Customer Spotlight
Lehigh Valley Health Network

About Lehigh Valley Health Network

Lehigh Valley Health Network (LVHN) is comprised of eight hospital campuses plus numerous health centers, physician practices, rehabilitation locations and other outpatient care locations in seven eastern Pennsylvania counties.

Lehigh Valley Cancer Institute's radiation therapy program is nationally recognized for maintaining the highest safety and care standards. With access to the latest treatments available, their radiation therapy program is able to provide leading-edge cancer care to the surrounding communities.

The following interview was conducted with Derek Moyer, Clinical Medical Physicist at Lehigh Valley Health Network.

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Please tell us about your experience implementing Adaptiiv into your current workflow.

With our early patients we were extra cautious, but the fit has always been great. In the case of Modulated Electron Bolus, we did CBCTs on our treatments in the beginning. We typically do not do this with electrons cases, but because of the capabilities of the modulation we wanted to be sure everything was aligned correctly. We did that to verify the structures and all the images were great!

Our current workflow is that we simulate the patient usually with an open-faced thermoplastic mask, prepare the plan and bolus. When everything is ready, the patient returns to the CT right before their first fraction to verify the fit and adjust the mask if necessary. Then the patient goes to treatment without CBCTs in most cases because we are confident in the fit.

Planning Software → DICOM → STL File

An illustration of how the Adaptiiv solution integrates with the radiotherapy workflow.

How would you describe the implementation and commissioning process for the 3D printer?

For commissioning, we performed all of Adaptiiv's recommended tests – we looked at the Hounsfield units (HU), density by weighing the material, uniformity of the HU for the benchmark and other prints, and we made sure that the volume that was printed was similar to the 3D model that was designed. We tested the fit of the bolus on phantoms and patients. We went above and beyond by doing some of the PDD measurements for commissioning, as well as, some MapCHECK and ion chamber testing.

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What type of cases are you using the Adaptiiv technology for?

We primarily use it for skin lesions on the face and head but have also used it for some complex extremity cases. For one patient, we created a bolus that was similar to a shoe which fit right over the patient's heel. They had recurrence because it was a very challenging region to get sufficient dose to by using traditional methods. The perfect fit of the Adaptiiv bolus allowed us to easily achieve optimal dose and reproduce the positioning of the bolus. This cannot be replicated using Superflab and/or wet gauze because there are always density issues and positioning is harder to reproduce between fractions. Adaptiiv enabled us to achieve optimal treatment for this case.
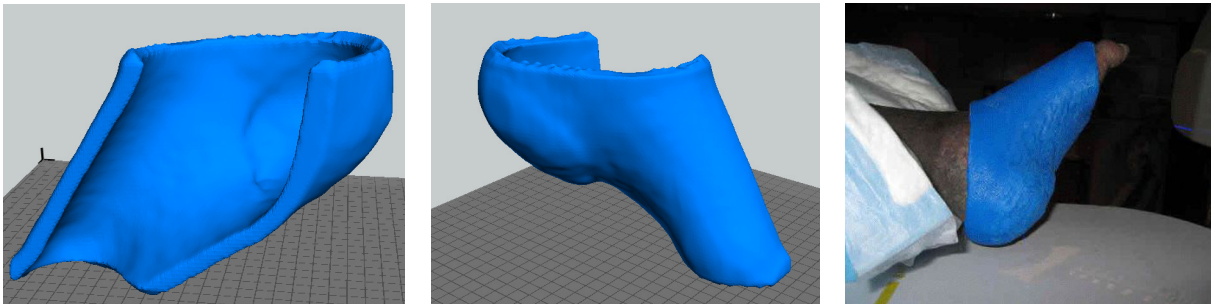
LVHN was able to treat a complex extremity case with a custom bolus that was fabricated based on the patient's exact anatomy, resulting in a perfect fit that provided optimal dose and reproducible positioning.

Has LVHN realized any significant benefits from implementing Adaptiiv software?

Yes, it has definitely saved us time. Especially in skin treatment cases where patients are treated 20 to 30 times, saving time on setup is very important. Our therapists initially had hesitations but through training they have gotten used to the workflow and now they enjoy not having to cut Superflab or place wet gauze on the patient in the same spot every day.

How has the longevity of these 3D printed RT accessories been in your experience?

