

fall 2005

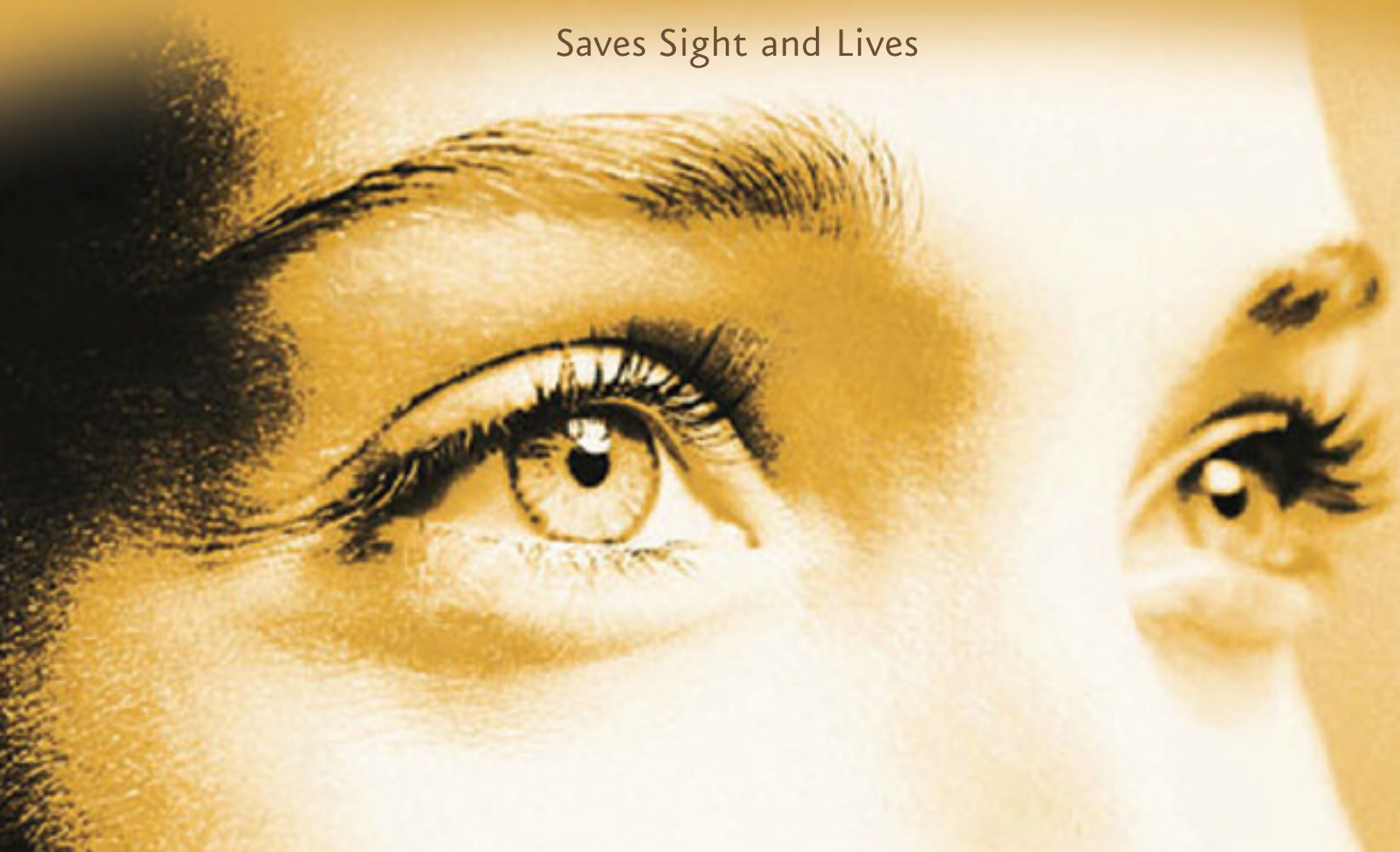
Joslin

magazine

Insight for the global diabetes community

The Eyes Have It:

How the Joslin Vision Network
Saves Sight and Lives



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by Lonnie K. Christiansen

The Eyes Have It:

How the Joslin Vision Network Saves Sight and Lives

A Joslin physician on a mission was stumped. In 1989, the clinical trials he oversaw clearly demonstrated that laser treatment could reduce the risk of vision loss by more than 96 percent in diabetes patients. Problem was, diabetes continued to be the leading cause of blindness in the United States—despite this proven therapy—because people weren't getting their eyes tested every year.

