

Unexpected Uses of 3D Printing During COVID-19: The Creation and Clinical Validation of a 3D Printed Nasopharyngeal Swab for Critical Need Testing

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CONCLUSION

By utilizing POC printing, our departments were able to develop and test a 3DP solution to COVID-19 testing. With bench and clinical validation, the production files and instructions were made publicly available to allow other institutions with POC 3DP capabilities to produce swabs locally. This project demonstrates the value of having POC printing teams in Radiology who can move quickly to address critical issues in beyond their normal medical imaging and modeling utilization.

BACKGROUND

Due to the COVID-19 pandemic and the disruption of global supply chains, one key component of the viral testing kit, the synthetic nasopharyngeal (NP) swab, resulted in test shortages. Access to testing is critical in managing the epidemic. University of South Florida Health and Northwell Health collaboratively created a 3D-printed (3DP) NP swab that was made freely available to address local shortages until global supply chains were restored.

EVALUATION

As point-of-care (POC) clinical 3DP labs in radiology departments, we examined what printers and materials we had access to and considered which were most ubiquitous and affordable to as many 3DP medical labs as possible. We selected the FDA cleared Formlabs Form2 and Form3B printers using the patient safe, Surgical Guide Resin. Stem and tip designs were developed in CAD software. These designs were printed and examined by infectious disease and otolaryngology faculty to narrow down a patient safe and comfortable design. Bench lab testing confirmed viral retention and sufficient sample capabilities. A multisite clinical trial was begun to test the 3DP swabs' performance compared to synthetic NP swabs.

DISCUSSION

The 3DP swabs passed all bench lab and clinical trial testing. They were implemented locally to supply our institutions. The swab was made publicly available and used across the world to allow institutions to address their respective needs. We were able to produce between 324-380 per printer/day. After washing and curing, the swabs were sterilized and included in viral test kits with the transport media. With these 3DP swabs in place, testing rates were able to increase so a clearer view of COVID-19 rates could be provided to healthcare professionals.