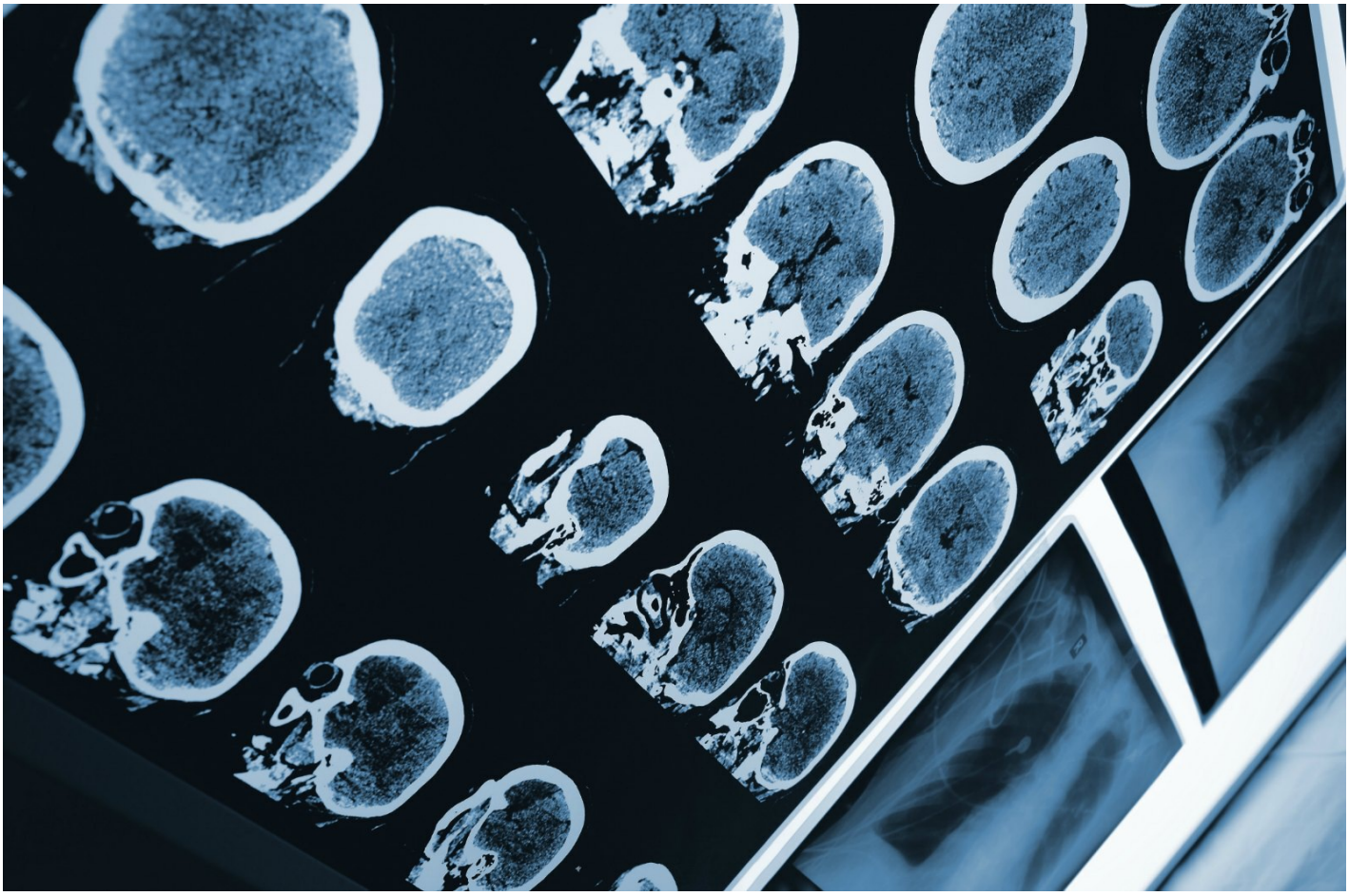
Mining Data For Treatment Goldmine

Emory University



Tim Fox, Ph.D., says his work as a medical physicist in radiation oncology at Emory University is akin to designing a war plan.

Before directing radiation at cancer cells inside the body, Fox and a specialized medical team must first map the exact location of a tumor inside the body, drawing distinct borders between diseased and healthy tissue and organs. To help in this mapping, or planning, process — and to evaluate the effects of the radiation after treatment — the team uses an increasing number of imaging technologies, from computed tomography (CT) and magnetic resonance (MR) imaging to positron emission tomography (PET).