In search of a solution, Lloyd M. Aiello, M.D., Co-Chairman of the Early Treatment Diabetic Retinopathy Study, and then Director of Joslin's Beetham Eye Institute, took the problem to the National Diabetes Advisory Board meeting in Washington, D.C. He described the dilemma and asked: "How do we *reach* these

patients to test them for eye disease and give them the appropriate laser treatment?” With no good answers, Dr. Aiello flew back to Boston discouraged but undeterred.

Returning to Joslin, he pulled aside his Beetham colleague, Sven-Erik Bursell, Ph.D., and said, “We’ve gotta talk.” Huddled over green bottles at a Boston bar, Drs. Aiello and Bursell began hatching the idea for the system that is now saving the sight of people with diabetes across the globe—the Joslin Vision Network (JVN). Not bad for a chat over a few beers.

Ingenuity and Technology Create New Gold Standard

“Sven and I decided we would have to go directly to the patient,” recalls Dr. Aiello. “And to do that, we’d have to design a way to image the retina wherever the patient was.”

A: Image of significant diabetic macular edema that is threatening vision. Early identification and laser treatment can prevent a progression to this severe level of macular edema.

B: Image of the same eye in image A following laser treatment.

C: Image of high-risk proliferative diabetic retinopathy with hemorrhage. There are laser scars visible in the photograph—early laser photocoagulation and intensive diabetes control reduce the risk of vision loss. Vitrectomy surgery often recovers vision if the hemorrhage does not clear spontaneously. The optimal time for laser is before developing any loss of vision.



PHOTO: MICHAEL MALONEY

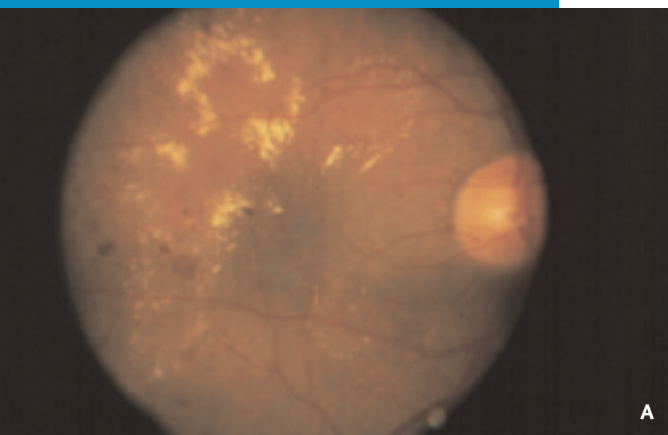
Medical mavericks extraordinaire: What started as a conversation between Lloyd M. Aiello, M.D., and Sven-Erik Bursell, Ph.D., has evolved into a life-saving technology.

That’s where Dr. Bursell’s technical expertise came in. “In my basic research lab, we used a lot of video technology as a tool to measure changes in the diabetic eye,” says Bursell, who has a background in biophysics and a technology mindset. He envisioned applying imaging techniques and electronic communications to solve the problem of reaching patients. And there are many patients to reach: each year in the U.S., between 12,000 to 24,000 people lose their sight because of diabetes.

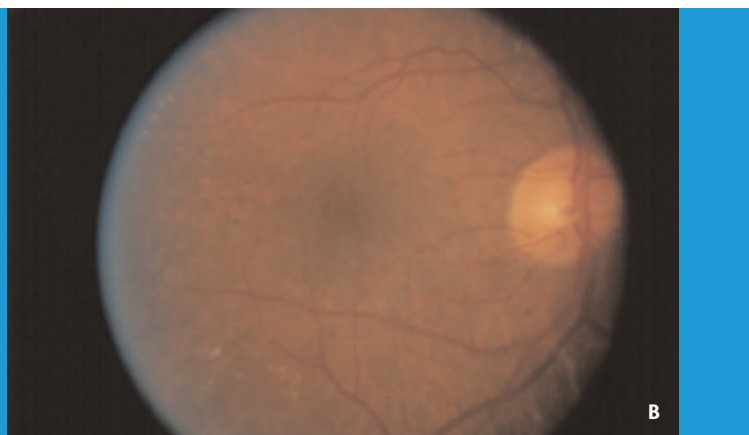
From the passion and expertise of these two scientists came a breakthrough in diabetes care—a telemedicine technology for early detection of diabetic retinopathy (eye disease involving abnormal blood vessel growth or fluid leakage in the retina). The diagnostic system includes

a digital camera for taking pictures of the retina and a software device for transmitting those images over a network to Joslin Diabetes Center. Retinal specialists analyze the images and transmit the information back to the originating site. The system can be installed in small walk-in clinics, large medical facilities, offices of primary care physicians—virtually anywhere diabetes patients are likely to be found.

