Effectiveness of an Interventional Program on Nursing Staffs' Practices toward Prevention of Peripheral Intravenous Cannula Complications in Al-Diwaniyah Teaching Hospital

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الخلاصة:

خلفية البحث: القنية الوريدية المحيطية هي أداة أساسية لتوصيل الأدوية ومنتجات الدم وسوائل التغذية للمرضى عن طريق الوريد. 90٪ على الأقل من جميع المرضى الذين يدخلون البيئة الطبية للرعاية لديهم شكل من أشكال العلاج الوريدي. يمكن أن يكون إعطاء الأدوية من خلال استخدام قنية وريدية أمرًا معقدًا بسبب ارتباطه بالعدوى الخطيرة.

الهدف: تهدف الدراسة إلى تقويم فاعلية البرنامج التداخلي في ممارسات الملاك التمريضي تجاه الوقاية من مضاعفات قنية الوريدية المحيطية في مستشفى الديوانية التعليمي.

المنهجية: اجريت الدراسة الشبه التجريبية في الاقسام الباطنية والجراحية في مستشفى الديوانية التعليمي للفترة من 22 / كانون الاول / 2020 إلى 1 / آيار / 2021. تم اختيار عينة غير احتمالية (غرضية) مكونة من 60 من الملاك التمريضي الذين يعملون في الاقسام الجراحية والباطنية، وتم تقسيمهم الى مجموعتين مجموعة الدراسة ومجموعة الضابطة. عينة الدراسة تكونت من (30) ممرض/ة تعرضوا الى البرنامج التداخلي فيما تكونت المجموعة الضابطة من (30) ممرض/ة لم يتعرضوا الى البرنامج التداخلي. لقياس تأثير البرنامج التداخلي في ممارسات الملاك التمريضي استعمل الباحث استمارة رصد الممارسات المتضمنة (12) فقرة متعلقة بالوقاية من مضاعفات قنية الوريدية المحيطية. تم استخدام الإحصاءات الوصفية (التكرارات والنسبة المئوية الوسط الحسابي، الانحراف المعياري) والاحصاءات الاستدلالية (الانوفا، اختبار t).

النتائج: أظهرت نتائج الاختبار القبلي عدم وجود فرق معنوي بين مجموعة الدراسة والمجموعة الضابطة (متوسط مجموعة الدراسة = 1.25 مقابل متوسط المجموعة الضابطة = 1.21) اما في الاختبار البعدي، أظهرت النتائج تحسنًا معنويًا في ممارسات مجموعة الدراسة مقارنة بالمجموعة الضابطة (متوسط مجموعة الدراسة = 2.46 مقابل متوسط المجموعة الضابطة = 1.28).

الاستنتاجات: خلصت الدراسة إلى أن البرنامج التداخلي له أثر إيجابي على ممارسات الكادر التمريضي فيما يتعلق بالوقاية من مضاعفات القنية الوريدية المحيطية في مستشفى الديوانية التعليمي.

التوصيات: أوصت الدراسة بضرورة تفعيل الدلائل الإرشادية لإدخال القنية الوريدية المحيطية في المؤسسات الصحية والصادرة من مؤسسة الصحة العالمية وكذلك إجراء البحوث المستقبلية لتحسين معارف وممارسات طاقم التمريض حول الوقاية من مضاعفات القنية الوريدية المحيطية.

ABSTRACT

Background: A peripheral intravenous cannula is an essential tool for delivering drugs, blood products, and nutritional fluids to patients intravenously. At least 90% of all patients who enter the medical environment for care have some form of intravenous therapy. Giving medications through an intravenous cannula can be complicated due to its association with serious infections.

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Objective: The study aimed to evaluate the effectiveness of the intervention program on the practices of the nursing staff towards preventing peripheral intravenous cannula complications in Al-Diwaniyah Teaching Hospital.

Methodology: A quasi-experimental design was carried out at the medical and surgical departments of Al-Diwaniyah Teaching Hospital for the period from 22 \ December \ 2020 to 1 \ May \ 2021. A non-probability (purposive) sample of 60 nursing staff who worked in the surgical and medical departments was selected, and they were divided into two groups, the study group and the control group. The study sample consisted of (30) nurses who were exposed to the intervention program, while the control group consisted of (30) nurses were not exposed to the nursing interventional program. To measure the effectiveness of the intervention program on practices of the nursing staff, the researcher used a practice checklist that included (12) items related to preventing peripheral intravenous cannula complications. To analyze the results, descriptive statistics (frequencies, percentage, arithmetic mean, standard deviation) and inferential statistics (ANOVA, t-test) were used.