“We have an explosion of imaging and treatment data,” says Fox, a medical physicist and associate professor of radiation oncology at Emory’s Winship Cancer Institute. “We are overwhelmed with images.”

Although the imaging studies available to cancer treatment teams are each highly useful individually — CT and MR for anatomical detail and PET for functional activity within the body — Fox knew that viewed collectively and within the treatment planning system, they could be even more valuable. So he joined Emory radiation oncologist Ian Crocker,

M.D., and software engineer Paul Pantalone in developing a software solution that integrates pretreatment and post-treatment images with treatment data.

> *Our goal is to intelligently assemble treatment data and patient images to improve clinical decision-making.*
>
> Tim Fox

Integrating PET PET scanning has become indispensable for diagnosing and determining the extent of cancer in the body because it visualizes what's happening at the molecular level: on a PET scan, highly active cancer cells appear as "hot spots," or areas of bright intensity. But without the added anatomical detail of an MRI or CT scan, it can be difficult to identify where those cells are located — which is critical to the radiation planning process in which diseased areas must be carefully outlined, or contoured.

"When I saw young physicians in training who weren't confident about incorporating PET into the radiation therapy planning process, I knew it was a problem that needed to be fixed," says Fox.

Fox and Crocker engaged Pantalone in the research project, asked the Georgia Research Alliance (GRA) for seed money and founded Velocity Medical Solutions in 2004. As part of the GRA commercialization process, Velocity licensed the technology from Emory.

A combination of seed grants and loans from the GRA enabled Velocity to begin integrating the technology and validating the platform. Within 18 months, the team received clearance in the form of a 510(k) from the U.S. Food and Drug Administration (FDA).

"Integrating PET into planning CT is where we started," says Fox. "But we also wanted to be able to combine all diagnostic images — PET, MR and CT — with treatment planning."

However, perfectly aligning multiple types of patient images taken at different times and in different positions posed a huge technical challenge.

Deformable Registration

The process required Velocity to innovate and create sophisticated scientific algorithms that identify landmarks within different images and align or "deform" them into a single view.

This method, called deformable image registration, is key to the interconnectivity and efficiency of Velocity's solution, which is also vendor-neutral.

"The treatment process has a tight timeline so efficiency is important," says Pantalone. "We knew that viewing a CT and PET scan together in a single view instead of having to toggle back and forth between the images would be a time-saver."

> *Another technology the team developed was a method for assessing treatment response to cancer therapy using PET imaging. The technique, called a metabolic volume histogram, measures the metabolic activity of a tumor following radiation therapy.*

"Our software solution helps physicians be more confident in their decision-making, especially when deciding whether or not to re-treat a patient," says Fox.

From a physician's standpoint, Crocker could not agree more. "Image registration and use of multimodality imaging are absolutely critical to the successful treatment of patients, and Velocity is extremely good at that," adds Crocker.

Partnering with Emory, GRA

Throughout the process, the Office of Technology Transfer at Emory University and the GRA proved extremely helpful.

"As a start-up company, you have to find investors and partners that believe in your ideas and your team," says Joelle Fox, chief financial officer of Velocity Medical Solutions. "For Velocity, these partners were Emory and the GRA. Without funding from the GRA, we wouldn't have been able to get started."

Since acquiring its first customer in 2007, Velocity Medical Solutions has grown to 30 employees who continue to build on its core technologies, developing new solutions including the VelocityGrid, which allows multiple users to access the same database, and a new product that will allow for cloud-sharing and storage.

"Velocity has done a good job of growing and creating new jobs in Georgia," says Philip G. Semprevio II, licensing associate at Emory. "We are happy with our partnership and have every confidence the company will continue to grow. Velocity is a perfect example of how Emory technologies can be transferred into commerce, grow the local economy and make a positive impact in the medical practice of cancer centers across the globe." Along the way, Velocity has posted impressive growth in both revenues and market share — the company's solutions are currently installed in 18 different countries and in 15 of the top 50 cancer centers in the United States as ranked by the U.S. News and World Report.

One Patient at a Time

For now, Velocity is content helping to improve cancer-care decisions one patient at a time, offering customers the option of a perpetual license or annual subscription to its software products, as well as onsite training and technical support. But long term, the company hopes to partner with its customers to use data stored at Velocity to better understand patient populations and develop new insights.

"Ultimately we want to be able to mine our data to learn more about patient outcomes and treatment trends," says Tim Fox.

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