The pagers light up and gently vibrate to notify patients when their clinician is ready to see them.

**Pagers give patients freedom to roam**

**By Douglas Morino**

USC Norris Comprehensive Cancer Center is using technology to give patients more freedom and comfort as they wait for appointments.

Clinic 5, which serves urology, hematology and medical oncology patients, recently introduced small pagers similar to the devices handed out to diners waiting for a table at restaurants. Controlled by a staff member from a computer, the pagers light up and gently vibrate to notify patients when their clinician is ready to see them.

“It’s about having more freedom, more comfort and really enhancing the patient experience,” said Charlene Martinez, project manager in Hospital Administration.

A pilot program began Feb. 10, and the pagers are expected to be in use across USC Norris Cancer Hospital by the end of March. It is modeled after a similar program that began in the Gold Lobby of Keck Hospital in November 2013. “We took the existing system in place and tailored it to fit our needs,” Martinez said.

The pagers feature small screens for custom messages typed by a staff member and sent through a web-based application accessible through an internal network. Messages can be composed in English and Spanish.

After each use, the pagers are carefully sanitized with a sani-cloth, a disposable germicidal wipe. The pagers allow patients to roam from the hospital’s traditional waiting areas to the Rainbow Café and outdoor coffee stations, the Harry and Celesta Pappas Quad, Plaza Marketplace and the Jennifer Diamond Cancer Resource Library.

But patient data is — quite literally — stored under lock and key at Keck Medicine of USC, and a team of security experts is constantly monitoring for unauthorized cyber-attacks.

“We have an iron dome at USC to protect patient data,” said Chief Information Officer Joshua Lee, MD. "Security has to be multi-dimensional," Lee said. “We create multiple layers to frustrate a potential attacker.”

Patient data is stored off-site through Century Corporation, a firm that specializes in health-care information.

**‘Iron Dome’ at USC keeps patient records secure**

**By Douglas Morino**

Mid disclosures of data stolen from major companies, some patients may worry that their private medical information is just a few illegal keystrokes away. But patient data is — quite literally — stored under lock and key at Keck Medicine of USC, and a team of security experts is constantly monitoring for unauthorized cyber-attacks.

“We have an iron dome over the USC system,” said Chief Information Officer Joshua Lee, MD. "Security is never compromised," Lee said. “We create multiple layers to frustrate a potential attacker.”

Patient data is stored off-site through Century Corporation, a firm that specializes in health-care information.

**Cleaner air, healthier kids**

**By Carl Marzluff**

A 20-year study by Keck Medicine of USC has found that millennial children in Southern California breathe easier than those who came of age in the ‘90s.

The gains in lung function paralleled improving air quality in the communities studied — and across the L.A. basin — as policies to fight pollution have taken hold.

The research appeared in the March 5 issue of the New England Journal of Medicine. Many studies have measured the health effects of pollution by comparing locations with different air quality. The challenge lies in ruling out other factors that may account for health differences between communities.

By following more than 2,000 children in the same locations over two decades and adjusting for age, gender, ethnicity, height, respiratory illness and other variations, the study provides stronger evidence that improved air quality by itself brings health benefits — benefits that last a lifetime for children breathing cleaner air during their critical growing years.

“We saw pretty substantial improvements in lung function development in our most recent cohort of children,” said lead author W. James Gauderman, PhD, of the USC Acoustic Neuroma Center.

**Little Leaguer is back in the game thanks to USC neurosurgeons**

**By Kris Siwek**

It was late September in Oklahoma, and 10-year-old Little League pitcher Alex Coker was taking the mound for the first time since brain surgery.

The sounds of the ballpark surrounded him—a fist hitting a glove, chants of “hey batter, batter,” cheers from the crowd. Alex could hear all those sounds thanks to the perseverance of his mother, Susan Bennett, and the skill of his doctors at Keck Medicine of USC.

Alex’s surgery just a couple of months before had involved removal of a tumor called an acoustic neuroma from his right auditory nerve. Common early symptoms include hearing loss, tinnitus (ringing in the ears) and problems with balance. Dr. Rick A. Friedman, MD, PhD, director of the USC Acoustic Neuroma Center.

In Alex’s case, it wasn’t symptoms that led to the diagnosis. Because his biological father had been previously diagnosed with Neurofibromatosis Type 2 (NF2), Alex was at risk of inheriting the rare genetic mutation characterized by growth of noncancerous tumors in the nervous system. Alex’s tumor was discovered during a precautionary MRI.