Results: The pretest results showed that there was no significant difference between the study group and the control group (Mean of study group=1.25 versus Mean of control group=1.21) In the posttest, the results showed a significant improvement in the practices of the study group compared to the control group (Mean of study group=2.46 versus Mean of control group=1.28).

Conclusion: The study concluded that the educational program has a positive effect on the nursing staff's practices regarding Prevention of Peripheral Intravenous Cannula Complications in Diwaniyah Teaching Hospital.

Recommendation: The study recommended the necessity of activating the guidelines for peripheral intravenous cannulation in health institutions, and conducting future research to improve the knowledge and practices of the nursing staff about the prevention of complications of the peripheral intravenous cannula.

INTRODUCTION

A peripheral intravenous catheter is a common hospital procedure with estimates of 200 million used per year in the United States [1]. Peripheral venous catheters are needed for a wide variety of patients. In acute care settings, every patient needs an intravenous (IV) line. Although the use of peripheral intravenous catheters is fairly common, complications are arising from its use [2].

O'Grady et al., (2011) stated that the Nosocomial Infection National Surveillance Service (NINSS) calculates that approximately 6.2 % of hospital-acquired bacteremia cases have been caused by peripheral intravenous cannulation. This percentage is not small for some patients who develop Bacteremia. Infection can be localized, or systemic, however, peripheral intravenous cannulation are more commonly associated with localized problems. Nevertheless, due to the number of people who have peripherally inserted intravenous catheters, serious infections have occurred resulting in significant morbidity. The majority of studies focus on central venous catheters rather than bloodstream infections related to peripheral intravenous catheters. The risk of catheter-related infection must be addressed to reduce patient morbidity and costs related to hospitalization and costly treatment [3].

Complications such as phlebitis, infiltration, leakage, and infections are often associated with intravenous therapy. Among many other factors such as age, gender, poor quality of peripheral veins, underlying medical diseases, catheter duration, type of infusion, large catheter, lower extremity catheter

insertion, change of gauze dressing, and the nurse operating have a major role in avoiding this complication. Nurses, who can insert an intravenous catheter, as well as knowledge about post-insertion management and treatment, can positively influence patients [4].

According to a study which indicates that 1,428 peripheral intravenous cannulas were placed among 368 hospitalized adult patients in tertiary care clinics. This study found that phlebitis complications were a major complication with an incidence of 44%, followed by 16.3% infiltration and 7.6% obstruction [5].

Phlebitis is a serious problem that can cause more serious health problems that lead to the use of antibiotics or surgery. Nurses' knowledge and identifying risk factors for developing phlebitis can help prevent complications. This improvement can positively affect the quality of care, patient safety, and patient satisfaction and can reduce the length of hospital stay and reduce overall healthcare costs. Nurses are all important to minimize unwanted outcomes [6].

For this reason, good training of nursing personnel is so important, therefore, patient survival success depends more on nurses having excellent training. Also, interventional intravenous cannula prevention programs have always been an important focus of nursing educators [7].

AIMS OF THE STUDY

1. To evaluating the practices of the nursing staff toward prevention of peripheral intravenous cannula complications.
2. To determine the effectiveness of the interventional program on nursing staffs' practices toward prevention of peripheral intravenous cannula complications.
3. To identifying the relationship between the nurses' practice and their demographic characteristics (age, gender, level of education, and years of experience).

METHODOLOGY

A quasi-experimental design has been applied with the use of the pre-posttest approach for study and control groups during the period from 22nd of December 2020 to 1st of May 2021 in medical and surgical departments of Al-Diwaniyah Teaching Hospital. A non-probability (purposive) sample was selected to obtain accurate and representative data for the study participants. The sample size was 60 nurses, divided into two groups, each group consisting of 30 nurses representing the study group and the control group, where the study group is exposed to an intervention program, while the control group is not exposed to any program.