The ingenuity of these two medical mavericks extended to how they first funded the system. In 1990, Richard Smith, C.F.O., of General Cinema (and now a Joslin Trustee), stepped forward with the first corporate grant. As Dr. Bursell recalls with a bit of mischief: “I was even able to convince Mr. Smith and the company that if we could save the sight of more patients with diabetes, they’d



A



B

be watching more movies for years to come.” By 1995, Digital Equipment Corporation entered the picture as an investor, hastening the evolution of the JVN. Our most dedicated early advocate of the JVN was Howard Hall, Joslin’s Vice President of External Affairs. “He championed the vision that Lloyd and I had,” says Bursell. And thanks to the software wizard W. Kelley Gardner, Associate Director of Technology for the JVN, the system is able to link to a reading center, where images are displayed, analyzed and interpreted.

Getting a Prescription and Eye Exam Simultaneously

The JVN is now a critical component of eye care at Joslin Clinic, Joslin’s Affiliates and its partner, Beth Israel Deaconess Hospital. The JVN camera stations are also now used in more than 50 sites in 12 states and the kingdom of Bahrain (see sidebar), with the majority in clinical facilities within the U.S. Veterans Health Administration, Indian Health Service, the Department of Defense and the United States Department of Agriculture.

“The key to the success of the implementation and provision of daily eye care for all our JVN clinical programs is Jerry Cavallerano and his clinical team,” notes Dr. Aiello. Jerry Cavallerano, O.D., Ph.D., is Chief of the Beetham Reading and Evaluation Center and the Beetham Ocular Telehealth Programs and has been involved with the JVN since day one.

This technology—which truly reflects the intersection of Joslin research, clinical care and education fulfills one goal of Joslin’s mission, which is to improve the public health. “The JVN program represents the unique ability of Joslin to bring the best of research to improve the public health without regard to geography, cultural or socioeconomic environment,” points out Alan M. Jacobson, M.D., head of Joslin’s Strategic Initiatives Division. The JVN is one of Joslin’s programs run by the Strategic Initiatives Division.

The JVN is now having a significant impact on reaching the populations at the highest risk for diabetes complications. For example, the prevalence of diabetes among Native Americans is twice that of the general population. The Indian Health Service, which is responsible for providing health services to about 1.5 million American Indian and Alaskan Natives, installed the very first purely clinical system in the Phoenix Indian Medical Center (PIMC) in Arizona.

To make access as easy as possible, the JVN was set up in the PIMC medical center’s pharmacy. “While patients wait for their glucose strips or prescriptions,” says Dr. Bursell, “a technician brings them in to take images of their eyes.” JVN imaging takes about 10 to 15 minutes and is virtually painless because it uses low-level light that does not require dilation of the pupils—though its just as accurate as a dilated eye exam.

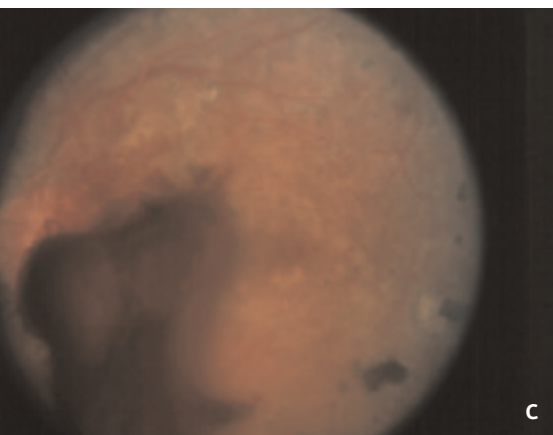
FINDING THE IDEAL PARTNER: THE SECRET TO REACHING THE UNDERSERVED

Although complications of diabetes have been dramatically reduced over the last three decades, “We still see these problems in patients outside Santa Fe, on the Indian reservations, in the inner cities, Mexico, India,” laments Dr. Aiello. “The only way we’re going to serve the underserved is if we make money that keeps funding the JVN program. That’s where the genius of Rick Morello and Gene Hopper come in.”

