

The Skin Preparation Knowledge, Attitudes and Practices among the Healthcare Professionals in Compliance with the World Health Organization (WHO) Guidelines

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ABSTRACT

Objective: To evaluate the knowledge, attitudes and the practices of healthcare professionals towards the skin preparation before giving injections.

Methods: Cross sectional study. A pre-tested, pre-designed, well-structured questionnaire which was written in English was administered to the volunteer doctors, pharmacists and the nurses at Penang General Hospital during 20th March 2011 to 20th April 2011. A total of 136 anonymously completed questionnaires were returned to the investigator. The data was analyzed by using SPSS-16 and the results were expressed as counts and percentages.

Results: Most of the respondents derived their knowledge from healthcare personnel (70.5%, n = 136) and medical books (44.1%, n = 136). Most of the healthcare professionals knew

that an alcohol swab would not minimize the pain either during (70%-85%) or after (55%-80%) an injection and that it would not minimize the risk of bleeding (50%-82%) after an injection. Almost all the respondents (93.7%) were of the view that not using a swab was not time saving and economical. However, more than 95% thought that skin preparations would minimize the risk of an infection; therefore, they would not administer an injection without using an alcohol swab.

Conclusion: The knowledge on the use of an alcohol swab before giving intra-dermal, subcutaneous and intra-muscular injections was poor. The healthcare professionals believed that skin preparations would minimize the risk of an infection and that an injection could not be given after cleaning the site with soap and water.

Key Words: Skin preparations, Clinical practices, Injections, Healthcare, Knowledge survey

INTRODUCTION

Injections are among the most common procedures which are used by healthcare professionals throughout the world. There is a general reluctance among people to accept injections without the site being cleaned with an alcohol swab [1,2]. According to the World Health Organization, there is no need to routinely use a 60%-70% alcohol swab for skin preparations before giving subcutaneous, intra-dermal and intra-muscular injections [3].

For the purpose of this survey, the term 'injection' refers to intra-dermal, intra-muscular and subcutaneous injections and to assess the knowledge awareness about the latest World Health Organization Guidelines 2010.

In the medical care, an injection is the introduction of a drug, contraceptive, vaccine or another therapeutic agent into the body by using a needle and syringe. Injections are among the most common healthcare procedures which are used throughout the world.

According to the World Health Organization [4], among the best infection control practices, eliminating unnecessary injections is the highest priority in preventing injection-associated infections and when the injections are medically indicated, they should be administered safely to protect the patients, providers and the communities.

Dann [5], in his six years of study, gave 5000 injections to unselected patients by all routes, from the intra-dermal to the intravenous routes, without using any form of skin preparation, without a single case of infection, either local or systemic. He suggested that a routine skin preparation may have unpleasant side effects.

Yoshika Kazuaki [6] and colleagues compared distillate water cotton with an alcohol swab as a skin preparation before a vaccination, and found no infection in both the groups. The side effects of using swabs were more frequent among the alcohol swab users.

Sutton, White, Edwards and Lewis [7], in their study, found only two cases of local infection at the venepuncture site. Both the patients were disinfected with Isopropyl Alcohol (IPA) and, interestingly, both the patients were on steroid therapy for chronic obstructive airways disease. Pus swabs subsequently grew *Staphylococcus aureus* in both the cases. The IPA skin disinfection did not prevent a local infection in either case, thus suggesting that IPA is an ineffective agent.

According to the recommendation of the World Health Organization (WHO), swabbing of the clean skin before giving an injection is unnecessary. The WHO further states that wash the skin that is visibly soiled or dirty? If swabbing with an antiseptic is being tried, then a clean, single-use swab should be used and a product-specific,

recommended contact time should be maintained. Cotton balls which are stored wet in a multi-use container should not be used. The recommendation for an alcohol swab is to wipe the swab for 30 seconds over the site of the injection and to allow drying for a further 30 seconds to ensure that the bacteria are rendered inactive (otherwise, there may be some increased injection pain [1,3].