The researcher constructed the study instruments (interventional program and an observational checklist practices) based on the nurses' preliminary assessment results and the review of relevant literature and study. Experts in different fields were evaluated the content of the program. The revision was made on the program contents based on these experts' recommendations and suggestions.

To collect the nursing staffs' demographic data, the researcher used the demographic data form. This form consists of (4) items; they are age, gender, level of education, and years of experience. The researcher used an observational checklist practices, which consist of (1) domain divided into (12) items. These items were rated according to the Likers' scale; always (3); sometimes (2); never (1).

The level of scale which was scored as a total of three episodes of events was observed for each nurse. Three correct practices out of three episodes were rated as always; 2-1 correct practice out of (3) episodes were rated as sometimes and uncorrected practices were rated as never. The time practice checklist of each nurse for each episode took about (5-15) minutes. The same practices tests were used for pretest and posttest.

The validity of the study tools was determined by the 20 experts those have more than 10 years in their fields.

The pilot study was carried out to determine the study instrument reliability. The questionnaire reliability was determined by using a test and re-test approach that obtained through evaluating (ten) medical and surgical nurses in Al-Diwaniyah Teaching Hospital. The time interval between the test and re-test was three weeks to determine the study instrument's reliability. The result of the reliability shows that there is a high degree of reliability coefficient for (inter examiners, Intra examiner) revealed that (0.89, 0.88) respectively of the practices test for the pilot study were obtained which means that the study instrument is reliable in measuring the study phenomenon at any time in the future.

The researcher obtaining the approval of the nursing staff for the purpose of participating in the study and conducting the pre-test, after the nurses were filled out the demographic data form, they have undergone the pre-test. Data were analyzed by using SPSS, descriptive statistics (frequencies, percentage, arithmetic mean, standard deviation), and inferential statistics (ANOVA, t-test) were used.

RESULTS

Table (1): Distribution of the Study Sample According to The Socio demographic Data (N=60).

Demographic Data	Groups	Study Group		Control Group		C.S. [*] P-value
		Freq.	%	Freq.	%	
Age / Years	21 to 25	16	53.3	14	46.7	χ^2= 1.763 P=.623 NS
	26 to 3	7	23.3	9	30.0	
	31 to 35	1	3.3	2	6.7	
	36 to 40	6	20.0	5	16.7	
	Total	30	100.0	30	100.0	
	Mean and SD	27.23 ± 5.998		27.40 ± 5.611		
Gender	Male	11	36.7	13	43.4	χ^2=.311 P=.958 NS
	Female	19	63.3	17	56.6	
	Total	30	100.0	30	100.0	
Education level	Secondary	12	40.0	13	43.3	χ^2=.784[a] P=.676 NS
	Institute	8	26.7	8	26.7	
	College	10	33.3	9	30.0	
	Total	30	100.0	30	100.0	
Years of experience	Less than 5	21	70.0	22	73.3	χ^2= 5.903[a] P=.434 NS
	6 to 10	5	16.7	5	16.7	
	11 to 15	3	10.0	3	10.0	
	16 to 20	1	3.3			
		30	100.0	30	100.0	

(Freq.): Frequency, (%): Percentage; HS: Highly Significant .at P<0.01; NS: Non-Significant. at P>0.05, FEPT: Fisher Exact Probability Test; χ2: Chi-Square test; x. =Arithmetic Mean

Table 1 the results indicated that the ages of both the study group and the control group ranged from 21 to 40 years (the mean age of the study group was 27.23 ± 5.998 and the mean age of the control group was 27.40 ± 5.611). While the majority of the participants in the two groups were females (the females in the study group were

63.3% and the females in the control group 56.6%). On the educational level, the results indicated that the majority of the participants in the two groups were from the secondary school of nursing (40.0% of the study group and 43.3% of the control group). Regarding years of experience, the results showed that the participants from the two groups had years of experience from one to five years (70% from the study group and 73.3% from the control group.

