

CAREERS

TRADE TALK Organizing career panels helps a scientist to land a job **p.509**

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differences, the more he realized that, if he wanted to find the cause — or develop possible interventions — he would need to do some doctoral-level research. When a research mentor in his nursing programme at the University of California, San Francisco (UCSF), mentioned that she had a data set from cancer patients that included self-reported attention scores and corresponding blood samples, Merriman knew what the topic of his PhD dissertation would be.

“This would give me a way to look at this variability I had seen clinically using the tools of research,” says Merriman, who is now a post-doctoral cancer research researcher at the University of Pittsburgh in Pennsylvania. “I was hooked at that point.”

As a registered nurse who also holds a PhD, Merriman is one of a small but growing number of nurse scientists worldwide. Many, like him, come to research because they see a problem in the clinic that needs a research-based solution. Nurse scientists arrive at a research-career path through a variety of trajectories; historically, many have begun their doctoral work mid- to late-career, after years of seeing patients. But that trend is shifting as leaders in the field encourage younger nurses to enter PhD programmes soon after earning a nursing degree and registered nurse certification.

“We’re the new kid on the block in academia,” says Quinn Grundy, a PhD candidate in social and behavioural sciences at UCSF. She entered her programme directly after completing a four-year nursing degree at the University of Alberta in Canada, and says that the PhD will help to provide her with flexible career choices because nursing research is a highly employable field. The US Bureau of Labor Statistics predicts that by 2022, more than half a million jobs for registered nurses will be added to the US workforce. Nurse scientists, in particular, are sought by several sectors, including academia, health-care organizations and the biomedical industry.

Although nurses have been engaged in research for generations, the field in the United States only began to recognize the need for more formal-training programmes around 1986. In the same year, the National Institute of Nursing Research (NINR) was created in Bethesda, Maryland, as part of the US National Institutes of Health. Other nations have followed suit: in Canada, for instance, the first PhDs in nursing were awarded in the early 1990s. Employment opportunities for nurse researchers who hold PhDs abound, with posts available in the ►

NURSING RESEARCH

Nurses know best

The time spent at a patient’s bedside makes nurses the perfect people to pursue potent quality-of-life research.

BY KENDALL POWELL

As an oncology nurse for patients with cancer, John Merriman noticed a striking variation in his patients’ ability to concentrate after undergoing radiation

treatment. Many people brought stacks of books for their hospital stays, but only some could make it through all of their reading. Several people struggled to focus even on short magazine articles.

The more he thought about these cognitive

► military, academia, hospital-based research organizations and health-care-policy think tanks. Many nurse scientists work at university nursing or medical schools, or at large clinical-research centres that are affiliated with them.

Outside these sectors, some nurse scientists work for pharmaceutical and medical-device companies to help to run clinical trials. Others head up scientific programmes at government organizations, including drug regulators and infectious-disease agencies or national health administrations. Health-management and insurance companies, as well as non-profit advocacy groups such as the American Heart Association, also seek nurse scientists to oversee their research programmes. In academia, nurse scientists are in high demand as lecturers, thanks to globally low numbers of nursing faculty members who are needed to train the next generation.

Nurse scientists pursue research that spans molecular biology, physiology, medical imaging, and public health and policy. Nurses who want to engage in research will need to identify a relevant PhD programme and determine how best to balance nursing practice with their studies. Postdoctoral-research experience is not required for many of the nurse-scientist careers listed above, but it is necessary for nurse scientists who want to run their own research groups at research-intensive universities.

Some nurse scientists find it difficult to make time to continue seeing patients in the clinic, whereas others manage to make it work synergistically. Rapid translation and adoption of nursing-research findings can quickly change bedside practice and bring nurse scientists immense gratification. With various career options from which to choose, the common thread that bonds nurse scientists is a focus on studies that improve patient care and, ultimately, quality of life.

TESTS TO TREATMENTS

After they receive a PhD, some nurse scientists give up seeing patients to run full-time research programmes. But in many cases, their research studies or administrative duties keep them in close contact with clinical practice. As a senior lecturer at Queensland University of Technology in Brisbane, Australia, Kimberly Alexander oversees the nursing school's cancer-nursing curriculum, while also investigating how genetics influence the symptoms and outcomes of cancer treatments. Similarly, Anna Axelin, a neonatal-care nurse at the University of Turku in Finland, no longer works at the bedside, yet her research on providing intensive care for premature babies keeps her close to patients and their families, and on the hospital ward weekly.