“When I understood the value and innovation of the JVN technology, I realized it was a diamond ready to polish,” says Rick Morello, Chief Operating Officer for Joslin’s Strategic Initiatives Division and JVN’s General Manager. “My role now is to create and execute the plan for making this wonderful technology more readily available so we can reach more people and extend our mission.” And as Rick points out, JVN has assembled a talented group of individuals to make this plan a reality.

The JVN’s first private-sector customer, Koch Eye Associates, licensed the technology in June 2005 to enhance its care of diabetes patients. The cost of the service is billed to private insurance companies, and Joslin’s revenues support research at Joslin, expansion of the JVN program and outreach efforts to the underserved.

“What Koch has done is really extraordinary,” says Gene Hopper, Director of Marketing and Business Development for JVN. “In addition to taking retinal images, they are gathering other patient data like A1Cs, blood pressure, pregnancy status—all the factors that influence the progression of disease. This is the total-patient model that Joslin hoped for and Koch willingly embraced. They’re an ideal partner.” And Gene notes that another partnership that she and the JVN team will focus on is the primary care community, where access to the patient is a critical success factor.



As Dr. Cavallerano explains: “It has been demonstrated through rigorous studies and publications in prestigious, peer-reviewed journals that JVN imaging is accurate and reliable”—which makes it equivalent to

MEETING A GLOBAL NEED

According to the World Health Organization (WHO), diabetes currently affects 30 percent of the Bahraini population, while another 30 percent are at risk of developing the disease. No wonder Antoine Kaldany, M.D., Director of International Programs at Joslin, expresses concern. “Diabetes has become a huge problem in the Middle East.”

That’s why he’s worked so hard over the past five years helping to develop the plans for the Joslin Diabetes Center Affiliate of Bahrain, which opened in February 2004. Located in Manama—on a strategically located parcel of land near the teaching hospital and the Arabian Gulf University’s Medical School, made available by the Government of Bahrain—the Affiliate is the region’s first medical center devoted entirely to the treatment of diabetes and related complications.

Beginning in September, the medical center began to offer retinal evaluation, thanks to the recently installed JVN. Bahraini technicians take the images, while retinal specialists from Joslin’s Beetham Eye Institute in Boston read the images and make diagnoses, which U.S.-trained Bahraini doctors will then implement.

“There is a shortage of retinal specialists in the Middle East,” says Dr. Kaldany, “so we envision the need for many, many more centers like this one.”

the traditional “gold standard” level of diabetic retinopathy imaging. During the visit, the technician obtains any relevant medical information and raises awareness of diabetes. “The imagers are trained to talk to the patient about control of diabetes—diabetes 101, if you will,” remarks Dr. Bursell, Director of JVN TeleHealth Programs and JVN’s Chief Scientific Officer. “That’s become a powerful point of education.”

What’s more, the technician shows the patient the images on a computer screen, which often has a profound effect on patient behavior.

After the first year of JVN imaging, for example, Dr. Bursell saw a one percent decrease in the blood glucose level of 100 patients. How significant is that? “If you can decrease the A1C by one percent, you can decrease the risk of *any* diabetes complications by 20 percent.” Today the JVN system is installed in over 36 IHS clinics in remote locations stretching from Alaska to Texas, thanks to the extraordinary dedication of Mark Horton, O.D., M.D., Director of IHS/JVN Telemedicine Program. The images from these clinics are transmitted to the IHS center in Phoenix, where trained readers evaluate them.

Taking JVN to the Front Lines

Joslin has also installed the system at the Walter Reed Army Medical Center, in Washington, D.C., and the Tripler Army Medical Center, in Hawaii. At the two military sites—as well as at installations at the Veterans’ Administration in Boston and Hawaii—Joslin has trained personnel on how to take and interpret retinal images, and established reading centers where military clinicians analyze them.

Physicians from Joslin’s Beetham Eye Institute continue to provide quality assurance on the evaluation of images.

Although most Department of Defense (DOD) installations of the JVN are in traditional medical facilities, the Army wants to eventually deploy the system in field medical tents to enable remote eye examination of the Army’s “far forward war fighters”—the soldiers on the front lines. Explains Dr. Bursell, “If soldiers have something wrong with their eyes, personnel could perform a telemedicine exam and make a determination as to whether a soldier could be triaged to medical care in the field or needed to be transported back to a major hospital facility.”

Meanwhile, since there are relatively few ophthalmologists or optometrists in the DOD, the Army is planning to use the JVN to image the eyes of servicemen and women returning from Iraq and Afghanistan. “That way, soldiers can go back to their families or wherever they need to be more quickly,” says Dr. Bursell, rather than waiting several weeks for an appointment with an ophthalmologist.