Table (2): Comparison between Pre-posttest of the Study Group Regarding the Practices Items

Practices Items	Pre-Test			Post – Test			Sig Difference		
	M.s.	S.D	Ass.	M.s.	S.D	Evaluative	T-Value	D.F.	P-Value
Hand washing before IV cannulation being carried out	1.13	.434	A	2.40	.563	N	-11.894	29	.000
The nurse uses an aseptic technique during preparing and inserting of IV cannula	1.07	.254	A	2.36	.490	N	-13.310	29	.000
The nurse uses gloves before procedure of the cannulation	1.03	.183	A	2.20	.484	S	-12.042	29	.000
The nurse prepares the skin of patient before performing the intravenous cannula (disinfection of the site)	1.40	.563	A	2.73	.449	N	-12.042	29	.000
The nurse uses clear and visible vein in the forearm	2.30	.651	S	3.00	0.000	N	-5.887	29	.000
The nurse disposes of needles of the cannula in the safety box after procedure of cannulation	1.23	.568	A	3.00	0.000	N	-17.026	29	.000
The nurse educates the patient on how to recognize the signs and symptoms of IV cannulation infection	1.00	0.000	A	2.46	.628	N	-12.775	29	.000
The nurse writes the date, time, site, and size of the cannula (Documentation)	1.00	0.000	A	1.70	.702	S	-5.460	29	.000
The nurse changes the dressing when it wet or dislodge	1.57	.504	A	2.63	.490	N	-10.016	29	.000
The nurse changes the IV cannula after 72 hours inserted	1.00	0.000	A	2.20	.406	S	-16.155	29	.000
When the nurse sees there is a sign of phlebitis she immediately changes the IV cannula to the non-affected part	1.37	.556	A	2.20	.406	S	-8.601	29	.000
The nurse uses an aseptic technique and prepares gloves, alcohol, and gauze while removing the	1.00	0.000	A	2.70	.466	N	-19.977	29	.000

intravenous cannula								
Total	1.25	.1372	A	2.46	.279	N	-29.981	29	.000

cut of point =(0.66) , (SD) (A)never(mean) = 1 to 1.66 , (S) sometime (mean) = 1.67 to 2.33 (N) always (mean) = 2.34 to 3, (SD) stander deviation,(Ns): Non-significant (S): significant , (T value): t-test, (D f): degree of freedom

Table (2) showed that there was a highly significant difference between the pretest and the post-test for the study group regarding to all items of an observational checklist practices. When analyzed by t-test, the results indicated poor practices in pretest of nursing staff and improvement of practices in post-test due to the study group exposure to the interventional program.

Table (3): Comparison between Pre-posttest of the Control Group Regarding the Practices Items

Practices Items	Pre-Test			Post – Test			Sig Difference		
	M.s.	S.D	Evaluative	M.s.	S.D	Evaluation	T-Value	D.F.	P-Value
hand washing before IV cannulation being carried out	1.00	0.000	A	1.21	.000	A	-1.224	29	.232
The nurse uses an aseptic technique during preparing and inserting of IV cannula	1.00	0.000	A	1.00	.000	A	-.961	29	.346
the nurse uses gloves before the procedure the cannulation	1.00	0.000	A	1.00	.000	A	-2.132	29	.043
The nurse prepares the skin of patient before performing the intravenous cannula (disinfection of the site)	1.37	.556	A	1.00	.583	A	-5.091	29	.000
The nurse uses clear and visible vein in the forearm	2.13	.681	S	1.50	.724	A	-.682-	29	.501
The nurse disposes of needles of the cannula in the safety box after procedure of cannulation	1.27	.640	A	2.27	.804	S	-.338-	29	.738
The nurse educates the patient on how to recognize the signs and symptoms of IV cannulation infection	1.00	0.000	A	1.38	.000	A	-.779-	29	.442
The nurse writes the date, time, site, and size of the cannula (Documentation)	1.00	0.000	A	1.00	.000	A	-.648-	29	.522
The nurse changes the dressing when it wet or dislodge	1.47	.571	A	1.00	.578	A	-.593-	29	.557
The nurse changes the IV cannula after 72 hours inserted	1.00	0.000	A	1.58	.000	A	-.833-	29	.412
When the nurse sees there is a sign of phlebitis she immediately changes the IV cannula to the non-	1.33	.606	A	1.00	.582	A	-.682-	29	.501

affected part									
The nurse uses an aseptic technique and prepares gloves, alcohol, and gauze while removing the intravenous cannula	1.00	0.000	A	1.46	.000	A	-.338-	29	.738
Total	**1.21**	**.142**	**A**	**1.28**	**.206**	**A**	**-.779-**	**29**	**.442**

cut of point =(0.66) , (SD) (A)never(mean) = 1 to 1.66 , (S) sometime (mean) = 1.67 to 2.33 (N) always (mean) = 2.34 to 3, (SD) stander deviation,(Ns): Non-significant (S): significant , (T value): t-test, (D f): degree of freedom.

