

Original Research Article

Skill of donning surgical gloves amongst residents: a neglected skill

Jayasree Kasula¹, Kodandapani Yerroju^{2*}

¹Department of General Surgery, Gandhi Medical College, Secunderabad, Telangana, India

²Department of Pediatrics, Niloufer Hospital, Osmania Medical College, Hyderabad, Telangana, India

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*Correspondence:

Dr. Kodandapani Yerroju,

E-mail: yerrojukodandapani@yahoo.co.in

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ABSTRACT

Background: Sepsis is a preventable cause of morbidity and mortality. Sepsis causes approximately 1 million newborn deaths annually. The global prevalence of maternal sepsis is 4.4% causing more than 5.7 million cases and one tenth of maternal deaths annually. Skin preparation, shaving and wound closure were some factors involved in surgical site infections. But the technique of wearing gloves in a sterile way has not received enough attention. Hence this cross sectional observational study was undertaken to assess the awareness and proficiency in this technique among the residents.

Methods: 104 post graduate students from the departments of General Surgery, Obstetrics and Gynaecology, Paediatrics and Anaesthesiology from two medical colleges were administered a questionnaire and also were observed one at a time with a checklist in an OSCE station. Study was conducted in several sessions over a period of 2 months.

Results: None of them were formally taught this technique. 36 (34.56%) were informally taught by seniors. 7 (6.72%) tore the glove while wearing. 39 (37.44%) put two fingers in one finger space. 42 (40.32%) touched bare skin with gloved hands while wearing. 54 (51.84%) touched bare skin with used surface of the glove while removing.

Conclusions: Awareness about technique and skill of donning sterile gloves among residents of various specialities are not satisfactory. It is recommended to teach this skill as soon as the students enter medical school in a strict and formal way and monitor their proficiency throughout their training period.

Keywords: Donning of gloves, Awareness, Skill level, Residents

INTRODUCTION

A medical graduate performs minor surgical procedures during internship and even major surgeries during resident ship. However, the question is whether a medico is taught the proper technique of donning the gloves at any of these stages from first year to post-graduation. Inadequacy in the proficiency of this technique increases not only the risk of sepsis to the patient, contaminating self but also the risk of spreading resistant organisms through cross infection, iatrogenically.

If we consider neonatal deaths alone which constitute 50% of infant mortality, authentic reports show that 33% of neonatal deaths in India are directly due to sepsis, pneumonia and diarrhea.^{1,2} Sepsis in neonatal care units has been a challenge to paediatricians for ages in spite of advancements in therapeutic standards and powerful antibiotics. Nosocomial sepsis is a serious problem for neonates who are admitted for intensive care. It is associated with increased mortality, morbidity, and prolonged length of hospital stay. Thus, both the human and fiscal costs of these infections are high. Simple

changes in process, which when implemented, can reduce nosocomial infection rates in neonates and improve outcomes.³

In the field of Obstetrics and Gynaecology, the global prevalence of maternal sepsis is 4.4% among live births, representing more than 5.7 million cases per year.⁴ Peri-partum bacterial infections account for about one tenth of maternal deaths globally.⁵ In addition to the high risk of mortality and acute morbidity, women who experience peri-partum infections are also vulnerable to serious long-term disabilities such as chronic pelvic pain, fallopian tube blockage and secondary infertility. Peri-partum infections also pose a threat to the lives of new-borns. Maternal infections during childbirth cause approximately 1 million new-born deaths annually.⁶

Infection rates in different surgical classifications (clean, clean-contaminated, contaminated and dirty wounds) have been published in many studies but most literature refers to the work of Cruse and Foord as a benchmark for infection rates. Clean wound infection rate was reported to be 1.7% in pre-prophylactic antibiotic era.^{7,8}

Since the introduction of routine prophylactic antibiotic use, infection rates in the most contaminated groups have reduced drastically. But clean wound Infection rates in some US hospitals were reported to be 2.1%.⁹ This relative increase in clean wound infection rate in surgery could also be due to inadequate sterilization protocols or techniques.

