

Extended Abstract

Ez-CapOff: One-Handed Needle Cap Removal

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ABSTRACT

Needle stick injuries (NSIs) among healthcare workers including nurses and nursing students present a significant safety risk, highlighting the urgent need for effective solutions to mitigate this preventable hazard. The Ez-CapOff is an innovative tool designed to simplify the removal of needle caps, thereby transforming nursing practices worldwide. With a focus on ergonomics and efficiency, the Ez-CapOff allows nurses to remove needle caps with one hand, significantly reducing the time and effort required for this routine task. Traditional methods of needle cap removal often necessitate the use of both hands, posing challenges for nurses who must maintain sterility while multitasking in fast-paced healthcare environments. The Ez-CapOff eliminates this cumbersome process by integrating intuitive design features that enable seamless, one-handed operation. Leveraging innovative mechanisms and materials ensures secure and reliable cap removal without compromising safety or hygiene. Additionally, the Ez-CapOff enhances workflow efficiency, empowering nurses to perform their duties more easily and confidently. It also promotes patient safety by minimizing the risk of accidental needle stick injuries, a persistent concern in clinical settings. A prototype survey of 24 nursing students aged 20 to 24 revealed that approximately 70% experienced difficulties handling syringes and needles for the first time during lab practice. Notably, over 80% responded positively towards using the Ez-CapOff, with more than 70% indicating they would likely purchase the product for their use. In conclusion, the Ez-CapOff represents a significant advancement in needle cap removal, offering a practical solution to enhance nursing efficiency, safety, and overall quality of care. As healthcare continues to evolve, the Ez-CapOff is poised to become an indispensable tool in modern nursing practice, setting new standards for innovation and patient-centred care.

Keywords: cap removal, injection, needle, needle stick injuries syringe (NSI)

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1.0 Introduction

Needle stick injuries (NSIs) are a significant safety concern for healthcare workers (HCWs), particularly nurses and nursing students, due to their frequent handling of syringes and sharp instruments. Xu Xu *et al.* (2022) (1) found that nursing students accounted for 35% of reported needle-stick injuries, while 63% did not report their injuries. Efforts to prevent needle-stick injuries must be strengthened, as only 54.55% of nurses reported using gloves injection, 90.91% sustained injuries due to carelessness, and 27.27% continued the unsafe practice of recapping needles (2). Despite preventive measures, NSIs remain common in healthcare environments, highlighting the urgent need for innovative safety solutions.

2.0 Innovation

Traditional methods of needle cap removal often necessitate the use of both hands, posing challenges for nurses who must maintain sterility while multitasking in fast-paced healthcare environments. Recapping needles is also one of the actions that may cause NSIs among HCWs. So, this innovation was ideated to help them easily remove and recap needles with only one hand, significantly reducing time and effort and also helping to prevent NSIs. The Ez-CapOff was designed using a special clay that sticks together which can hold the needle cap firmly during removal or recapping the needle (Table 1). It was designed in a round shape with a diameter of 3.5 cm, in various vibrant colours, which is placed in a plastic casing. It can also serve as a decorative device.

3.0 Uniqueness

Based on a literature search, limited information and research focusing on similar

products available in Malaysia. The uniqueness of this product depends on its sticky component that holds the needle cap firmly. It can be placed on many flat surfaces including metal, plastic, wood and glass, reusable and the clay does not stick to fingers.

Table 1: The Ez-CapOff

Item	Description
Ez-CapOff 	• Round shape • Diameter of 3.5 cm • Vibrant colours with abstract design
Ez-CapOff in plastic casing 	• Encased in plastic for moisture protection. • Available in black and white casings. • Variety of vibrant colours and designs • Can be displayed as decorative piece.

3.1 Prototype Survey

This project involved a survey targeting a prototype among 24 nursing students aged 20 to 24, focusing on their experiences during laboratory practice with syringes and needles. The findings indicated that approximately 70% of the participants encountered challenges when handling these medical instruments for the first time. This suggests a significant level of difficulty and potential risk associated with needle handling among novice healthcare providers.

