUNITY HOSPITAL

Lung screening program launched at The AIS Cancer Center

The AIS Cancer Center at San Joaquin Community Hospital (SJCH) is proud to announce Kern County's first multidisciplinary lung cancer screening program, combining the talents of interventional radiology, pulmonology, thoracic surgery and pathology.

The program utilizes state-of-the-art, ultra-low dose CT scanners at SJCH's Quest Imaging facility. It is designed for high-risk patients who meet the National Comprehensive Cancer Network guidelines. Screening program participants still smoking will be encouraged to take part in the American Lung Association's "Freedom from Smoking" cessation program at The AIS Cancer Center.

The lung cancer screening program is part of the comprehensive Thoracic Oncology Program at The AIS Cancer Center. Since enrollment began in November 2013, seven screenings have resulted in two positive for nodules, two suspicious and the remaining three found to be benign/no findings.

"Lung cancer is the leading cause of cancer mortality in both men and women, causing more deaths than breast, colon and prostate cancers combined," said Amir Berjjs, AIS medical director of thoracic oncology. "This is in part due to finding lung cancer after it has already spread. Simply put, lung cancer screening saves lives."



Amir Berjjs

continued from page 26

“We have begun recruitment of a physician-researcher to lead the effort.”

The group’s leaders include three friends, two of whom had been diagnosed with and treated for breast cancer: Carol Garcia and Teri Munger, and a third, Laura Tyrrell of Granite Bay, who is still battling the disease. The group also credits Virgil Traynor of the Auburn Community Cancer Endowment Fund, whose leadership fulfilled a mission to fund a basic cancer research chair at UC Davis.

“It was beyond my wildest expectations,” said Tyrrell of the ACRE event that concluded the years-long effort. “It renews my energy to keep fighting this disease.”

UC Davis leads study on strategies to boost minority biospecimen collection

In work aimed at boosting collection of blood and tumor specimens among minorities, researchers at UC Davis and collaborators at three other institutions found that Asian-, African- and Hispanic-Americans are open to donating specimens for research when clinicians and scientists adopt the right strategies.

The findings, published in March the *Journal of Community Genetics*, are **the first to analyze cognitive, communication and sociocultural factors affecting biospecimen donation among diverse racial and ethnic populations**. The researchers investigated these dynamics in three different parts of the United States.

“Time, trust and transparency are essential to success in biospecimen collection among these groups,” said Julie Dang, administrative core director at Asian



Julie Dang

American Network for Cancer Awareness and Training, headquartered at the UC Davis Comprehensive Cancer Center, and lead author of the article.

“You can’t just go in and ask patients for biospecimens without building trust, and you can only do that by spending a lot of time with them, getting to know them, and having a vested interest in understanding what the community wants and where they are coming from,” she said.

Collection and banking biospecimens from all groups is critical because clinical research increasingly relies on the availability of appropriate genetic materials for the development of new, more targeted cancer therapies, the authors write. When underrepresented, racial and ethnic minority patients cannot equally benefit from clinical research breakthroughs.

For their studies, collaborators collected data using similar methods, which involved community advisory boards, interviews and focus groups. Data interpretation was conducted within a cross-cultural community framework to identify patterns among community groups and sources of divergence among the findings by geographic, racial or ethnic group.

Co-authors on the paper included researchers at Moffitt Cancer Center in Tampa Bay, Florida, Jiann-Ping Hsu College of Public Health at Georgia Southern University and Roswell Park Cancer Institute in Western New York.

Synthesis is published twice each year by the UC Davis Comprehensive Cancer Center.

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Synthesis

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