

Suture Management Practices in Central Venous Catheters: A Survey Among Healthcare Professionals

Matthew Prevost, BS¹; Nishaki Mehta, MD²

¹Oakland University William Beaumont School of Medicine

²Department of Cardiology, Corewell Health William Beaumont University Hospital

Introduction

- Traditional suture methods (Fig. 1) for securing central venous catheters (CVCs) lack standardization, are nonadjustable post-securement, and require dexterity → increasing risk of catheter micropistoning and central line-associated bloodstream infections (CLABSI).
- This study examines medical practitioners' experiences and challenges with suturing CVCs
- Our hypothesis predicts that variations in responses and differences in practitioner training may influence experiences and complication rates.

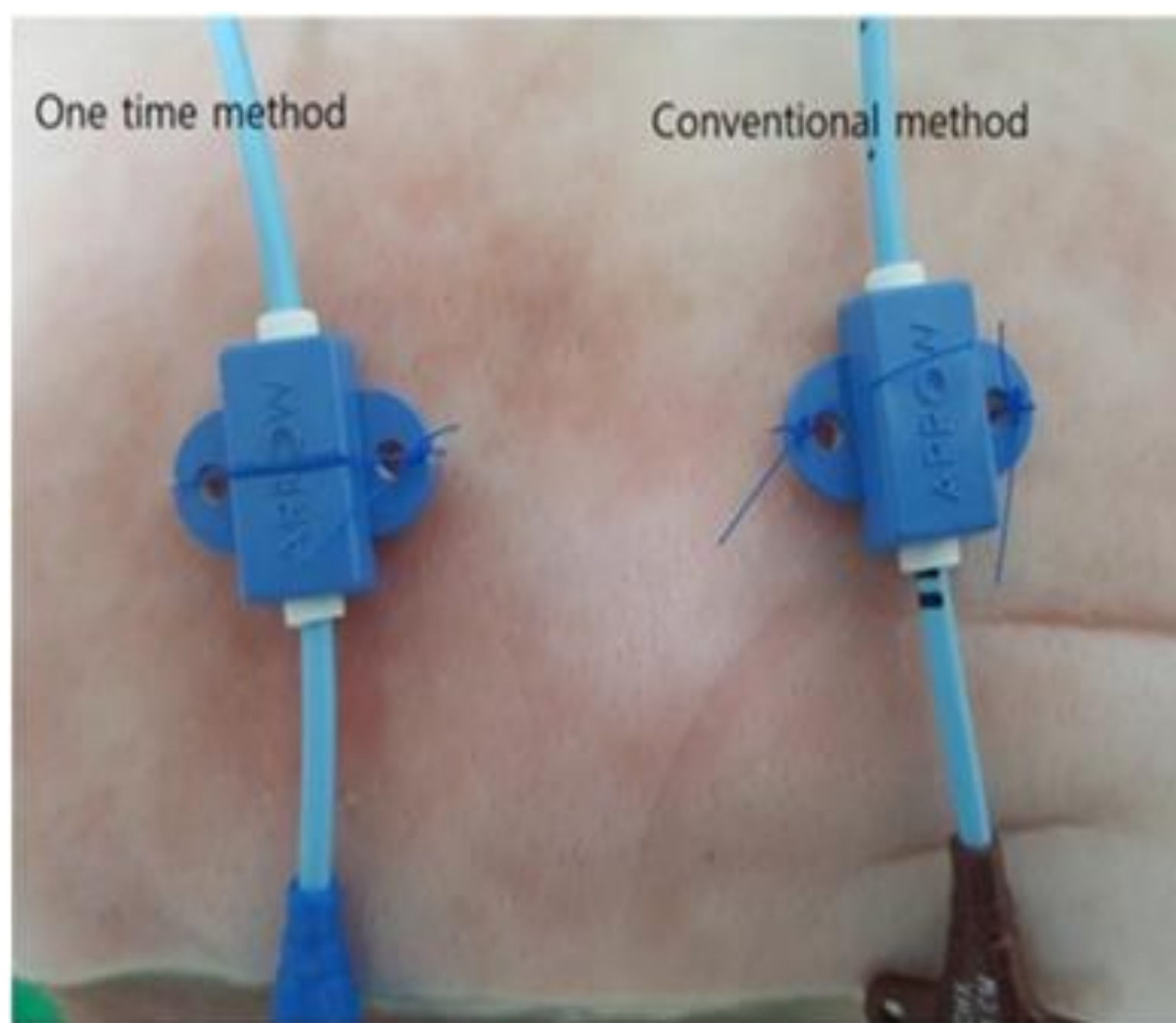


Figure 1. Two common/traditional CVC suturing techniques

Aims and Objectives

- Assess the experiences and challenges of healthcare providers involved in CVC suturing.
- Identify variations in securement techniques and complication rates based on training levels.
- Explore the potential for improving standardization and training methods