Furthermore, the survey assessed the students' perceptions of the **Ez-CapOff** tool, revealing a notably positive reception. Specifically, over 80% of the respondents expressed favourable opinions about using the **Ez-CapOff** during their training (Figure 1). Additionally, more than 70% of the

participants indicated a likelihood of purchasing the product for personal use, reflecting a strong interest in adopting tools that enhance safety and efficiency in needle handling. These results underscore the potential of the **Ez-CapOff** to improve the educational experience of nursing students while also promoting safer practices in clinical settings.

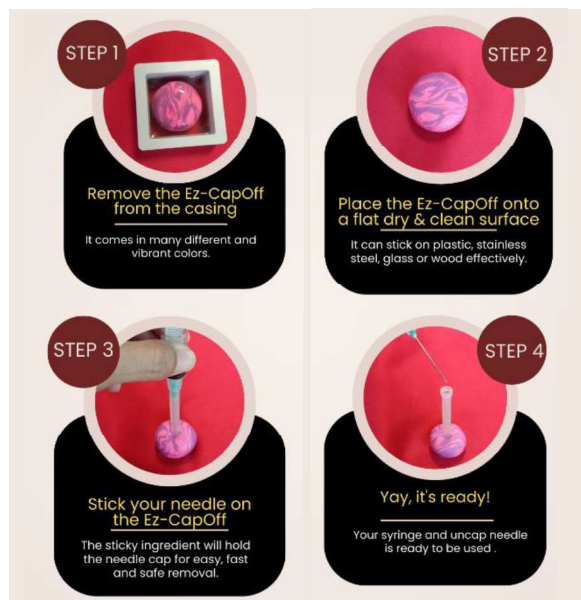


Figure 1: Steps of using the Ez-CapOff.

4.0 Commercialisation Potential

The Ez-CapOff has huge potential to be commercialized due to its convenience and purpose in assisting healthcare workers in handling needles and syringes. It also plays an important role for health care providers such as doctors, nurses, pharmacists, phlebotomists, medical laboratory technologists, educators and students in the medical and health sciences study.

5.0 Impact on Quintuple Helix

5.1. Society

The Ez-CapOff helps protect healthcare workers from needle stick injuries (NSIs), reducing the risk of dangerous infections like

HIV and hepatitis. Preventing these injuries, improves worker safety, saves healthcare costs, and promotes better public health.

5.2 Academia

In education, the Ez-CapOff is a useful tool for teaching safe needle handling. It helps students learn better safety practices and encourages research on healthcare safety and ergonomics, making it an important resource in nursing and medical schools.

5.3 Government

For governments, the Ez-CapOff can lower healthcare costs related to treating NSIs and support workplace safety regulations. It aligns with public health initiatives aimed at preventing infections and helping create safer healthcare environments.

5.4 Industry

In the healthcare industry, the Ez-CapOff reduces workplace injuries, leading to fewer compensation claims and improving efficiency. It also offers new opportunities for medical device manufacturers and encourages innovation in creating safer healthcare tools.

5.5 Environment

The Ez-CapOff can help reduce medical waste by preventing NSIs and cutting down on contaminated sharps. Made from sustainable materials, it can also lessen the environmental impact, especially if it's reusable or long-lasting.

6.0 Conclusion

The Ez-CapOff represents a significant advancement in needle cap removal, offering a practical solution to enhance nursing efficiency, safety, and overall quality of care.

As healthcare continues to evolve, the Ez-CapOff is poised to become an indispensable tool in modern nursing practice, setting new standards for innovation and patient-centered care.

Authorship contribution statement

The author confirms that she is the sole contributor to the work presented in this manuscript. The author independently conducted all stages of the project, including the conception, design, data collection, analysis, and interpretation, as well as the drafting and revising of the manuscript.

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Conflict of Interest

The authors declared that they have no conflicts of interest to disclose.

References

1. Xu X, Yin Y, Wang H, Wang F. Prevalence of needle-stick injury among nursing students: a systematic review and meta-analysis. *Front Public Health*. 2022; 10: 1-8.
2. Jheffany Y, Raja Yaakub, R. M, Suzana, Y, Angga W. Knowledge, Attitude, and Practices towards Needle-stick Injuries among Nurses in a Public Hospital, Malaysia. *Environ-Behav Proc* 2023; 8(24): 221–228.