At present, according to the policy guidelines in Penang General Hospital, the use of an alcohol swab before giving an injection is necessary. Thus, this survey was conducted to assess the theoretical knowledge of the healthcare professionals on the use of alcohol swabs, to let them have some awareness of this issue and to bring them a step ahead towards the WHO guidelines.

SUBJECTS AND METHOD

A cross-sectional survey was employed as a method of data collection by using a previously validated, structured questionnaire, among the healthcare professionals of Penang General Hospital, during March 2011 to May 2011.

For this survey, the universal sampling method was used for both male and female doctors, pharmacists and nurses. The questions of this survey were adapted from a previous study and they were modified to suit the local subjects. The questionnaire was pilot-tested at Penang General Hospital in December 2010. The questionnaire was administered to 30 healthcare professionals from different departments. The covering letter of the questionnaire outlined the title and the purpose of the study and the identity of the researcher. The participants were informed about the importance of the study and they were encouraged to participate in the study.

The questionnaire consisted of 2 sections with 14 items: (1) Demographic and (2) Knowledge. In the first section, the participants were asked about their *demographic data*. The skin preparation knowledge among the healthcare professionals was in compliance with the WHO best injection practice guidelines. Thus, the demographic data which were collected were gender, age, ethnicity, country of origin, initial medical education, profession, and the number of years in the medical practice.

The second section consisted of 8 questions which determined the level of the *knowledge* and the *source of the knowledge* of the participants regarding the use of a skin preparation before the parenteral practice. The respondents were asked to answer as “yes”, “no” and “don’t know”. The scoring range of the questionnaire was +5 (maximum) to -5 (minimum). A cut of level of +5 to +3 was considered as good knowledge, that of +2 to 0 was considered as moderate knowledge, and that of -1 to -5 was considered as poor knowledge about a skin preparation. The knowledge scores for the individual respondents were calculated and they were summed up to give the total knowledge score.

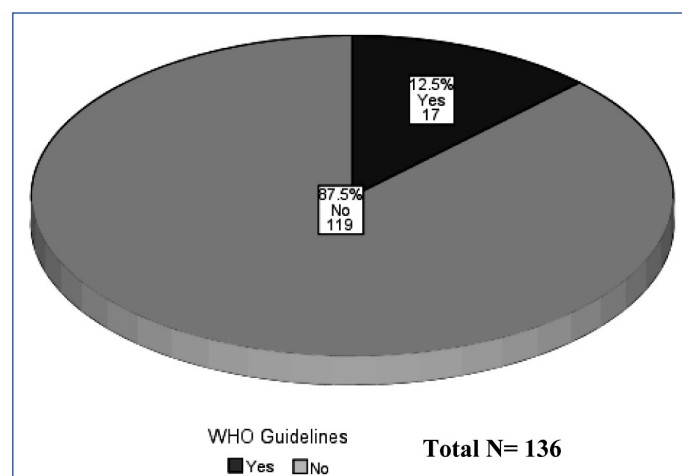
Out of 150, 136 anonymously completed questionnaires were returned to the investigator.

Statistical analysis: The statistical analysis was performed by using the Statistical Package for Social Sciences (SPSS), version 16 software. Descriptive statistics such as percentages and means were used to describe the samples on the various variables. The results were expressed as counts and percentages.

RESULT

Out of 160 distributed questionnaires, 136 (85%) completed questionnaires were returned. Among the 136 respondents, a majority were females 118 (86.8%) and Malays. There were 90

