**RAPID CREATION OF NINE OPEN SOURCE 3D PRINTED PERSONAL PROTECTIVE EQUIPMENT SPECIFIC TO MEDICAL DEVICES**

Lemanski BCP1,2, Lemanski N1, and Cheng M1

1. Mabel MP Cheng MD PLLC, 3140 Troy Schenectady Road, Niskayuna, NY 12309
2. AlbanyNYPPE, a NYS not-for-profit, 3140 Troy Schenectady Road, Niskayuna, NY 12309

**BACKGROUND:** Medical devices utilized by health professionals often require close proximity to patients (e.g. ophthalmoscopy, otoscopy, etc.). Due to Coronavirus pandemic, this presents a challenge as patient infection status may be unknown. Personal protective equipment (PPE) exists for use on one’s person, but few exist for medical devices. Here we rapidly created and produced inexpensive medical device specific PPE (mdsPPE), released open source for free use.

**METHODS:** Stereolithography (STL) files of otoscopes, direct / binocular indirect ophthalmoscopes (DO / BIO), panoptic ophthalmoscopes (PO), AO style phoropters, and vision screeners (VS), were made by laser triangulation digitization at 10 μm, or obtained from colleagues. STLs were made to accept the 3DVerkstan (3DV) shield template (most popular NIH approved emergency PPE) via Computer Aided Design (CAD) software. STLs were sliced at 250 μm in Cura Lulzbot Edition 3.6.3, printed in Polylactic Acid, and validated for proper fitment against each device.

**RESULTS:** STL files (SZ Yehiam, MD, Israel) for Welch Allyn (WA) DO, Keeler All Pupil I & II BIO, WA Otoscope, and Heine Omega BIO, were converted in CAD to 3DV template within 1 hour. AO style phoropters, WA PO, WA Spot SV, and WA Otoscope, were digitized in 6 hours. Time to create 1 design (digitization, design, printing, revision / validation) was 72 hours. Average cost of mdsPPE was 2 USD. Average time to print mdsPPE was 35 minutes. Designs yielded satisfactory protection to medical testers.

**CONCLUSIONS:** Digitization / printing yields high quality mdsPPE that are quickly and inexpensively produced. To our best knowledge, mdsPPE for WA PO, WA Spot VS and WA Otoscope are novel. MdsPPE for phoropters is novel for non-interference with cross cylinder function. Designs hosted on NIH print exchange: <https://3dprint.nih.gov/users/bcplemanski>

**CONTENT CATEGORY:** Biomedical Engineering, COVID-19 Response

**KEYWORDS:** *3DPrinting, COVID-19, Coronavirus, PPE*