Patricia Grady, a neuroscientist and director of the NINR (see "The price of quality of life"), says that nurse scientists who wish to remain in the clinic must find ways to efficiently blend a research question with a well-matched

FUNDS FOR NURSES

The price of quality of life

One of the least known of the 27 US National Institutes of Health (NIH) centres, the National Institute of Nursing Research (NINR) operates on an annual budget of about US\$144 million. That budget has nearly tripled in the past 20 years, but it is a tiny slice compared with the almost \$5 billion that the NIH gives to the National Cancer Institute, for example. About 10% of NINR funds support a small internal programme of seven research groups, and the rest of the budget is given in the form of grants to fund external research and training programmes.

Unlike the many other institutes, however, the NINR is not focused on a particular disease area, life stage or organ system. "Our science is primarily

clinical research, but we are what can be described as disease-agnostic," says Patricia Grady, director of the NINR in Bethesda, Maryland. "It's all about the science of what causes symptoms, how can you intervene and how can you help people live with chronic symptoms."

NINR-funded research has uncovered differences in how men and women respond to pain medicine; developed better tools for end-of-life and palliative care; and led to programmes that help adolescents to better manage their diabetes.

Grady says that both the evolution of health-care delivery and the ageing of populations worldwide ensures nursing researchers a bright future. **K.P.**

patient population. US Navy commander Jason McGuire, a certified nurse anaesthetist who is stationed at the Walter Reed National Military Medical Center in Bethesda, Maryland, has managed to do just that. He chose to research a condition that affects veterans who are undergoing general anaesthesia for surgery.

In McGuire's work with combat veterans, he noticed a clinical phenomenon that was missing from the scientific literature: his patients experienced 'emergence delirium' at a much higher rate than did the general population. With this condition, veterans wake up from anaesthesia in a confused and combative state. It can lead to physical and cognitive complications, both during recovery and later in life. "I wanted to find out what the incidence was in our military population and how we can decrease the chance of it happening," says

Rapid translation and adoption of nursing-research findings can quickly change bedside practice.

McGuire, chief of nursing science and clinical inquiry at the Walter Reed centre. In 2008, the Navy considered McGuire's question important enough to send him to get a PhD at the University of San Diego, California. Gaps in scientific knowledge of nursing practices are common, and often become dissertation topics for nurse scientists. Like many nurses, McGuire chose to pursue the applied side of his research question. "Am I really going to figure out why this delirium occurs? Or can I move a little quicker, to something that will decrease the incidence?" he asked.

Now, four years after receiving his PhD, he is beginning a randomized controlled trial to test whether giving a specific sedation

medication during surgery — before patients enter recovery — can reduce the risk of emergence delirium. By the end of the 3-year, 370-patient study, McGuire might have devised a new standard of surgical care for combat veterans.

Such immediate application of research findings to clinical practice is particular to nursing science and contrasts sharply with related fields, such as medicine, dentistry or veterinary science, in which translation of results into clinical interventions and treatments can take decades. This rapid application makes nursing research especially attractive to researchers who want to see their work improve lives right away.

Quick adoption comes largely through the close ties that many nurse scientists keep with their colleagues who work at the bedside. Of the nearly three million registered nurses in the United States, Grady estimates that only 1% are nurse scientists. In 2013, the US Health Resources and Services Administration reported that almost two-thirds of nursing schools had restricted student enrolments because of faculty shortages (see go.nature.com/fwcli1). "We need more of a critical mass," she says.

It is clear that increasing the number of nurse researchers would help to improve patient care. In the decade that Axelin spent in neonatal intensive-care units (NICUs), she noticed a poignant, recurring pattern: during painful procedures such as an intravenous insertion, mothers would weep outside in the hallway while their babies cried inside the hospital room. "It's common practice to ask parents to step outside. But they're both crying," she says. "I thought, 'There must be some solution.'"

Her dissertation research found that parents who held their premature babies during medical procedures alleviated the

children's pain as effectively as did the standard long-accepted protocol — giving babies a sugar solution before a procedure. Within a year of that discovery, almost every NICU in Finland was using Axelin's parental-hold technique, and she had received calls from hospitals in Sweden, Switzerland, Norway, Estonia and Canada that all wanted to implement it.

"It's important for nurses to know and notice that they can make a change in care," says Axelin. "In nursing research, it's all about a holistic view of the patients we work with every day."