(66.2%) Malays, 28 (20.6%) Chinese, and 18(13.2%) Indians. The ages of the respondents ranged from 23 to 56 years, with a mean age of 27.54 ± 3.604 years. Most of the participants were nurses 76 (55.9%), followed by house officers 23 (16.9%), medical officers 16 (11.8%), pharmacists 12 (8.8%), specialists 5 (3.7%) and consultants [4 (2.9%)]. Among the healthcare professionals, 17 (12.5%) answered “yes”, which meant that they had a copy of the WHO best practices for injections and related procedures toolkit guidelines 2010, while 119 (87.5%) said that “we don’t have” [Table/Fig-1]. Among the respondents, the length of the years of practice was between 1 to 19 years, with a mean length of service of 3.29 ± 3.14 years. The consultants had a higher mean age (37.25 ± 7.136 years), followed by the specialists (34.00 ± 3.240 years), pharmacists (28.67 ± 2.605 years), medical officers (28.06 ± 1.982 years), nurses (26.82 ± 3.041 years) and the house officers (25.87 ± 1.014 years). Regarding the years of practice, the consultants were found to have more experience (mean years 14.00 ± 3.742), followed by the specialists [8.60 ± 2.966 years], pharmacists (3.25 ± 2.261 years), nurses (3.11 ± 2.404 years), medical officers (2.97 ± 1.848 years), and the house officers (1.10 ± 0.302 years). A summary of the demographic information of the healthcare professionals has been presented in [Table/Fig-2].



[Table/Fig-1]: WHO Best Practices for Injections and Related Procedures Toolkit Guidelines March 2010

A total of 119 healthcare professionals (87.5%) claimed that, “we don’t have the copy of the WHO best practices for injections and related procedures toolkit guidelines 2010”. Only 17 claimed (12.5%) that, “we have the copy of WHO guidelines” [Table/Fig-1].

Variables	Frequency N (%)	Age (Mean ± SD)	Years of practice (Mean ± SD)
Gender			
Male	18 (13.2)	27.89 ± 2.632	2.69 ± 2.408
Female	118 (86.8)	27.48 ± 3.736	3.38 ± 3.239
Ethnic Origin			
Malay	90 (66.2)	± 3.420	3.24 ± 2.703
Chinese	28 (20.6)	± 4.442	3.88 ± 4.525
Indian	18 (13.2)	27.39 ± 2.593	2.63 ± 2.581
Profession			
Medical Officer	16 (11.8)	28.06 ± 1.982	2.97 ± 1.848
House Officer	23 (16.9)	25.87 ± 1.014	1.10 ± 0.302
Consultant	4 (2.9)	37.25 ± 7.136	14.00 ± 3.742
Specialist	5 (3.7)	34.00 ± 3.240	8.60 ± 2.966
Pharmacist	12 (8.8)	28.67 ± 2.605	3.25 ± 2.261
Nurse	76 (55.9)	26.82 ± 3.041	3.11 ± 2.404

[Table/Fig-2]: Demographic characteristic of respondents who completed the KAP questionnaire N=136.

Total N= 136.

The Survey Participant's Source of Knowledge

Multi-source and multi-response information was obtained from the respondents, so percentage > 100. Most of the participants derived their knowledge about the cleansing site of the injection before giving subcutaneous, intra-dermal, and intra-muscular injections from other healthcare professionals. Approximately 96 (70.5%) respondents obtained the knowledge from healthcare professionals, 60 (44.1%) obtained it from medical books and 16 (11.8%) obtained it from medical journals. Other identified sources were the internet, medical books, medical journals, mass media and friends [Table/Fig-3].

Source of Knowledge	Percentage (%)*
Health Personnel	70.5 %
Medical Books	44.1%
Medical Journals	11.8%
Internet	2.2%
Friends	0.7%
Mass Media	0.7%

[Table/Fig-3]: Source of knowledge regarding skin preparation before injection

*% > 100 (Multi response).

The respondent's knowledge about swabbing the site before giving intra-dermal, subcutaneous and intra-muscular vaccines was poor. More than 90% participating groups wrongly answered and said that "A routine skin preparation by using an alcohol swab before giving intra-dermal, subcutaneous and intra-muscular vaccine injections will prevent infections" [Table/Fig-4].

Most of the healthcare professionals knew correctly that swabbing the site before giving subcutaneous, intra-dermal, intra-muscular vaccines, therapeutics and venous access injections would not minimize the pain before or after an injection [Table/Fig-4].

Some of the doctors (20.8%) and nurses (40.8%) had a wrong belief and they mentioned that, "An alcohol swab will minimize bleeding after a venous access," whereas a majority of them correctly replied this question [Table/Fig-4].