Alex Coker, right, with his parents Jared and Susan Bennett and younger brother Austin.
Alex Coker posed outside Keck Hospital when he was in Los Angeles for the successful surgery by UCSF neurosurgeons that removed tumors from his brain to save his hearing. "I want to go to Los Angeles," Coker said back to being a 10-year-old kid, "I was speechless. All I could say was thank you!" Bennett hopes her family’s story will empower other parents to advocate on behalf of their children and encourage them to seek a medical team they can truly trust.

"The compassion that Dr. Friedman has for his patients is nearly $2 billion in research dollars in 2010 — the second-largest research expenditure total for any U.S. metro region — according to an L.A. County report on biotech. But often the discoveries are turned into new drugs or devices by companies located far away.

To counter the drain of potential biotech jobs and innovation, the County Board of Supervisors unani- mously voted in November to develop a biotechnology framework. As part of that effort, leaders propose building a tech corridor across Los Angeles County. Thomas N. Sayles, JD, USC’s senior vice president for university relations, said biotech corridors would leverage existing academic medical centers, companies and colleges to spur economic development and job creation. One such corridor would use the Health Science Campus as an anchor — building on the intellectual, medical and commercial assets of the medical school of USC, LAC-USC Medical Center and pharmaceutical firms.

"If we get it right, the economic potential is enor- mous," Nikias said. "The initial Biotechnology Park is expected to create 3,000 construction jobs and nearly 4,000 permanent positions, from entry-level technicians to PhD-level, doctorate-level scientists." Nikias met with County Supervisor Hilda Solis in advance to discuss their visions for the eastside corridor and building a broad- based coalition of educators, government and investors. He estimates that the cor- ridor would be similar to San Francisco’s Mission Bay project, which will employ $3 billion.

"All of the ingredients for Los Angeles to capture growth for these emerging fields are already here," Nikias said. "With the right align- ment between government, academia and industry, we can harness the region’s existing strengths — includ- ing our science graduates — to create lasting economic growth."

Other USC participants included Andy McMahon, Ph.D., a professor and chair of the executive committee of USC Stem Cell, and Steve Kao, Ph.D., a biochemist and dean of the USC Dornsife College of Letters, Arts and Sciences.

Calendar of Events
Friday, March 13
Monday, March 16, plus
March 19, 23 and 30
Noon or 11 a.m. Office of Emer- gency Management & Business Continuity Management. "Bring Your Lunch and Learn Seminar. "Ac- tive Shooter, Remaining Prepared in a Risk-Aware World." Robert C. Vance III, USC. March 16, 23, noon; Noon Hospital, Room 156; March 19, 11 a.m., and March 30 at noon; Keck Hospital, Room B100, March 19, noon; Soto Room 2102. Info: Bob Vance, (323) 442-9915, robert.vance@med.usc.edu
Tuesday, March 17
3:30 p.m. Ophthalmology Grand Rounds. Billy Pan, MD, USC. HCA, Conference Room, 4th Floor. Info: Yvonna Christopher, (323) 442-5235, christy.chris- topher@med.usc.edu
Wednesday, March 18
Noon, Zilka Zilbergstein Neurological Institute Seminar. "3D Genome Organization and Gene Transcription Regulation in Human Diseases," Yuqin Roan, PhD, Jackson Laboratory for Genomic Medicine. Hektoen Seminar Room, ZNT 112. Info: Julie Carl, (323) 442-5219, jcarl@usc.edu
Tuesday, March 24
Thursday, March 26
Noon, Southern California Research Center for ALPDI & Carthosin Lecture. "Mitochondria and Metabolic Regulation of Human Pluripotent Stem Cell Differentiation," Michael Teitel, UCLA, McKibben Lecture Hall, 156. Info: Julie Lee, (323) 442-4844, julie.lee@med.usc.edu
Friday, March 27
11:45 a.m. Center for Applied Molecular Medicine Seminar. "Circling Tumor Cells as Liquid Biopsies for Metastasis," Mal Yu, MD, PhD, USC. Harkness Auditorium. Info: Rosa Rangel, (310) 936-0610, rmarangel@usc.edu
Wednesday, April 1
4:30 p.m. KSPOM of USC. Department of Anesthesiology Lecture Series. "The 2015 Donald I. Feinstein Distinguished Lectureship: Unifying Theory of Thymus Development," Bruce Furie, MD, Stanford University, Palo Alto, Calif., and Paul Singh, MD, University of Pittsburgh. KSOM. Mayer Auditorium Pappas. Info: Julie Lee, (323) 442-4844, julie.lee@med.usc.edu
Friday, April 3
Monday, May 18
By Les Dunnith

Kerrick Medicine of USC researchers in the lab of Peggy Farnham, PhD, were key participants in the recent publication of a landmark collection of scientific papers related to mapping the DNA and histone modifications in human epigenomes and the ways that they coordinate the body's biological activities.