We haven't noticed any degradation of structural integrity across fractions. There has yet to be a case that required a reprint. We always clean these boluses between fractions with wipes and spray, so we have put them to the test.

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Are there any techniques that you look forward to implementing at your center in the future?

We have a lot of excitement built around using 3D printed moulds to create flexible (silicone) bolus. Our doctors really like the idea of using softer silicone boluses that would be much more comfortable for patients with highly sensitive treatment areas, such as skin lesions. We have started testing the process as we think it will dramatically increase our number of use cases.
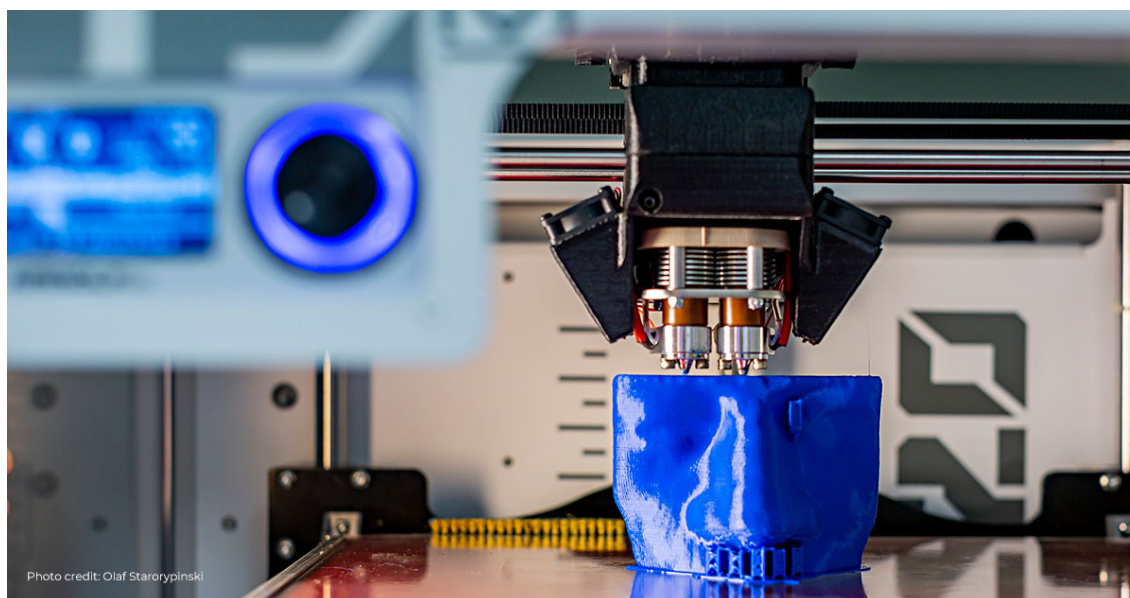

Photo credit: Olaf Starorypinski

LVHN is one of a few locations in the U.S. using groundbreaking 3D printer technology to create customized boluses for radiation oncology patients.

Have you found any alternative uses for the 3D printer in your center?

The printer has been used to fabricate PPE and other tools in response to the COVID-19 pandemic, such as facemasks, ear saver straps, and 'hands free' door handles. We also just recently printed a CT laser phantom and some ion chamber holders. There are definitely numerous opportunities to find creative, alternative applications for your printer that also help your center gain a quicker return on investment.

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Who is primarily using the Adaptiiv solution at LVHN?

Originally when we had lower volumes, I was able to take all the responsibility. Volume started to build to 7-10 cases per month as more physicians wanted to use the technology. I started training dosimetrists for the planning side and another physicist on generating the 3D print from the plan. It's easy software to work with and in terms of training, our staff has gotten up to speed very quickly.

"The doctors that were involved were very excited to get started right away and were able to make some really interesting plans.

There were some doctors that were hesitant in the beginning, but as we gained confidence with the process and proved out the workflow and that the patient treatment was just as good or better, they quickly embraced the technology.

Now we are at the point where every doctor has used the Adaptiiv software in some capacity."

Derek Moyer
Medical Physicist
Lehigh Valley Health Network

About Derek Moyer:

Derek Moyer holds an undergraduate physics degree from Bucknell University and a DMP (Doctor of Medical Physics) from the University of Cincinnati with graduate research in 3D printing and computer programing. He is currently an ABR certified Clinical Medical Physicist, specializing in SBRT, 3D printing, and scripting at Lehigh Valley Health Network.