More than 90% of the healthcare professionals believed that intra-dermal, subcutaneous and intra-muscular vaccine injections could not be given after just cleaning the site with soap and water [Table/Fig-4].

Questions	Doctor (n = 48)			Pharmacist (n = 12)			Nurses (n = 76)			Total (N = 136)
	ID	SC	IM (V)	ID	SC	IM (V)	ID	SC	IM (V)	
Q1	-	-	-	1 (8.3)	1 (8.3)	-	-	-	-	
Q2	40 (83.3)	38 (79.2)	37 (77.1)	9 (75)	9 (75)	9 (75)	57 (75)	55 (72.4)	56 (73.7)	
Q3	37 (77.1)	37 (77.1)	35 (72.9)	9 (75)	9 (75)	9 (75)	44 (57.9)	44 (57.9)	43 (56.6)	
Q4	37 (77.1)	39 (81.2)	38 (79.2)	9 (75)	9 (75)	9 (75)	38 (50)	39 (51.3)	35 (46.1)	
Q5	4 (8.3)	2 (4.2)	2 (4.2)	1 (8.3)	2 (16.7)	1 (8.3)	-	-	-	
Q6	45 (93.8)			12 (100)			65 (85.5)			122 (90)
Q7	9 (18.8)			7 (58.3)			12 (15.8)			28 (21)

[Table/Fig-4]: Correct responses of healthcare professionals

*ID (Intra-dermal injection); Sc (Subcutaneous); IM-V (Intra-muscular vaccine injection)

Q1. Swabbing before injections will minimize the risk of infection?

Q2. Swabbing before injections will minimize the pain during injection?

Q3. Swabbing before injections will minimize the pain after injection?

Q4. Swabbing before injection will minimize the risk of bleeding after injection?

Q5. Injection can be given just cleaning the site with soap and water?

Q6. Correct time to give injection after swabbing

Q7. Alcohol swab can affect the medication constituents (so affect the action of drug)

Almost all the healthcare professionals answered correctly that, "if swabbing is selected for use, wipe the swab for 30 seconds over the site of the injection and allow drying for a further 30 seconds before giving an injection." Only few doctors (6.2%) and nurses (10.5%) answered wrongly, "while the skin wet with alcohol" [Table/Fig-4]. Only 21% of the participants answered correctly that an alcohol swab could affect the contents of the injected medication and that it could affect the mode of action of the injection also [Table/Fig-4].

The knowledge was assessed by giving 1 for a correct answer and -1 for a wrong answer. A "don't know" response was also taken as 0. The scale measured the knowledge from a maximum of +5 to a minimum of -5. The scores which ranged between +5 to +3 were taken as good, those which ranged from +2 to 0 were taken as moderate and those which ranged from -1 to -5 were considered as a poor knowledge on the skin preparation.

The mean knowledge score regarding the skin preparation among the intra-dermal, subcutaneous, intra-muscular and the venous access injections for the doctors were 2.7, for the pharmacists, it was 3 and for the nurses, it was were -3.4. In general, the doctors had a moderate level of knowledge on the skin preparation, the pharmacists had good knowledge and the nurses had poor knowledge on the skin preparation before injections.

The mean knowledge score regarding the skin preparation among the intra-dermal, subcutaneous and the intra-muscular injections for question 1 and question 5 was poor. For question 1, the doctors scored -4, the pharmacists scored -3.5 and the nurses scored -3.8. Similarly, for question 5, the doctors scored -3.5, the pharmacists scored -2.8 and the nurses scored -3.15.

[Table/Fig-4] shows the healthcare professionals' attitude and their practices towards the skin preparation. Almost more than 90% of the healthcare professionals believed that intra-dermal and subcutaneous injections could not be administered after cleaning the site with soap and water. Similarly, the HCPs did not agree with the method of giving intra-muscular vaccines without alcohol swabbing (70% alcohol). There was a negative attitude in these two statements. While they had a positive attitude about the swabbing before injections, it was not found to be time saving and economical.