Farnham is one of the leading experts in epigenetics, a field of study that seeks to explain how genes and life experience conspire to make us who we are. There is a series of chemical annotations to our DNA and associated proteins that determine whether, how and when genes are activated. These chemical changes determine normal development, and disruptions in epigenetic patterns are involved in disorders from cancer to autism to heart disease.

Beginning in 2000, the Roadmap Epigenome Consortium set out to identify the cell type-specific regulatory elements in a large number of different human cell types, said Farnham, who is the William M. Keck Professor of Biochemistry and Molecular Biology and associate dean for graduate affairs at the Keck School of Medicine of USC. She has been part of the consortium since its inception.

The Roadmap Epigenome Consortium published 22 papers that represented the first comprehensive maps and analyses of the epigenomes of a wide array of human cell and tissue types. Farnham and her lab took part in a large integrative paper that was central to the project, plus additional papers in the set. A unique contribution of Farnham's lab was a paper that focuses on deleting a regulatory element to expand our knowledge of how genomic variation contributes to the risk of colon cancer. Follow-up efforts will expand the analyses to prostate cancer.

She said that publication of the epigenome mapping project has great significance in our understanding of how the epigenome modifies the genome, making marks that tell genes what to do and when to do it.

“One of the surprising findings that came from genome sequencing is that humans have about the same number of protein-coding genes as a microscopic worm,” Farnham said about prior research that formed the foundation upon which epigenome research is based.

“Only a small fraction of the human genome encodes proteins, suggesting that the large differences between our development and that of other, less complicated organisms is likely due to precise changes in the abundance of specific proteins, which is in turn controlled by regulatory elements that can be switched from inactive to active states,” she continued.

Unlike genes, which remain fairly stable during an individual’s lifetime, the epigenome is dynamic. Researchers are finding that the epigenome’s instructions can be altered by personal habits such as smoking or eating fatty foods. It also changes in response to experiences such as prolonged stress.

Understanding why this happens is vital to the battle against disease. “Understanding how genome sequence elements regulate normal development and differentiation — and how variants in the genome contribute to human diseases such as colon cancer — are leading challenges of 21st Century medicine,” Farnham said.

New protein target is found for prostate cancer treatment

By Leslie Ridgway

Kerrick Medicine of USC scientists have found a promising new therapeutic target for prostate cancer.

The findings offer evidence that a newly discovered member of a family of cell surface proteins called G protein-coupled receptors (GPCRs) promotes prostate cancer cell growth. The protein, GPR158, was found while the researchers were looking for new drug targets for glaucoma.

“When a prostate cancer tumor is in its early stages, it depends on hormones called androgens to grow,” said Nitin Patel, PhD, research scientist at the Institute for Genetic Medicine at the Keck School of Medicine of USC, and one of the lead authors on the research. “Eventually it progresses to a more lethal form, called castration-resistant prostate cancer (CRPC), and is resistant to drugs that block androgen receptors. We found that GPR158, unlike other members of the GPCR family, is stimulated by androgens, which in turn stimulates androgen receptor expression, leading to tumor growth.”

The researchers used a conditional Pten knockout mouse model of prostate cancer in collaboration with Keck School researchers Mitchell Gross, Chun-Peng Liao and Pradip Roy-Burman.

The study was published Feb. 18 in the journal PLOS ONE.

The research was produced by the laboratory led by senior author M. Elizabeth Fini, PhD. Other USC research contributors include Tatsumo Iakuta, Shiwu Joong, Ebrahim Zandi, Susan Grushen, Jackie Pinski and Gerad A. Coetzee.

Records: Cyber-security measures protect patient data

Continued from page 1

technology. This physical storage facility is secured, but a separate data security firm and USC staff members also protect electronic data through other measures.

Among them is a security operations center in which electronic information is monitored around-the-clock by security professionals looking for abnormal computer traffic, malware and network intrusions.

Stored patient data may include clinical records, medication, length of stay and billing records. Should an unauthorized data breach still occur, patients would be immediately notified, as would state and federal officials.

Hackers target personal data because it can be sold on the underground market.

After recent data breaches at major health insurers, officials have been investigating the extent of the cyber attack, and state and federal officials are probing whether the companies took proper measures to secure data.

At Keck Medicine of USC, the storage system also uses various authentication measures to prevent breaches, including requiring that users gain access into the system through strong passwords that can’t be easily deciphered by hackers.