Gottrup et al have overviewed the rates and analysed the causes. They mentioned skin preparation, shaving and technique of wound closure as the factors involved in surgical site infections (SSIs) apparently assuming that

glove donning technique is correct and fool proof. But in our setting we need to look into this aspect of sterile technique of wearing gloves also which will obviously have a bearing on secondary surgical infection rates.¹⁰

Gaps identified: In the present curriculum no adequate emphasis is given on teaching medical students or interns about proper technique of donning sterile surgical gloves and maintaining the sterility of the gloves till the end of the procedure. Students learn by just observing their seniors.¹¹ Proper training and practice are needed to achieve perfection in this skill.

There are very few studies conducted to assess the skill level amongst residents in this skill. We came across only few such studies conducted in this regard which concluded that the existing skills were poor.¹¹

In this background we felt it is important to assess the level of skill of donning the sterile gloves among the residents who actually are delivering medical care to the patients and bring to light the importance of formal and strict training in this vital skill.

The study was undertaken with aim to study the skill level of donning sterile gloves among the residents in two medical colleges.

METHODS

This was a cross sectional observational study conducted over a period of two months from February 2017 to March 2017 in two renowned medical colleges in south India. Postgraduate students of these colleges are graduates from various private as well as government medical colleges.

Table 1: Distribution of residents.

Year of PG residency	Speciality	General surgery	Obstetrics and gynaecology	Anaesthesia	Pediatrics	Total
1 st year		14	10	8	12	44
2 nd year		14	12	4	7	37
3 rd year		11	5	2	5	23
Total		39	27	14	24	104

A total of 104 post graduate students from the departments of General Surgery, Obstetrics and Gynaecology, Paediatrics and Anaesthesiology who were available and willing on the days of study session, irrespective of their year of residency were enrolled after taking informed consent (Table 1). Time of conducting each session was flexible as per the convenience of the participants. All the recruited resident postgraduates participated enthusiastically without any apprehension as they too were interested in knowing their skill level. The method of assessment used was OSCE (Objective Structured Clinical Examination). An OSCE station was

set up in each department on different days, after informing the postgraduate residents of the department. Each OSCE station was equipped with adequate number of gloves of different sizes to meet the requirements of participants. Adequate space was left open on the table to wear the gloves. Different coloured bio waste disposal bins were placed at a distance in sight.

Each participant was instructed to don a pair of sterile gloves, while others were waiting for their turn outside the OSCE station, out of sight. No time limit was given to them. The technique was assessed by a faculty member

with the help of a check list while each of them performed the task. The checklist included observation of various steps of donning the glove, time taken to wear, whether they are aware of proper disposal after usage, whether they knew different techniques of donning sterile gloves and whether anyone had taught them informally or formally in the curriculum.

Statistical analysis

One way ANOVA technique in Microsoft Office was used for analysis.

RESULTS

Of all the 104 residents, 44 were 1st year residents, 37 were 2nd year residents and 23 were 3rd year residents (Figure 1). 39 were from General surgery, 27 were from Obstetrics and Gynaecology, 14 were from Anaesthesia and 24 were from the department of paediatrics (Table 1). 80 (76.92%) were not aware of disposal in appropriate colored container. 14 (13.46%) did not choose appropriate size of the glove. 10 (9.6%) picked up left hand glove first with right hand. 39 (37.5%) did not pull up the cuffs of both gloves upwards. 39 (37.44%) put two fingers in one finger space. 42 (40.32%) touched bare

skin with gloved hands while wearing. 54 (51.84%) touched bare skin with used surface of the glove while removing. 28 (26.88%) un-cuffed the glove prior to wearing. 27 (25.92%) pulled up the cuff of second worn glove first. 16 (15.6%) did not pull up the cuffs. 7 (6.72%) tore the glove while wearing. 28 (65.44%) took more than two minutes to wear the gloves (Figure 1).

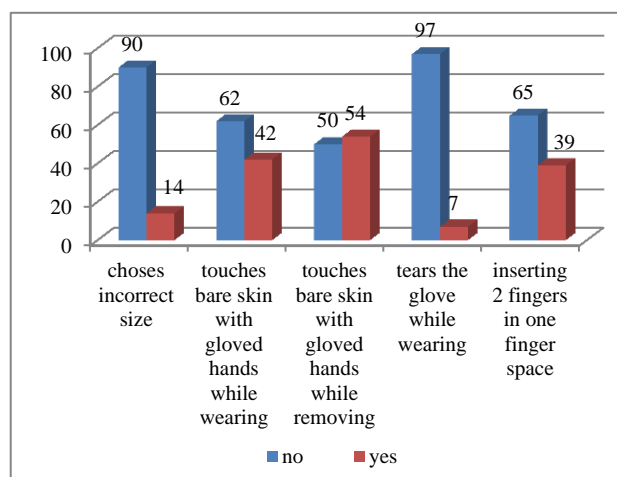


Figure 1: Common errors while donning gloves.