Alexander echoes that sentiment, emphasizing that nursing science is not about discovering new therapies or drugs to treat a particular disease. Rather, it focuses on understanding people's responses to treatments and alleviating symptoms to improve quality of life. Her research aims to find ways to tailor nursing care to each patient who has cancer.

Grady says that the NINR's vision for nursing science is to generate a knowledge base that will improve clinical patient care and help to shape US health-care policy. Although many nursing interventions might seem obvious in hindsight — such as parents holding their babies in the NICU — these care procedures must still be tested under rigorous conditions to prove that they lead to better patient outcomes than do current standards of care.

In some ways, nursing science is playing catch-up as researchers race to fill in holes left in the scientific literature — for instance, how transport by helicopter might alter a trauma-patient's physiology. The field is also

poised to determine how nursing care might be delivered to patients now — and in the future — through smartphones and other forms of digital technology.

IN THE THICK OF IT

The US military has been a front-runner in training nurse scientists, with the US Army, Navy and Air Force each sending one or two nurses for doctoral work each year for the past decade. Although military nurse scientists run research programmes that are designed to address military medicine, situations and populations, their work spans a wide swathe of disciplines, from physiology to public health. Navy Commander Virginia Blackman, a critical-care nurse scientist at the Walter Reed centre, studies how different pain-management protocols used on trauma patients in the field might

"In nursing research, it's all about a holistic view of the patients we work with every day."

affect their long-term development of chronic pain or post-traumatic stress disorder. Like many nurse scientists in hospitals, Blackman advises staff nurses on how best to convert the latest research findings into practice.

As a public-health nurse scientist in the US Air Force, Lieutenant Colonel Jennifer Hatzfeld has worked on projects as diverse as boosting mammogram rates in military wives and — while deployed to Kandahar, Afghanistan — designing protocols for treating blast-fragment wounds. Now based at Fort Detrick, Maryland, she manages the Department of Defense's 'en route' care research portfolio, which focuses on improving care for patients during air or ground transport.

"Some days, it's a little bit like managing somebody's cheque book," Hatzfeld says of her job as a programme manager: she decides which projects to fund. "But I love it because it's an opportunity to strategically guide the future of en route care."

She says that nursing usually attracts those who want to take care of others and contribute to making the world a better place — not necessarily those who see themselves pursuing a doctoral degree. But nurses have important roles in research, she says. They bring unique perspectives to research teams because they are usually closest to the final stages of a study, when an intervention is delivered to a patient or when carers are helping someone to cope with side effects. "There are questions that we need asked and answered that are specific to nursing," Hatzfeld says. "If we don't do it, then we are allowing physicians or other disciplines to ask those questions with what might not be the right perspective or approach." ■

Kendall Powell is a freelance writer based in Lafayette, Colorado.

TRADE TALK

Career doctor



After finishing a PhD and a postdoctoral fellowship in virology, Thomas Magaldi forged a career helping science graduate students and postdocs to plan

their paths. He is now the career-services administrator at the Memorial Sloan Kettering Cancer Center in New York City.

Why did you go to graduate school?

I wanted to be a professor at a small liberal-arts college. I learned that I needed a PhD to do that.

How did that work out?

During my PhD programme, I started to question my goals. I helped to develop a career-networking group for science trainees at Yale University in New Haven, Connecticut, and I explored other career options, including a science-policy fellowship. But every fellow I spoke to had done something interesting outside the laboratory; I knew that I wouldn't be competitive.

So what did you do?

While finishing my thesis, I decided that I should also pursue skills that would set me apart. I did an internship for the US Department of State on how the United States could help Mongolia to create a viable science-education programme. I spent my nights doing that during the last few months of my PhD. Then, for my postdoc, I chose a mentor who would keep me excited about science and who was in Washington DC, where I would have access to policymakers. I volunteered to meet with my local congressman about raising the US science budget, and I taught as an adjunct professor.

How did all of that experience help you?

When my wife and I had a baby, we needed more than my postdoc salary and we wanted to be near family. I realized that I had already built a competitive CV for many positions outside the lab, but still requiring a science PhD and postdoc training. The specific scientific work I had done would not distinguish me, but my other experiences would. For the jobs that I wanted, I was ready. ■

INTERVIEW BY MONYA BAKER

This interview has been edited for length and clarity; see go.nature.com/5xbdz6 for more.

SHOJA LAK



Anna Axelin at the University of Turku, Finland.