　　　Table (3) showed that there was no significant difference between the pretest and the post-test for the study group regarding to all items of an observational checklist practices. When analyzed by t-test, the results indicated poor practices in pretest and post-test due to both groups not exposure to the interventional program.

Table (4): Significant Difference between Study and Control Groups regarding Pre-post Test Scores

Overall Evaluation pre-test	Rating	Study group				Control group				Significant		
		Freq.	%	M.S.	S.D	Freq.	%	M.S	S.D	t-value	d.f.	p-value
Overall Evaluation pre-test	Never	30	100	1.25	.137	30	100	1.21	.142	1.2281	58	.224 NS
	Sometime	0	0			0	0					
	Always	0	0			0	0					
Overall Evaluation post-test	Never	0	0	2.46	.279	30	100	1.00	.206	18.88	58	.000 HS
	Sometime	14	46.7			0	0					
	Always	16	53.3			0	0					

cut of point = 0.66) , (SD) (N) never(mean) = 1 to 1.66   , (S) sometime (mean) = 1.67 to 2.33 (A) always (mean) = 2.34 to 3, (SD) stander deviation,(Ns): Non-significant (S): significant , (T value): t-test, (D f): degree of freedom.

　　　Table 4 showed illustrates the statistical difference in the practices of the nursing staff, as the results indicate that there was no statistical difference between the study group and the control group in the pre-test, but after implementing an interventional program to prevent complications of the peripheral intravenous cannula, the practices of the study group improved in the post-test compared to the control group that did not expose to the program.

Table (5): Mean differences (ANOVA) between the overall evaluation of the nurses' practices at the post-test score (study group)   according to their some demographic data

Demographic data		Df	Mean Square	F	Sig.
Age	Between Groups	6	2.031	1.972	.112
	Within Groups	23	1.030		
	Total	**29**			
Gender	Between Groups	6	.378	1.660	.176
	Within Groups	23	.228		
	Total	**29**			
Educational level	Between Groups	6	.306	.358	.898
	Within Groups	23	.854		

	Total	29			
Number of years in employment	Between Groups	6	.472	1.072	.408
	Within Groups	23	.441		
	Total	29			

Table 5 shows that there is no statistically significant relationship between the overall practices of the nursing staff in the study group (post-test) and their demographic data (age, gender, educational level, and years of experience).

DISCUSSION

Through the data analysis distribution of demographic variables table (1), this study used a purposive clinical trial design to test the effectiveness of an interventional and skill-building training program in the prevention of peripheral intravenous cannula complications. The sample consists of 60 nurses who were purposively allocated to either a control group (n=30) or a study group (n=30). The mean age of the nurses was (27.23±5.998) years for the study group and (27.40±5.611) years for the control group which ranged from (21-40) years, so both of study and control groups share a highly aged group (21-25) years.

According to point of view, all nurses who work in medical and surgical departments need to be young to cover all needs of patients. This result is consistent with the some studies [8] which found that the mean age of study participants was (25.8±4.24) out of 110 participants. Another study conducted [9] found in their study that the majority of nursing staff are in the age group (20-25 years) with an average age of 25 ± 5.

Regarding the gender of the participants in the study, the results showed that more than half of the participants were female. The percentage of females in the study group was (63.3%), while the percentage of females in the control group was (56.6%).

This result is consistent with the some studies [10] found that 57.8 % of study participants were female out of 45 participants in a study conducted in Baghdad. In their study conducted in the Northeastern United States [11], indicated that most of the study participants were female, with 87% of 62

participants, where the percentage in Group A was equal to 90% of 30 participants, while the percentage in group B was 84% of 32 participants.

On the educational level, the results of the study showed that 40% of the study group participants were from high school of nursing and 33.3% were from nursing colleges, while the results in the control group showed that 43.3% were from high school of nursing and 30% from nursing colleges. This result was similar to a study conducted in Turkey [12], in which they stated that most of the nursing staff was from the nursing school with 66.7% of the participants. The most recent studies conducted in neighboring and developed countries indicate that the lowest level of nursing is the diploma and this is confirmed that 99% of the study participants have a diploma in nursing [13]. And in another study conducted in Malaysia [14], stated that 79.2% of the study participants have a diploma in nursing.