Methods

- Design:** Cross-sectional survey
- Participants:** 106 healthcare professionals, including physicians (interns, residents, fellows, attendings), nurses (RNs), and nurse practitioners (NPs) at Corewell Health.
- Data Collection:** Paper-based survey covering securement techniques, training, adjustment challenges, and complications (Fig. 2).
- Analysis:** Chi-square and Fisher's Exact Tests to identify differences between training levels.

1. What stage of medical training are you currently in?
 a. Medical student
 b. Internship
 c. Resident
 d. Fellow
 e. Attending: 1-3 yrs.
 f. Attending: More than 3 yrs.

(For Nursing group):
 a. LPN
 b. RN
 c. Physician Assistant (PA)
 d. Nurse Practitioner (NP)

2. Did you receive formal training for suturing of central catheter lines?
 a. Yes
 b. No

3. How many different techniques do you know regarding suture securement of central lines?
 a. One
 b. Two
 c. Three
 d. More than three

4. How many central lines have you placed in your career?
 a. None
 b. Less than 5
 c. 5-10
 d. 10-25
 e. More than 25
 f. More than 100

5. What type of suture material do you typically use for placing central lines?
 a. Silk
 b. Steel wire
 c. Nylon (Ethilon)
 d. Polyester (Ethibond)
 e. Catgut
 f. Polypropylene (Prolene)
 g. Polydioxanone (PDS)
 h. Polyglycolic (Vicryl)
 i. Polylactone (Monocryl)
 j. Other: _____ (free text)
 k. Unsure

6. What suture size do you typically use for placing central lines? (USP scale)
 a. #5-0
 b. #4-0
 c. #3-0
 d. #2-0
 e. #0 or 1
 f. #2
 g. #3 or larger
 h. Other: _____ (free text)
 i. Unsure

7. Of the following, which is the most challenging step in central line suturing?
 a. Tying the suture
 b. Removing suture
 c. Readjusting the suture
 d. Combination of the above (circle response below)
 I. a + b
 II. b + c
 III. a + c
 IV. a + b + c

8. How long does it take to secure a central line suture?
 a. Less than 1 minute
 b. 1-3 minutes
 c. More than 3 minutes

9. How long does it take to remove a suture?
 a. Less than 1 minute
 b. 1-3 minutes
 c. More than 3 minutes
 d. I have not removed sutures

10. While securing a suture, how often does it have to be readjusted or redeployed?
 a. Less than 10% of the time
 b. 10-25% of the time
 c. More than 25% of the time

11. While securing a suture, how many times have you experienced or heard of skin nicks/cuts?
 a. Never
 b. 1 time
 c. 1-3 times
 d. 3-10 times
 e. More than 10 times

Figure 2. Survey questions and answers posed to physicians (Nursing cohort was exclusively asked Questions 1, 9, 10, and 11)

