GUIDEWIRE ORGANIZER FOR ENDOVASCULAR PROCEDURES

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Abstract

During an endovascular procedure, many guidewires of different styles are used. The guidewire is removed from original casing and inserted into the patient. The catheter is secured in place and the guidewire is then removed from its original casing. After the guidewire is removed, a problem arises. The guidewire can become easily tangled and disorganized. As a result, the team has been tasked with creating a device that allows for better organization, storage, and dispensing of guidewires during endovascular procedures. The team produced four designs: Magnetic Wheel, Clamped Wheel, Wheel of Magic, and Guidewire Hoop. Ultimately, the team chose the Guidewire Hoop as the final design. The proposed design is a ring-like device with a magnetic inner surface in order to keep the guidewire secure at all times.

Background and Motivation

In many endovascular surgeries, the main concern is a dangerous and unorganized environment due to guidewires being difficult and time-consuming to store and manage. Each lost minute in a hospital operating room costs an average of $60 [1]. Thus, this device will decrease the amount of time a surgeon spends in the operating room; therefore, decreasing the amount of wasted time and money in the operating room (OR). Additionally, this device will allow for better organization and a less hazardous setting in the OR.

Figure 1. Original Guidewire Casing [2].

Design Criteria

- Device should allow for more efficient loading and unloading of guidewire during operating room procedures.
- Device must keep guidewires organized and untangled while stationed within the wheel.
- Device should consist of two parts: the guidewire organizer wheels and the crate to hold the wheels .
- Device must be able to hold guidewire sizes from 0.014 and 0.035 inch with varying stiffness.
- Device prototype should be 3D printed for proof of concept.

Final Design

Description:

- The device includes 4 guidewire hoops and a crate.
- The inner cavity of the hoop is magnetized.

Progress:

- The team has made two prototypes:
  - The first prototype was too large.
  - The second prototype amended this issue.
- The team has tested the second prototype:
  - Loading and Unloading Time Test.
  - Entanglement Test.

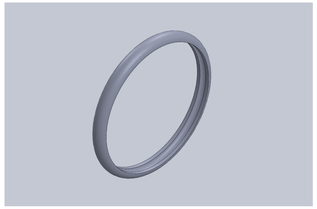

Figure 2. Final Design Guidewire Hoop. Outer Radius: 11 cm. Inner Radius: 10 cm.

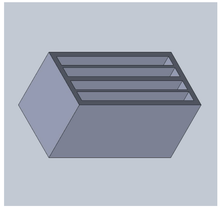

Figure 3. Final Design Crate. Dimensions: 12 cm x 24 cm x 12 cm

Testing and Results

- ANOVA test found significantly different (p = .00617) loading times for the soft versus stiff wire.
  - Difference in loading time is an indication that using multiple devices for different wires, stiff and soft, may be needed to speed up the loading process of guidewires.
- Prototype had more efficient unloading times versus the original casing (p = 3.77E-9) for both the soft and stiff wire.
- Occurrence of the wire getting tangled was tested (n = 10) and 0/10 times the wire got tangled/fell out of the device.
- The prototype successfully kept guidewires organized.
  - Main goal of our client.

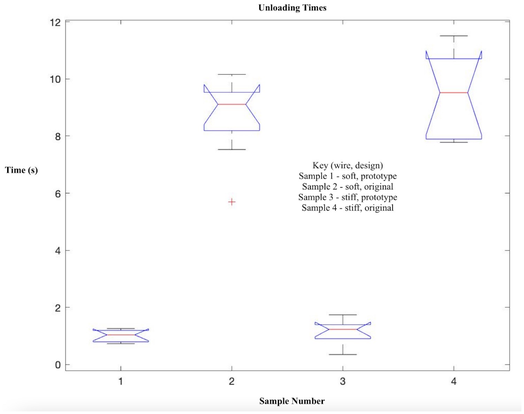

Figure 4. Data distribution of Unloading Times comparing 4 samples

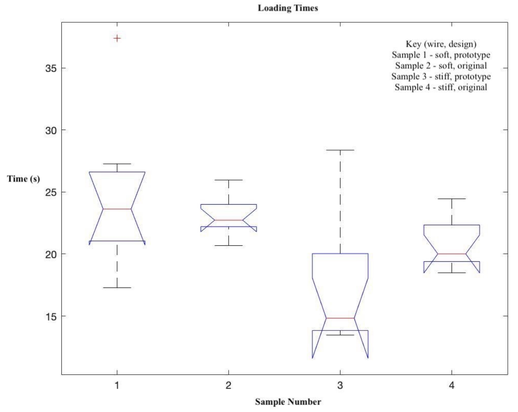

Figure 5. Data distribution of Loading Times comparing 4 samples

Material Cost

Item	Description	Quantity	Cost
Preliminary Guidewire Hoop	Initial Prototype	1	$19.76
Final Guidewire Hoop	Final Prototype	2	$7.68
Final Crate	Final Prototype	1	$61.84
Magnetic Tape	Magnetic tape for inner surface of hoop	1	$14.23

Total Cost:$111.19

Future Work

Modifications to make loading more efficient:

- Added back wall.
- Deeper inner cavity.
- Decrease the diameter of the guidewire hoop.

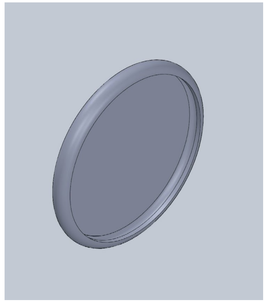

Figure 6. Modified Guidewire Hoop. Outer Radius: 11 cm. Inner Radius: 10 cm.

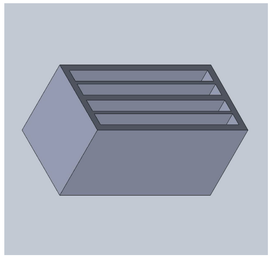

Figure 7. Modified Crate. Dimensions: 10 cm x 20 cm x 10 cm

References

[1] H. Gül, "Occupational health and safety in operating rooms," *IntechOpen*, 26-May-2021. [Online]. Available: https://www.intechopen.com/online-first/76118. [Accessed: 23-Sep-2021].
[2] "Vascular access," *Qosina*. [Online]. Available: https://www.qosina.com/vascular-access?specs=74%2C84%2C85#gref. [Accessed: 07-Dec-2021].

Acknowledgements

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