



DOUGLAS LEVERE

to see the Greater Risk

Mary Carey's research focuses on how data from electrocardiography can predict who is at imminent risk for a sudden cardiac event. As her research career developed, it took her into the field to look at a population that shows special risk.

In the words of the manual, the School of Nursing's PhD program trains candidates to "contribute to knowledge development, theory generation and hypothesis testing." Intellectual work.

What the manual doesn't say is that in addition to brains and diligence, making that contribution will probably take business sense, good career management, contacts and—when you can catch it—serendipity. Mary Carey shows how it's done.

Before she went to graduate school, Carey, who received her bachelor's in nursing from UB in 1990, worked in trauma intensive care at Erie County Medical Center. As an ICU nurse, her entire focus was on the body—heartbeat, blood pressure and other vital processes—fighting to keep it alive. She didn't have much psychosocial contact with patients. That was for a different service, if the patient survived.

When she went to graduate school in nursing at the University of California-San Francisco, she was still, in her words, "caring oriented." She earned an MS in critical care nursing, but she also signed on as a research assistant with UC-SF cardiovascular nursing expert Barbara Drew. That started her down a path toward pure research.

Carey spent 12 years in Drew's lab working in the area of improving ECG detection of myocardial ischemia as a precursor for heart attack. She earned a PhD in physiological nursing and learned

the business of funded research as project director for Drew's National Institutes of Health grants.

When she was ready to look for a faculty position, one of the main attractions at UB was the strong research program in the medical school's Center for Research in Cardiovascular Medicine, a leader in the study of sudden cardiac death. She met center director John Canty when she interviewed at the nursing school and was persuaded that there were good research opportunities for her at the center.

In 2005 she partnered with Canty to secure a \$404,000 National Institutes of Health (NIH) grant specifically designed to train new clinical investigators under the mentorship of a senior investigator. The grant supported research on the potential of using 12-lead electrocardiography (ECG) to identify more precisely patients who would benefit from an implanted defibrillator as a guard against sudden cardiac death. Her research subjects were 250 patients already enrolled in one of Canty's studies.

The next step up

Carey now had good working research partnerships at UB and an impressive NIH grant on her resume. The next necessary milestone in building a research career—one that can support graduate

students both financially and intellectually, just as she had been supported in a lab at UC-SF—was to secure grant funding on her own to pursue her research on ECG monitoring.

Miniaturization has changed how Carey does research. When she worked with Drew in San Francisco, 12-lead ECG equipment was something they rolled around on a cart. Then it scaled down to desktop size. Now it fits in a shirt pocket. That makes it much easier to do research with well populations going about their everyday lives. But what population might she study next?

This is when serendipity kicked in. Carey listens to National Public Radio on her commute. She heard a story about an article in the *New England Journal of Medicine* on sudden cardiac deaths among firefighters. Stefanos Kales and colleagues had looked at death records to determine what duties the firefighters had been performing when they died. The hook that had made the report so newsworthy was that more firefighters die on duty from heart attack than from fires. In fact, heart attacks accounted for almost half of all on-duty deaths among firefighters in 2007, more than twice the rate for police and four times that for emergency medical responders.

Carey was paying attention because sudden cardiac death is her business. She had no idea that so many firefighters die from heart attacks while on duty. She needed a novel population to frame her next research project. A-ha!

She sketched out a study that would monitor firefighters with wearable 12-lead ECGs during 24-hour duty periods while also logging what the firefighters were doing during that period. She went to see Buffalo Fire Department Commissioner Michael Lombardo to explain what she hoped to do—and why. He gave her access to a firehouse for the pilot study. She acquired \$10,000 in seed money for the study from the school's Garman Behavioral Health Nursing Endowment Fund and went to work.

The pilot study—Feasibility of Obtaining High Quality ECGs in Firefighters Under Work Conditions—successfully demonstrated the feasibility of obtaining the ECG records of on-duty firefighters. That's all she needed to know: This can be done.

Perfect alignment

She applied to the National Institute for Nursing Research, one of the branches of the National Institutes of Health, for funding for a full-scale project to record ECG data on firefighters at work, associating what they're actually doing—responding to an alarm, fighting a fire, resting, cooking, exercising—with the ECG record “to determine the proportion of professional firefighters that show cardiorespiratory abnormalities of the ECG and VO₂ (oxygen intake)

at rest, at max capacity during a treadmill test and on duty.”

Her choice of the particular novel population—at-risk first responders—may have played a role in the fate of her proposal. The presence of clinical cardiologist James Fallavollita from the Center for Research in Cardiovascular Medicine as a significant contributor to the project probably helped, as well as the fact that she'd be doing the research with relatively inexpensive equipment so that the grant she was seeking would be paying more for research than hardware. And, of course, the research proposal itself was sound. All the factors lined up and Carey got the grant—an exploratory-developmental research grant award of \$411,000 for “Surveying and Assessing Firefighter Fitness and Electrocardiography: The SAFFE study.” The acronym probably contributed, too.

So now, in the arc of her young career, she has served her professional research apprenticeship, joined a faculty and completed a funded research project under the mentorship of a senior scientist, and finally stepped out on her own as an NIH-funded researcher. And having secured funding, she's better positioned to secure more.

Carey has hired nursing doctoral student Rachael Butler and master's student Salah Al-Zaiti as research assistants on the SAFFE project. One of their duties will be to watch the subjects who are wearing the ECG through their shifts, logging what they are doing every 15 minutes. As Carey observed in her pilot study, this can range from watching a Bills game in a recliner one moment to running for the fire truck the next. When the trucks roll, Butler or Al-Zaiti will go with them. During the pilot study, Carey was outfitted with boots, coat and gear, assigned to a truck and given a place to sit. The first rule for her was that when an alarm came in, the truck doesn't wait. She was amazed at how fast they respond.

Not only did she learn how to run for the truck during the feasibility study, she discovered that firefighting gear doesn't have a belt, which she'd assumed she could use to secure the ECG recorder. She also learned that male firefighters aren't enthusiastic about shaving the spots on their chests where the ECG leads are applied. More seriously, she observed irregular heartbeats in a few of the firefighters that warranted check-ups.

Two years from now, when the grant period ends, the data will have been collected and analyzed and Carey will be writing about her findings. She will also be drafting a proposal to NIH for an R01 grant—the gold standard for individual researchers in health-related fields—to follow up those findings. And she will have reached the next level of a well-managed research career, contributing “to knowledge development, theory generation and hypothesis testing.”

—Judson Mead

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