While for the practice statements, 97% of the healthcare professionals stated that alcohol swabbing of a clean skin was not

Attitude toward skin preparation	Agree			Disagree			
	D	P	N	D	P	N	
Intradermal and subcutaneous injection can be administered by cleaning the site with soap and water	–	16.6%	1.3%	98%	83.4%	98.7%	Negative
Intramuscular vaccine injection can be administered without swabbing (70% alcohol)	2.1%	–	–	97.9%	100%	98.7%	Negative
Administration of injection without swabbing is time saving and economical	–	–	–	95.8%	91.7%	98.7%	Positive
Practice toward skin preparation							
Alcohol swabbing of clean skin for injection is unnecessary practice	–	–	–	100%	91.6%	100%	Negative
Intramuscular vaccine injection can be administered after cleaning the site with soap and water?	8.3%	25%	2.6%	75%	66.6%	92.1%	Negative
Swab can be reused if we dip again into 70% alcohol?	12.4%	8.3%	30.3%	68.7%	83.3%	61.9%	Positive

[Table/Fig-5]: Attitude and Practice of health care professionals toward skin preparation

an unnecessary practice, while they are also did not agree with the method of administering IM vaccine injections after cleaning the site with soap and water. On the practice regarding the reuse of an alcohol swab after dipping it into 70% alcohol, only 71.3% disagreed and stated that it could not be used, while 17% agreed to its reuse [Table/Fig-5].

DISCUSSION

The survey was conducted in one of the government hospitals in Penang. The purpose of this survey was to focus on the specific education, training and awareness programs for healthcare professionals with respect to the implementation of the WHO guidelines for giving safe injections. Among the healthcare professionals, 17(12.5%) claimed that they had a copy of the WHO best practices for injections and related procedures toolkit guidelines 2010, while 119 (87.5%) said they did not have it, as shown in [Table/Fig-1]. It shows that a majority of the healthcare professionals lacked awareness and knowledge about the availability of the WHO practice guidelines for giving safe injections. A study showed that among the 78% of the guidelines, more than 10% of physicians are not aware of their existence. The lack of awareness was contributed as a major factor of non adherence to the guidelines [2]. During the discussion which was held with the healthcare professionals, they said that they did not have an idea about the presence of any guidelines for safe injection practices. No evidence-based guidelines were available to guide the injection providers through the steps that they had to follow, to prevent injection-associated infections. Thus, the WHO developed the best practices for the use of the safe injections guidelines [4].

Most of the participants derived their knowledge from various sources. This study found that 70.5% of the healthcare professionals got the knowledge from other healthcare personnel. 44.1% got their knowledge from medical books [Table/Fig-2]. In contrast to the findings of the study which was done by Rajab Ali [1], 85% of the healthcare professionals were found to have got their knowledge from other health personnel and 45% had got it from medical books in our study. These similar findings showed that a majority of the healthcare professionals got their knowledge from other healthcare personnel during their practice.

Regarding the knowledge of the healthcare professionals, this study showed that the respondent's knowledge about swabbing before giving an injection and the injection related infections were poor in the case of intra-dermal, subcutaneous and intra-muscular vaccines, and therapeutics, which showed that our findings

were similar to those of the study which was done by Rajab Ali Khawaja [1]. More than 95% of all the participating groups wrongly answered and said that "Routine skin preparations with the use of an alcohol swab before giving intra-dermal, subcutaneous and intra-muscular vaccine injections will prevent infections". In case of the intravenous injections, 94.8% of the respondents answered the questions correctly [Table/Fig-4].

Barbara Workman [8], in her study, reported that swabbing before giving subcutaneous insulin injections predisposed the skin to be hardened by the alcohol. Previous studies have suggested that the lack of a skin preparation did not result in an infection ((Dann 1969; Koivisto and Felig 1978) [9,10].

Veikko A Koivisto and Philip Felig, in their study subjects [10], omitted the skin preparation before giving insulin injections every other week. More than 1700 insulin injections were given without a skin preparation. No signs of local or systemic infections were observed. These results indicated that giving insulin injections without a skin preparation did not prevent infections at the injection site.

