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Promoting Technology and Collaboration

Breaking Barriers of SDOH in Breast Reconstruction Surgery: Point of Care 3D Printed Prosthetics for Post-Mastectomy Patients

Rand Kittani; Ayse Ozkan; Vignesh Chennupati; and Victor Stams, MD

Carle Illinois College of Medicine, Urbana, IL; Carle Foundation Hospital, Urbana, IL

Background: Breast reconstruction after mastectomy is critical for patient quality of life, yet the reconstruction rate remains at 59%. Urban patients have a three times higher reconstruction rate than those in rural areas. Also, those with lower income, minority, and publicly insured were less likely to receive reconstruction. Post-op recovery time of estimated 8 weeks can further impact work productivity and patient time commitments. There are several comorbidities that are contraindicated for breast reconstruction surgery prompting patients to decline the procedure such as age, cardiac disease and obesity. Given these disparities and challenges, 3D printing methodologies have demonstrated significant benefits in offering more tailored solutions that are patient-centered alleviating barriers such as recovery time and cost. In addition, 3D printed prosthetics would reduce the need for multiple surgeries and eliminate the reliance on specialized surgical teams, making reconstruction more accessible.

Technology Overview: Point-of-care 3D printing represents a transformative approach to breast reconstruction, addressing critical access barriers and improving outcomes for low-SES patients. Using 3D scanning technology to capture the dimensions of the intact breast, the data is used to design a mirror-image model of the contralateral breast using a user-friendly Computer-Aided Design (CAD) software. This model is subsequently printed using a biomaterial 3D printer, producing a custom prosthetics that matches the patient's anatomy. Supported by patient preference and replicable prototypes, implementing affordable, in-house 3D printing solutions, we aim to improve patient outcomes and satisfaction.

Potential Application in Surgical Simulation and Education: Installation in surgical training during residency and holding periodic training workshops can help integrate this technology into practice and gain expertise to support patients sooner.

Potential Opportunities to Collaborate: Initial collaborations with CAD software engineers could help with surgical staff training as well as with 3D printing manufacturers to customize printer features to continue support implant customizations and improvement.