Saving Sight—And Lives

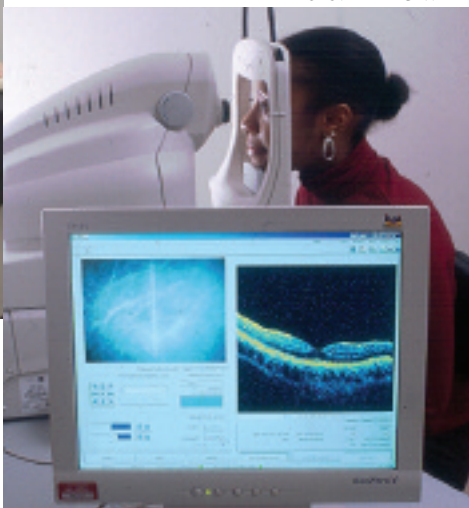
Finally, through the JVN, Joslin is able to extend its mission to serve the underserved by reaching Hispanic communities in the rural Southwest who otherwise would not be cared for. Dr. Aiello describes one patient case in this population “that epitomizes where we should go and what we should be doing in the long run with the JVN.”

“Lucia” is a 49-year old Latino woman who’s had diabetes for 25 years. Dr. Aiello oversees her care through Paula, a nurse practitioner who runs a clinic for residents of rural Santa Fe. Paula drives into remote areas offering care and access to the JVN service, made possible by a contract with the U.S. Department of Agriculture. Dr. Aiello and others at Joslin have trained Paula in the



PHOTO: RICK COLSON

PHOTO: WEBB CHAPELL



JVN certified imagers acquire patient's retinal images in the office.



PHOTO: RICK COLSON

use of the JVN as well as in interpreting the retinal images.

When Lucia finally comes to Paula's clinic, her blood pressure is 260/210 and her diabetes is poorly controlled by insulin. "She's at risk of going blind and dying," says Dr. Aiello. Paula takes the retinal images and sends them via JVN to Dr. Aiello, who, along with other Joslin ophthalmologists, can literally see severe hypertension, anemia, kidney disease and diabetic proliferative retinopathy (the most severe eye disease) through the eye, or as Dr. Aiello puts it—"all these characteristics in one eye." He tells Paula to immediately treat the hypertension and anemia, cautioning her to bring the blood pressure down slowly to avoid severe hemorrhaging in the retina.

Four days later, Lucia's blood pressure is down and the anemia is improving, and "it's time to treat the kidneys," says Dr. Aiello. "Because kidney disease causes swelling, fluid backs up in the body, including the retina. If we don't get the kidneys squared away, the eye will go blind in three months." So per

Dr. Aiello, Paula initiates aggressive kidney treatment, including dialysis. Over the next couple of weeks, Lucia is doing much better: the hypertension, anemia, kidney disease and retinopathy are all improving.

With Dr. Aiello directing her overall care, she's not only alive, she's now healthy enough to receive laser treatment for her eyes, which will dramatically improve her chances of preserving her sight.

"We provided the medical care and eye care guidance to save a person's life and sight," says Dr. Aiello. "That's exactly what the JVN is supposed to do." He adds, "Of course we want to have access to everybody, determine their level of retinopathy

Joslin Vision Network images can identify emerging acute and chronic conditions, or as Dr. Aiello puts it: "All these characteristics can be seen through the eyes."

every year and start treatments a lot earlier." Dr. Aiello recently gave up his position as Director of the Beetham to concentrate on doing just that. Like Dr. Bursell, whose greatest satisfaction during the JVN odyssey has been helping save patients' sight, Dr. Aiello's passion is reaching the underserved. It's been an exhilarating journey so far. But as Dr. Aiello is quick to add, "The job's not done yet."

Lonnie Christiansen is a freelance writer who specializes in the health sciences.

AND WHAT THE FUTURE BRINGS

Drs. Aiello and Bursell hope to see the JVN expand to include more than just appropriate eye care delivery. "Our vision is to extend the care community beyond the bricks and mortar of traditional healthcare institutions by bringing diabetes care to the every day surrounding of the patient with diabetes and their families, says Dr. Bursell."

This will be accomplished by innovative technology, such as the use of cell phones to allow patients to automatically download results from their blood glucose meters to a secure patient portal—allowing both patients and their providers to review immediately.