

Safety And Efficiency Of A Novel Needle Management System For Wound Closure

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Abstract

Sharps injuries are relatively common in the operating room (OR), with all members of the OR staff being at risk. Interventions so far have reduced but have not eliminated the risk. We examined the use of a novel needle entrapment device to evaluate impact on safety and efficiency of needle handling. We found that the needle trap may significantly reduce the amount of time to complete a suturing task, needle touches by hand or instrument for the surgeon and scrub technician, number of times the needle crosses the surgical field, and the dependence of the surgeon on the scrub tech. The needle trap did not significantly affect the number of times the needle was dropped onto the surgical field. A needle entrapment device is an avenue through which needle sticks can be reduced in the operating room.

Introduction

Sharps injuries expose both physicians and patients to infection, particularly in the operating room (OR) where sharps are frequently handled by surgeons and scrub technicians. Across the United States, 380,000 sharps injuries are reported each year (Gurria, 2019); many more are unreported, especially in medical students and resident physicians (Hasak, 2018; Choi, 2017). Most sharps injuries occur towards the end of surgical cases (Yonezawa, 2015), with suture needles making up a significant portion of that risk (Myers, 2015). All OR personnel are susceptible to injury, with 59% of sharps injuries occurring in surgeons and 19% occurring in scrub personnel.

Safe needle handling practices are critical to mitigating risk of sharps injury. Current practices include double gloving (wearing two pairs of surgical gloves) (Lipson, 2018), the surgeon covering suture needle tips when returning used needles to the scrub technician (Linzer, 2017; Gurria, 2019), using clear communication when passing sharps (Gurria, 2019), and using blunt tipped needles (Saarto, 2011). Despite these practices, these changes in sharps handling practices have reduced, but have not eliminated, needle stick risk. Therefore, new approaches and devices are needed to further reduce risk.

While there has been work on changing protocols, there has been little in the way of research into and development of devices to reduce the risk of sharps injury in the OR. We examined the use of a novel needle entrapment device (Operative Armour Needle Trap) to evaluate impact on safety and efficiency of needle handling. Our hypothesis is that the needle entrapment device would reduce the risk of needle stick injury amongst surgeons and scrub techs, improve efficiency in closing a surgical wound, and reduce surgeon dependence on the scrub tech.

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Methods

Sequentially remove and manage 24 needles pre-loaded in polymer suture board (simulating stitch just completed)

10 Surgical Residents
Three 24 Needle Trials Each Arm

<p style="text-align: center;">Std Needle Passing Arm For each of 24 needles:</p> <ol style="list-style-type: none"> 1. Remove needle from needle board 2. Secure in needle driver jaws 3. Pass to Mayo stand neutral zone 4. Scrub tech secures needle 5. Scrub tech counts needles 	<p style="text-align: center;">Needle Entrapment Arm For each of 3 Sets of 8 needles:</p> <ol style="list-style-type: none"> 1. Remove needles from needle board 2. Self-Secure into Needle Trap 3. Return full trap to Mayo stand 4. Replace with new Needle Trap 5. Scrub tech counts needles
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Results

Protocol	Time (seconds)	Needle Touches (Finger)	Needle Touches (Instrument)	Needle Touches Scrub	Needle Touches Field	Tech Freed	Drops
		Standard	Standard	Standard	Standard	Standard	Standard
Averages	152.6	6.3	20.8	24.3	24.1	0.0	0.3
Std Dev	34.8	9.2	9.4	0.6	0.2	0.0	0.7
Needle Trap							
Averages	120.7	0.1	7.9	0.0	0.0	120.7	0.4
Std Dev	28.5	0.3	10.7	0.0	0.0	28.5	0.6
Statistics							
T-Test	2.2	2.1	2.9	128.0	381.0		0.3
p	0.0377	0.0472	0.0103	<.001	<.001	<.001	0.7356

Subjective Questionnaire

(1 low - 5 high)

Standard needle handling ease of use = 3.4/5

Needle Trap device ease of use = 4.5/5

Likelihood of Trap use in practice = 3.75/5

Agreement with Following Statements

5/10 Agree Needle Trap reduces dropped/lost needles

9/10 Agree Needle Trap safer handling than standard

9/10 Agree Needle Trap more efficient closure

9/10 Agree Needle Trap fewer scrub tech distractions

9/10 Agree Needle Trap requires less needle manipulations

10/10 Agree Needle Trap reduces dependency on scrub tech

Study Limitations

- Small sample size from one university hospital
- Utilization of simulated operating room task
- Lack of cost analysis
- Learning curve may have contributed to needle drops

Conclusion

The Operative Armour System may significantly reduce:

- Amount of time to complete suturing task
- Needle touches by hand or instrument for surgeon and scrub tech
- Number of exposed needle crosses of the surgical field
- Scrub tech distractions during counts leading to URFOs
- Surgeon dependence on scrub tech

In this study the device did not significantly affect needle drops.

A needle entrapment device is an avenue through which needle sticks can be reduced in the operating room.