Years of experience, the results showed that 70% of the study group and 73.3% in the control group had an experience of less than 5 years of work in the medical and surgical departments. This result is consistent with the some studies [13] who stated that 44.7% of the study participants had an experience of between one and five years. While Rajih (2020), who conducted a study in the same hospital stated that 60% of the participants have experience ranging from one to three years [15].

As in Tables (2) (3) (4), the study results showed that the nursing staff practices related to the prevention of peripheral intravenous cannula complications in the pretest were low in both the

study groups and the control group (the mean of the study group was 1.25 while the mean for the control group was 1.21). In the post-test and after implementing an interventional program to prevent PIVC complications, the results showed a significant improvement in the practices of the study group (the mean was 2.46) compared to the control group whose practice did not change from the pretest.

The results of the study are consistent with the some studies [9], which it was observed that PIVC training was effective for the intensive care nurses to do it properly. However, it is necessary to repeat the exercises at certain intervals to ensure a complete change of practices. The study conducted by Keleekai et al [11], indicates a significant improvement in the practices of the nursing staff after implementing an educational program on PIVC insertion. In another study on the practices of nursing staff [16], indicated the effectiveness of the educational program in improving the practices of the nursing staff about peripheral intravenous cannula.

This study demonstrated that there is a deficit in nursing staff practices regarding cannula insertion, equipment preparation, patient preparation, cannulation procedure, post-operative care with waste, and documentation in pre-testing but improving their practices in post-testing.

As for the relationship between the nurses' practices and their demographic characteristics, the study showed as in Table (5), there was no statistical relationship between the practices of the nursing staff in the study group and their ages on the post-test (the p-value was 0.112). This result indicates that the intervention program was effective at all ages of the group. This finding is supported by Khunaw et al., (2020) showed that there were no significant associations between the health care worker's knowledge and practices with their age-related to main domain toward prevention of peripheral intravenous cannula complications. As for gender, the results showed that there was no statistical

relationship between the practices of the study participants in the post-test and their gender (the p-value was 0.176). This result showed that there were no significant associations between the health care worker's knowledge and practices with their gender-related to the main domain toward prevention of peripheral intravenous cannula complications [17].

This study demonstrated that there is no relationship between nurses' practices with their gender regarding the main area towards prevention of PIVC complications due to the majority of nurses not receiving any training on the prevention of PVC complications. Regarding the educational level, the results showed that there is no statistical relationship between practices of the individuals of the study sample and their educational level (the p-value was 0.898). This result may be because most of the study participants are of the same educational level (high school nursing) as well as learning wrong practices from their colleagues in the profession. This result revealed that there is no relationship between the socio-demographic characteristics which comprised of the level of education with knowledge of the respondents about PIVC [18]. Years of experience on the job, the study data showed that there was no statistical relationship between the knowledge and practices of the nursing staff and their years of experience (the p-value was 0.898). The reason for this result may be that most of the study sample has less than 5 years of employment experience. This result agree with the studies [17] showed that there were no significant associations between the health care worker's practices with their years of experience related to the main domain toward prevention of peripheral intravenous cannula complications. This study showed that there is no correlation between nurses' knowledge and practices with years of experience related to the main area of prevention of PIVC complications because the majority of nurses have less than 5 years of experience and receive no training in the prevention of PIVC complications.

CONCLUSION

The study concluded that the interventional program has effectively contributed to improving nurses' practices in preventing peripheral venous cannula complications, as this was demonstrated by the results of pretest and post-test.

RECOMMENDATIONS

1. Correctly activate the continuous medical education unit to give educational courses related to peripheral intravenous cannula complications in all hospital departments.

2. Implementing the guidelines for Peripheral intravenous catheter (PIVC) issued by the World Health Organization.

3. Focus on the issue of complications and care for the peripheral intravenous cannula as part of the primary school curriculum.

4. Conducting future research programs to improve the knowledge and practices of the nursing staff regarding the prevention of complications of the peripheral venous cannula for all hospital departments.

5. Continuous provision of antiseptics and alcohol that are used to clean hands.

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