Suture Readjustment

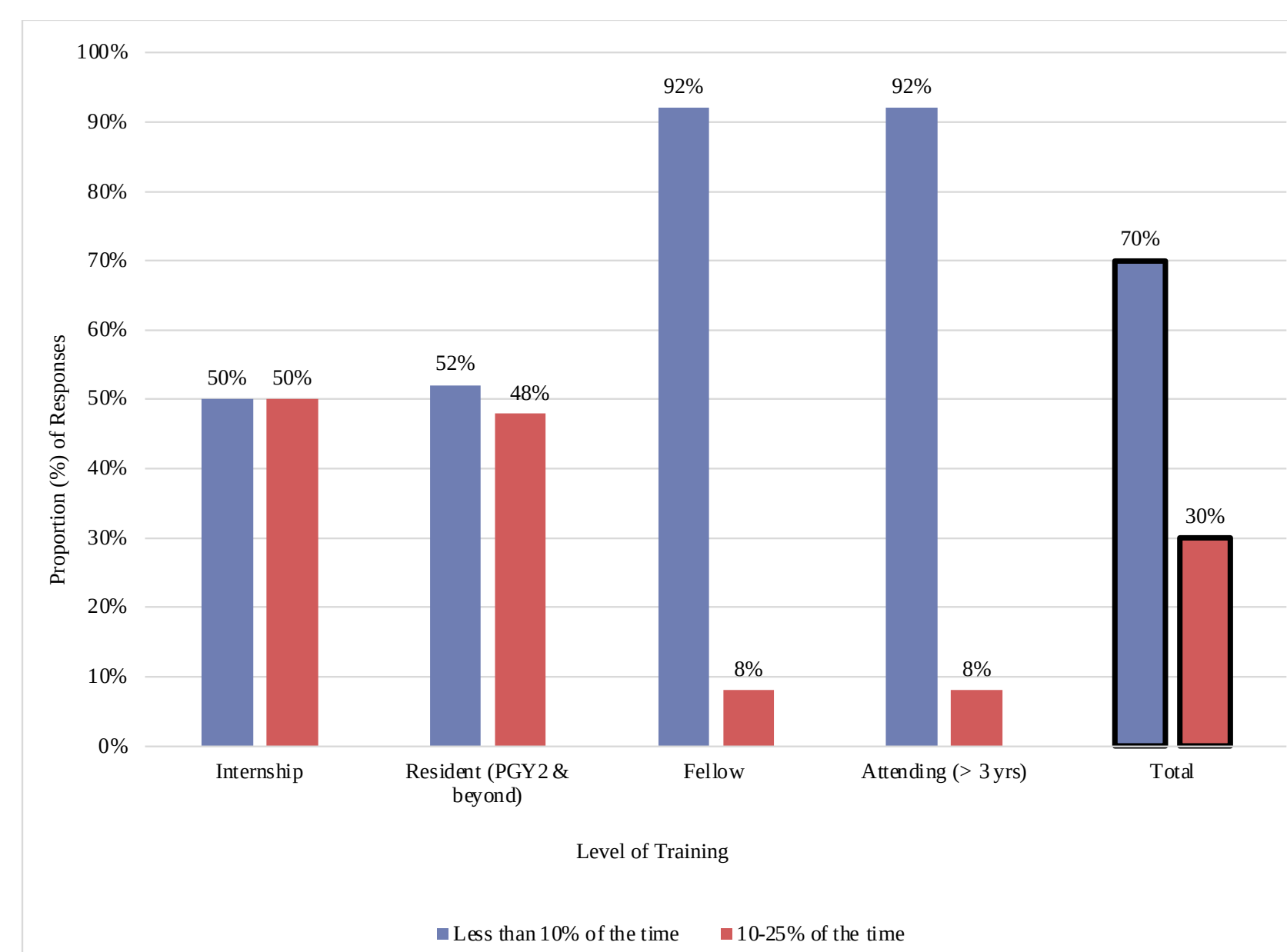


Figure 3. The frequency of suture readjustment during securement for different stages of medical training. ($P=0.0053$)

Results

- Participants:** 106 total (40 residents, 13 fellows, 13 attendings, 36 RNs, 5 NPs)
- Suture Training:** 47% had formal training; no differences across training levels ($P=0.6188$).
- Securement Techniques:** Fellows knew the most ($P=0.0008$); most (50.8%) knew one technique (Fig. 4).
- CVC Experience:** Attendings (>3 years) placed the most CVCs ($P<0.0001$) (Fig. 3).
- Securement Time:** Fellows took the longest ($P=0.0034$); 69.2% secured in 1-3 min (Fig 5).
- Most Challenging Step:** Readjustment (49.2%), then suturing (29.2%) ($P=0.1182$) (Fig 6).
- Suture Readjustment:** Interns/residents required it most ($P=0.0053$); 80% of nurses were “unsure” (Fig 3).
- Skin Nicks/Cuts:** Residents (62.1%) and attendings (>3 years, 58.3%) reported the highest rates ($P=0.0758$) (Table 1 & Fig. 4).

Skin Cuts by Level of Training

Skin Cuts Frequency	Intern (%)	Resident (%)	Fellow (%)	Attending (1-3 yrs) (%)	Attending (>3 yrs) (%)	Nursing (%)	Total (%)
Never	6 (60.0%)	11 (37.9%)	9 (69.2%)	0 (0.0%)	5 (41.7%)	26 (65.0%)	57 (54.3%)
1 time	1 (10.0%)	8 (27.6%)	2 (15.4%)	0 (0.0%)	1 (8.3%)	4 (10.0%)	16 (15.2%)
1-3 times	3 (30.0%)	10 (34.5%)	2 (15.4%)	0 (0.0%)	5 (41.7%)	5 (12.5%)	25 (23.8%)
3-10 times	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (5.0%)	2 (1.9%)
More than 10 times	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	1 (8.3%)	3 (7.5%)	5 (4.8%)

Table 1. Frequency of skin nicks/cuts experienced or heard among medical professionals, categorized by training stage. Values represent the number (n) of responses and percentages (%) represent the proportion of respondents within each category.

