**3D Printing for Biomedical Technologists:   
An ounce of prevention is worth a pound of cure**

L. Cortez1

1 Medical Engineering, University Health Network, Toronto, Canada

Fundamental to health technology management (HTM) is to promote equipment uptime so staff/patients have the tools they need to provide exemplary care. This is typically achieved this via two maintenance activities. First, we conduct unscheduled maintenance using a “find and fix” approach. Second, we conduct scheduled maintenance as part of “predict and prevent” approach. However, very few medical devices benefit from schedule maintenance.(1) Therefore, there is a need to augment our ability to “predict and prevent” medical device issues.

Human factors science indicates that to *prevent* issues, person-focused interventions (which attempt to change knowledge; e.g., in-service training) are less effective than system-focused changes (which attempt to eliminate the issue by changing the underlying design; e.g., forcing functions).(2) Yet, in HTM we often focus on the former as they are perceived as requiring less effort(2) and that only manufacturers can change medical device design.

In 2021, the Medical Engineering Department at the University Health Network, Toronto, purchased a 3D printer. The intent was to challenge this paradigm and augment equipment uptime by *preventing* medical device issues through improved *design*. Since then, the printer has been in continuous use.

This presentation aims to support those not yet 3D-printing to start to do so, and for those already 3D-printing, to further embed this technology within HTM. This presentation will highlight:

* How to implement 3D printing in an HTM department to address safety issues (e.g., equipment, software, training)
* 3D prints we have created, from simple to advanced 3D object designs; samples and their impacts will be shown. For example; power cord “retainer” has prevent charging issues; an oxygen flow meter control knob “protector” has prevented inadvertent changes to patient oxygenation (critical safety incident).
* Challenges (e.g., learning software) and tips (e.g., iterative learning and designing) to ensure successful 3D printing and designs
* Next steps to advance 3D printing in HTM (e.g., open source designs)

In summary, 3-D printing can prevent medical device issues and promote equipment uptime, and thus should become a standard and essential tool in HTM departments.

Keywords— 3D-print, prevent, design, safety

Conflict of Interest

The author declares no conflict of interest.

REFERENCES

1. M. Ridgway, “Optimizing Our PM Programs,” Biomedical Instrumentation & Technology, vol. 43, no. 3, pp. 244-254.  2009. DOI: 10.2345/0899-8205-43.3.244
2. P. Trbovich and K.G. Shojania. “Root-cause analysis: swatting at mosquitoes versus draining the swamp,” BMJ Qual Saf, vol. 26, pp. 350–353, 2017. DOI:10.1136/bmjqs-2016-006229