

## **In this article, we present the design, development and experimental evaluation of a novel hand-held robotic device for improving the process of peripheral intravenous catheterization by facilitating the needle insertion procedure” Cheng et al (2017).**

### Abstract:

Intravenous catheterization is frequently required for numerous medical treatments. However, this process is characterized by a high failure rate, especially when performed on difficult patients such as newborns and infants. Very young patients have small veins, and that increases the chances of accidentally puncturing the catheterization needle directly through them.

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In this article, we present the design, development and experimental evaluation of a novel hand-held robotic device for improving the process of peripheral intravenous catheterization by facilitating the needle insertion procedure. To our knowledge, this design is the first hand-held robotic device for assisting in the catheterization insertion task. Compared to the other available technologies, it has several unique advantages such as being compact, low-cost and able to reliably detect venipuncture. The system is equipped with an electrical impedance sensor at the tip of the catheterization needle, which provides real-time measurements used to supervise and control the catheter insertion process. This allows the robotic system to precisely position the needle within the lumen of the target vein, leading to enhanced catheterization success rate. Experiments conducted to evaluate the device demonstrated that it is also effective to deskill the task. Naïve subjects achieved an average catheterization success rate of 88% on a 1.5 mm phantom vessel with the robotic device versus 12% with the traditional unassisted system. The results of this work prove the feasibility of a hand-held assistive robotic device for intravenous catheterization and show that such device has the potential to greatly improve the success rate of these difficult operations.

Reference:

Cheng, Z., Davies, B.L., Caldwell, D.G., Barresi, G., Xu, Q. and Mattos, L.S. (2017) A hand-held robotic device for peripheral intravenous catheterization. Proceedings of the Institution of Mechanical Engineers. October 1st. .

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