Formal Training on Skin Cuts

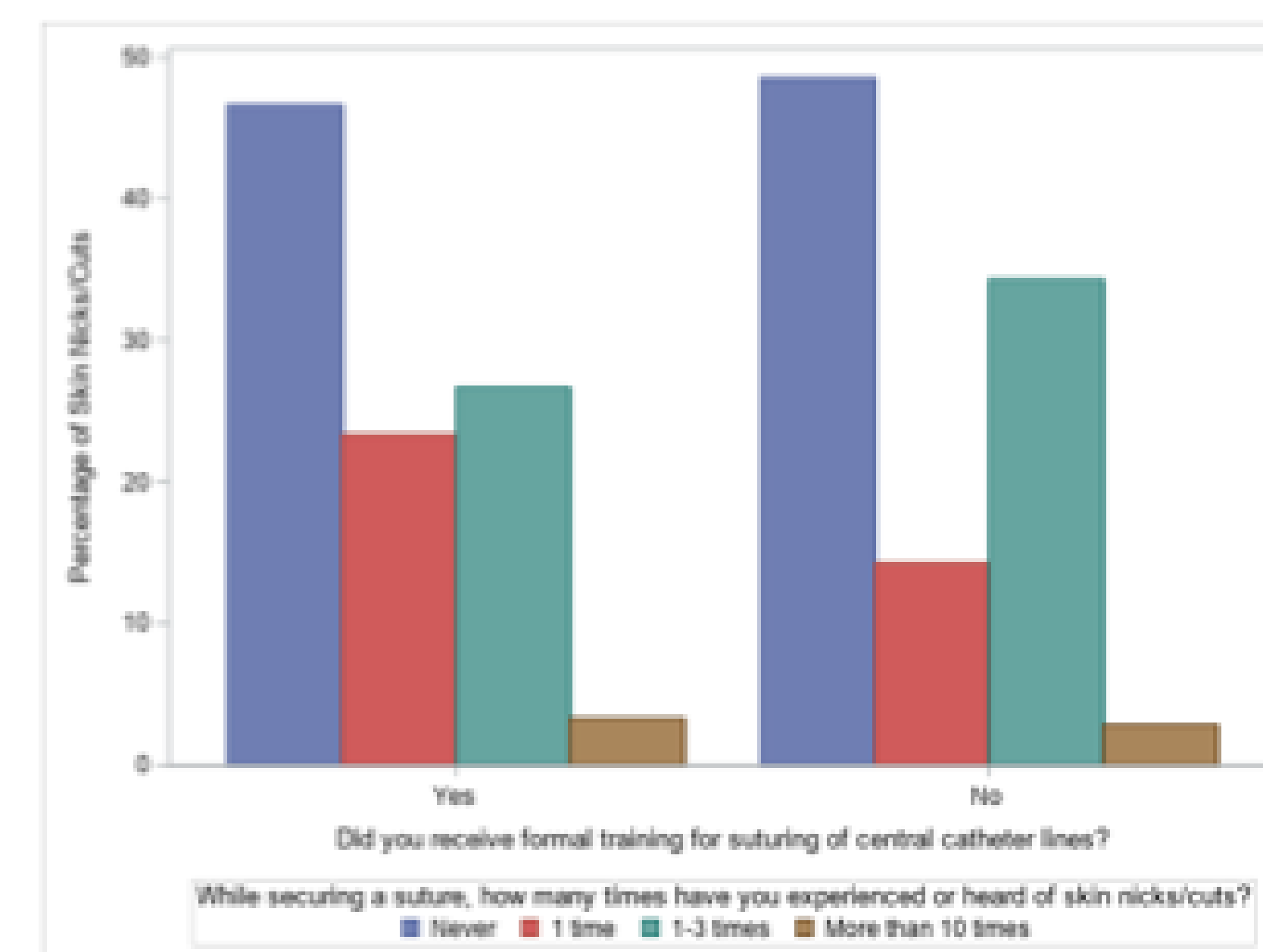


Figure 4. Influence of formal suture training on physicians' encounters with skin nicks or cuts. $P=0.79902$ (>0.05)

Discussion

- Our results provide firsthand medical provider experiences, revealing novel qualitative insights unexplored in existing literature.
- Variability in training and techniques contributes to inconsistencies in CVC securement. Standardized training and simulation-based education could enhance procedural safety.⁴
- Future research should explore sutureless securement devices (SSDs) to reduce complications and improve efficiency. SSDs have shown improved securement times and reduced infection rates compared to traditional sutures.⁵
- Prioritizing improvements in CVC securement methods may mitigate CLABSI risks and enhance patient outcomes.