Keck staff members are also looking at two-factor authentication, which might require a thumbprint, a retina scan or an electronic token that rotates to a new code every 30 seconds.

Staff members regularly evaluate new cyber threats and discuss security measures.

“We are constantly working to ensure that our electronic storage systems are up-to-date with the highest security standards,” Lee said.

Photo: Peggy Farnham and her lab contributed to four of the 22 papers published Feb. 18 in the epigenome package.

By Van Urfalian

Farnham Lab helps create landmark genetic roadmap

By Virginia Baca

The Farnham Lab is situated at USC Norris Comprehensive Cancer Center. Additional USC participants in the epigenome research were Research Specialist Heather Witt, PhD candidate Lijing Yao, PhD candidate Yu Gyung Tark and Benjamint Ferman, who at that time was an assistant professor in the Department of Preventive Medicine at the Keck School of Medicine of USC.

Farnham Lab helps create landmark genetic roadmap

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Farnham is one of the leading experts in epigenetics, a field of study that seeks to explain how genes and life experience conspire to make us who we are. There is a series of chemical annotations to our DNA and associated proteins that determine whether, how and when genes are activated. These chemical changes determine normal development, and disruptions in epigenetic patterns are involved in disorders from cancer to autism to heart disease.

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“We are constantly working to ensure that our electronic storage systems are up-to-date with the highest security standards,” Lee said.
Low sugar uptake in brain appears predisposed to develop the disease. — Alison Trinidad

**Heart regenerative capacity depends on severity of injury**

Researchers at Children’s Hospital Los Angeles (CHLA) have shown that neonatal mouse hearts have varying regenerative capacities depending upon the severity of injury. Using cryoinjury — damaging the heart through exposure to extreme cold in order to mimic cellular injury caused by myocardial infarction — investigators found that neonatal mouse hearts can fully recover normal function following a mild injury, though they may not regenerate after a severe injury. Published online by the journal Developmental Biology, the study suggests that case-by-case regenerative strategies should be based on the type and severity of heart injury. “Using models such as zebrafish and neonatal mice that regenerate their hearts naturally, we can begin to identify mechanisms that enhance heart repair,” said Ellen Lion, PhD, of the Sahan Research Institute of CHLA. Lion, who was senior author on the paper, was an assistant professor at the Keck School of Medicine of USC and a principal investigator with USC Stem Cell. Newborn mice have shown the capacity for heart regeneration, but it is rapidly lost by seven days after birth. Approaches to extend this regenerative capacity in a mammalian model from the neonatal period to the juvenile or adult period could help identify new treatment options for humans. — Ellen Kavanagh

**Pollution: Long-term study of children finds health benefits from cleaner air**

Continued from page 1

**Children’s Lungs**

In 1991, nearly 80% of 5-year-olds had significant lung defects. By 2010, only about 35% of 5-year-olds had significant lung defects.

**Epidemiology**

W. James Gaederman

In the early 1990s, children aged 5 years old were much more likely to have lung problems. For example, in 1991, nearly 80% of children aged 5 years old had significant lung defects. By 2010, that number had dropped to 35%. This indicates that over the past two decades, children have experienced improved lung health. This improvement is likely due to decreased air pollution levels in the area. — W. James Gaederman

**Lung function**

Lung function tests such as forced expiratory volume in one second (FEV1) and forced vital capacity (FVC) are used to assess lung health. The study found that lung function has improved significantly over the past two decades. This improvement is likely due to decreased air pollution levels in the area. — W. James Gaederman

**Polynomial model**

A polynomial model suggests that administering 0.3 milligrams of ranibizumab per eye every 2 months can reduce the number of cases of legal blindness by 75 percent, or 1,275 individuals. The study was supported in part by Genentech. — W. James Gaederman

**Economic benefits**

The study found that the economic benefits of administering ranibizumab every 2 months are significant. For example, the study estimated that administering ranibizumab can save the health care system $150 million per year. — W. James Gaederman

**Environmental benefits**

The study also found that administering ranibizumab can help to reduce the number of cases of air pollution-related asthma. The study estimated that administering ranibizumab can reduce the number of cases of asthma by 1,000 per year. — W. James Gaederman

**Future research**

Further research is needed to determine the long-term effects of administering ranibizumab. — W. James Gaederman

**References**


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**Author disclosure**

W. James Gaederman discloses the following conflicts of interest: Genentech Inc. (Ranibizumab).

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This research was supported by Genentech Inc. under the trade name Lucentis. The study was supported in part by Genentech. — W. James Gaederman

**Abbreviations**

CHLA: Children’s Hospital Los Angeles

Lucentis: Brand name for ranibizumab

**Other notes**


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