Bringing crucial cancer treatments to rural communities

March 14 2023, by Velvet Hasner

Credit: Pexels image by Peter Fazekas

Fresh air, sunsets, and a night sky full of stars are a few of the benefits to country living that rural residents can claim. But access to medical specialists and customized cancer treatment? That often means a lengthy

drive to a more urban area. Researchers at Missouri S&T are looking at a new way to deliver radiation therapy to cancer patients that eliminates the need to travel.

Medical physicist Alex Price's idea is relatively simple: bring radiation therapy to rural areas by vehicle, similar to a mammogram van that provides breast cancer screening services to rural communities. Price, who works in radiation oncology at University Hospitals Health System in Cleveland, Ohio, is a Ph.D. candidate in systems engineering at Missouri S&T.

"Science is cool, especially when you can use it to help people," he says.

To make his idea work, Price must solve a series of challenges: the logistics of getting, using and staffing the vehicle while following radiation safety precautions; investment by a health care system; and favorable public perception by patients and their families plus the health care professionals who recommend the service to their patients.

Price is working with a team of researchers at S&T to study the feasibility of a mobile radiation oncology unit and anticipate challenges of his concept using his health care knowledge and systems engineering education. Dr. Casey Canfield, assistant professor of engineering management and systems engineering, says systems modeling can be a helpful tool when considering changes within many types of systems, including health care.

"In the first step of the research, we simulated the economic and technical aspects of the system using what is known as a Monte Carlo simulation to predict possible outcomes," Canfield says. "Second, we conduct targeted interviews to survey key stakeholders, including patients and physicians, to measure how individuals might behave within the system."

Canfield says the final step will be modeling using information learned in the first two steps. The team will pursue funding from the National Institutes of Health to pilot mobile radiation oncology in a rural area.

Price led the technological-economic analysis, and the results were published in *JCO Global Oncology*, a journal of the American Society of Clinical Oncology. The study showed that mobile radiation treatment is both technologically and economically feasible within rural Missouri. The model used two mostly-rural areas as sites: a portion of northern Missouri and southeastern Missouri.

Taking the pulse of the patients

For the second part of the project, Price interviewed 10 rural cancer patients and five doctors who provide cancer care. Jadeyn Metcalf, a sophomore in psychology at Missouri S&T from Advance, Missouri, helped transcribe the interviews for analysis. This information will be used to create a survey for a larger set of patients and providers by working with the University of Missouri-Columbia, Case Western Reserve University in Ohio and the Iowa Cancer Consortium. Researchers at Washington University in St. Louis will assist with data collection as well.

Metcalf can relate to living in rural Missouri. Her hometown of Advance has a population of 1,300 and Cape Girardeau—the closest city, with a population of 39,000—is 30 minutes away.

"Rural is all I really know," she says.

Metcalf says she has enjoyed conducting research at S&T, beginning her first year with a program named FYRE (First Year Research Experience). Dr. Clair Kueny, interim chair and associate professor of psychological science, served as Metcalf's advisor.

"Research helps broaden your knowledge in several different fields," Metcalf says. "You learn as you go, and you learn from experience rather than just in class."

In April, Metcalf will share details about the research project during Undergraduate Research Day at the Capitol in Jefferson City. This summer she will participate in an internship with St. Louis-based health insurance company Centene. She plans to pursue a master's degree in industrial-organizational psychology.

"Research has given me the experience to explore a different field of psychology," Metcalf says. "I've been doing so much with health care, through S&T's Opportunities for Undergraduate Research Experiences and FYRE programs that I've decided this is what I want to do as a career."

Kueny praises the multidisciplinary aspect of the team working on the mobile radiation oncology project.

"We have people representing psychology, systems engineering and a medical focus," Kueny says. "With Jadeyn's support in undergraduate research and some of her experiences growing up, it's very interdisciplinary and broad in terms of expertise and levels of experience."

More information: Alex T. Price et al, Techno-Economic Feasibility Analysis of a Fully Mobile Radiation Oncology System Using Monte Carlo Simulation, *JCO Global Oncology* (2022). DOI: 10.1200/GO.21.00284

Provided by Missouri University of Science and Technology