Suture Duration

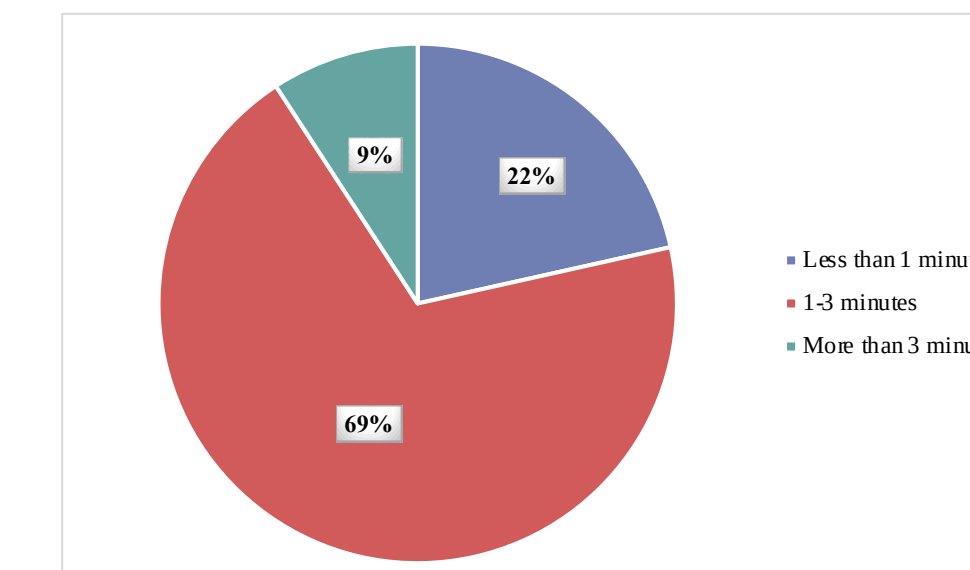


Figure 5. The time duration reported by physicians of all training levels for securing central line (CVC) sutures.

Most Challenging Step

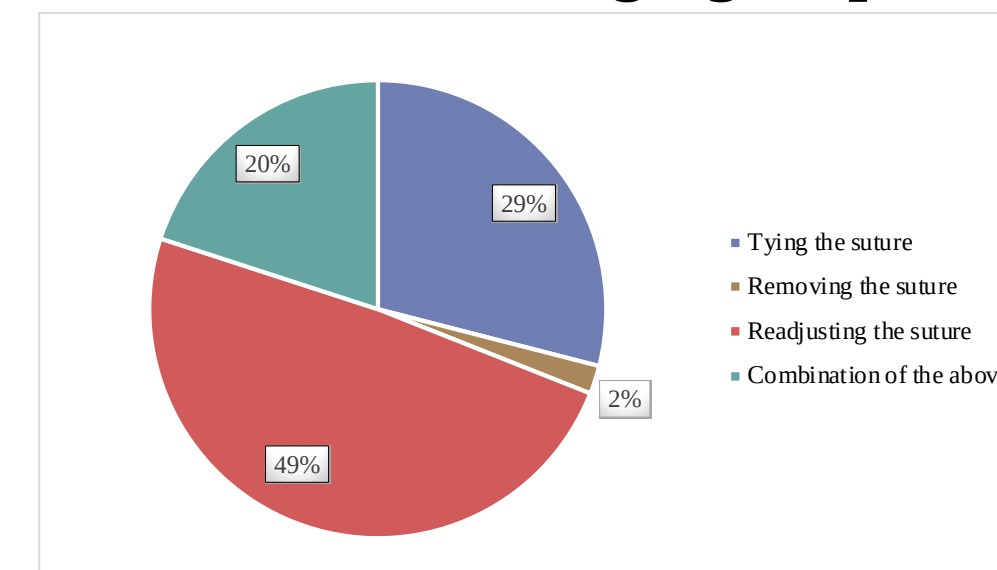


Figure 6. The most challenging step in central line (CVC) suturing reported by physicians of all training levels.

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