Table 2: Year wise and speciality wise distribution of average numbers of errors per resident.

Year of PG residency	Speciality	General surgery	Obstetrics and gynaecology	Anaesthesia	Pediatrics	Total
		(No. of errors/ no. of residents)	(No. of errors/ no. of residents)	(No. of errors/ no. of residents)	(No. of errors/ no. of residents)	(No. of errors/ no. of residents)
1 st		4.07 (57/14)	4.90 (49/10)	2.62 (21/8)	3.08 (37/12)	6.86 (164/44)
2 nd		2.57 (36/14)	3.25 (39/12)	3.25 (13/4)	3.28 (23/7)	3.0 (111/37)
3 rd		1.99 (21/11)	3.2 (16/5)	3.5 (7/2)	2.6 (13/5)	2.47 (57/23)
Total		2.92 (114/39)	3.85(104/27)	2.92(41/14)	3.04 (73/24)	3.19 (332/104)

Table 3: Association between year of residency and cumulative number of errors.

Year of residency	Mean±SD	P value	df
1 st	41±15.663	0.034	2
2 nd	27.75±12.038		
3 rd	14.25±5.852		

Table 4: Association between specialities and cumulative number of errors.

Speciality	Mean±SD	P value	df
General surgery	38.00±18.083	0.226	3
Obstetrics and gynaecology	16.921±9.770		
Anaesthesia	7.024±4.055		
Paediatrics	12.055±6.960		

The total number of errors committed by all 104 residents was 332 (Table 2). While the 1st year residents of all specialities comprising 44 in number committed 164 errors, 2nd and 3rd year residents comprised 37 and 23 in numbers committed 111 and 57 errors respectively

(p=0.034) (Table 3). All 39 residents of general surgery committed 114 errors. Residents of Obstetrics and Gynaecology, Anaesthesia and Paediatrics numbering 27, 14 and 24 respectively committed 104, 41 and 73 errors respectively (p=0.226) (Table 4).

None of the residents were formally taught about donning a sterile glove. However 36 (34.56%) were informally taught by seniors. None of them were aware of different types of donning sterile gloves.

DISCUSSION

The average number of errors committed while donning the sterile gloves by 2nd and 3rd year residents were less when compared to 1st year residents irrespective of speciality. This decrease was statistically significant ($p=0.034$). This implies that there has been learning throughout their residency and not in the beginning. It is worth noting that 34.56% were taught informally by their seniors and remaining claimed that they never received any training on the technique of donning the sterile gloves.

Though there were differences in the average numbers of errors in different specialities, the difference was not statistically significant ($p=0.226$) implying that the lack of training was not lacuna of any one faculty but rather widespread among the specialities studied.

Patil et al did a similar study in interns and concluded that donning of surgical glove is a skill neglected, and there is a need to teach every medical student as soon as they join medical school and to reinforce from time to time. In their study of 101 interns they observed that 5 (4.95%) interns tore the glove while wearing in her study when compared to 7 (6.72%) in our study. 35 (34.65%) choose right size of glove in her study as compared to 90 (86.5) in our study understandably because our study subjects were post graduate residents. Touching bare skin with gloved hand was done by 39 (38.61%) interns in her study. In our study, 42 (40.32%) touched bare skin while wearing the gloves and 54 (51.84%) touched bare skin while removing the gloves.

Skill learning is an active process and needs repeated practice by student. According to Miller's pyramid, a medical student learns skill in several steps. A four step approach of teaching skills as suggested by Rodney Peyton appears to be the best way to teach a skill.¹²

The results of this study make us realize the need to focus on teaching this simple yet important basic skill in order to prevent iatrogenic sepsis in addition to meticulous maintenance of operating areas and sterilization of instruments.

CONCLUSION

The skill level of wearing sterile gloves properly is not satisfactory among the residents of various clinical specialities of the medical colleges studied. There is a need to teach and train medical graduates in the very beginning of their internship and reinforce the same throughout their residency.

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