

Endovascular Devices For Cath Lab And Operating Room Procedures

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An endovascular procedure is a minimally invasive technique used to diagnose and treat vascular diseases. The growing endovascular device market is currently 2.8 billion US dollars and is expected to gain market growth from 2017 to 2022 at a compound annual growth rate (CAGR) of 7.3% showing an increasing market growth beyond 2022 (Thakur, 2018). As chronic diseases increase and as the geriatric population grows, the need for minimally invasive procedures becomes more apparent. The decreased recovery time of these procedures and emerging technological advancements in healthcare will continue to make this market prosperous. The growing market indicates a need for innovation to ensure well-done and efficient procedures. With today's advanced medical technologies, catheter-based intervention is replacing traditional surgery for many patients and is also reaching a wider range of patients, as it can be applied to patient groups where open surgery is not possible. These technologies rely on guidewires and catheters to travel the vascular system and access the desired position. The use of guidewires spans a variety of different surgical sectors including, but not limited to: angioplasty, stenting, pacemaker insertion, electrophysiology studies, atherectomy, thrombolysis, and endourology and therapeutic endoscopy of the gastrointestinal system (Sharei et al., 2018). Vascular surgeries are becoming so common that it was previously estimated that 1,020,067 vascular procedures would be done in 2020 (Satiani et al., 2009). This estimation was accurate as there are more than 1 million cardiac catheterization procedures performed annually in the US (Yugandhar et al., 2021).

During endovascular procedures, surgeons use multiple guidewires that are often removed and reinserted multiple times. The exact number of guidewires depends on both the physician and procedure; for example, in coronary total occlusion (CTO) procedures, an average of 4.32 guidewires are used (Karabulut et al., 2020). Once removed from the patient, guidewires are hard to manage due to their spring-like nature, risking both damage and contamination. Since each minute in an operating room costs an average of \$60 (Gül 2008), guidewire management becomes a critical concern.

Currently, most doctors simply store used guidewires wound up under a wet towel until later use. However, this technique commonly causes guidewires to fall or tangle and become unusable. Thus, a new duplicate guidewire must be used, raising procedure costs, and time spent in the operating room increases. As for commercial devices, there is the Cath Clip. It is a *single-use* device that has been shown to reduce device management time by an average of 80% (Cath Clip, 2017). To use the Cath Clip, the operating technician must wind the guidewire into a neat circle and clip it together. Once clipped, guidewires are stored *together* in a single bowl of saline.

The team has developed a system to organize and secure guidewires in the operating room safely and efficiently. The device consists of two parts: (1) multiple wheels (DYWheel) in which single guidewires are placed, and (2) a stand (DYStand) to hold the wheels loaded with guidewires. Our design addresses the many shortcomings of the towel technique, and at least two specific shortcomings of the Cath Clip. Our device is *reusable*, and it stores multiple guidewires in *separate* casings. To use the device, a guidewire is wound into a circle by the user, then placed in the inner cavity of the DYWheel. The guidewire can be removed from the wheel while on the stand or with the wheel in hand by simply pulling at the exposed guidewire tip. The DYWheel and DYStand is a safe and efficient solution for the fast-paced environment of endovascular procedures, and commercialization of the device will advance the way healthcare professionals operate in endovascular procedures.