The success in reducing the rate of unnecessary skin preparations with the use of an alcohol swab before giving subcutaneous, intra-dermal, and intra-muscular injections as per the WHO guidelines could only occur if the current theoretical knowledge, attitude and practice of the healthcare professionals were known. This would help in tailoring the training and the awareness programs for the healthcare professionals.

When asked whether the intra-dermal, subcutaneous and the intra-muscular vaccine injections could be given just after cleaning the site with soap and water [Table/Fig-4], more than 90% of the healthcare professionals replied in the negative, and the main reason for the refusal was that they believed that just cleaning the site with water and soap could cause an infection. Other studies suggested that there was no increased risk of infection when the injections were given in the absence of a skin preparation [5, 9, 10, 11, 12, 13].

With respect to the knowledge about the correct time of giving the skin preparation, previous studies which were done in Saudia found that 59.4% of the doctors and nurses responded with a correct answer [1], while in the present study, 93.8% doctors, 100% pharmacists and 85.5% nurses responded with the correct answer [Table/Fig-6]. This showed that a high percentage of doctors, pharmacists and nurses had good knowledge about the correct time of giving injections in Malaysia.

Study Ref.	Time of Observation	Study type	Physical examination of injection site	No. of patients	Skin preparation protocol	No of injection without skin preparation	No of injection with skin preparation	No. of infection at injection site
Fleming [11]	0.5-59 years	R	No	21	NA	66807*	NA	0
Fleming [11]	20 weeks	P	Yes	42	Alcohol	7275*	6445	0
McCarthy [12]	NA	P	Yes	50	Alcohol Water	600 600	600 600	0 0
Borders [9]	1 week	R	Yes	47	NA	NA	NA	0
Stepanas [13]	≥ week	P	No	3	NA	NA	NA	0
Koivisto [10]	3-5 months	P	Yes	13	70% alcohol	Over 1700	Over 1700	0

[Table/Fig-6]: Studies reporting insulin injections given to diabetic patients with or without skin preparation

NA = not available

* = injection given through clothing

Simmonds [14], in his study, stated that if it was necessary to use skin disinfection, the skin had to be cleaned with an alcohol swab for 30 seconds, and then allowed to dry for at least 30 seconds; otherwise it would be ineffective. Additionally, if the injection was given before the skin dried, not only would it increase pain for the patient, as the needle entry would make the site sting, but also the bacteria would not be rendered inactive and they could be inoculated into the injection site [6, 15, 16].

In this survey, only 31% of the respondents answered correctly that an alcohol swab could affect the contents of an injected medication and that it could affect the mode of action of the medication [Table/Fig-3], while in the Rajab Ali [1] survey, only 22% of the participants answered correctly that an alcohol swab could affect the contents of an injected medication and that it could affect the mode of action of the medication. Both these studies showed the lack of knowledge of the healthcare professionals. The World Health Organization guidelines for safe practice in injections³ has mentioned that alcohol disinfection should not be used for the administration of an intra-muscular vaccine.

Ramskogler K [17] reported in his study that, alcohol dehydrogenase (ADH), acetaldehyde hydrogenase (ALDH) and cytochrome P450 2E1 were the enzymes which were responsible for the metabolism of ethanol. These enzymes were also the sites of a direct pharmacological interaction between ethanol and other drugs. However, the altered effects of the medication could also be caused by ethanol, adding to or reducing the drug's effect. Interactions have most frequently been described for analgesics, psycho pharmacologically active drugs, antihistamines, anticoagulants antihypertensive drugs, and antibiotics.

In this survey, the knowledge of the healthcare professionals regarding the routine preparation of the skin before giving an injection was poor. According to the findings of this survey, the important disadvantage which was observed among the healthcare professionals was that the absence of an alcohol swab before giving an injection could lead to the risk of an infection. This concept was not in agreement with the findings which were reported earlier, both from the developing and the developed countries [5, 9, 10, 12, 18, 19]. Poor knowledge on these issues would most likely lead to a defective attitude and some misconceptions towards the use of a routine alcohol swab.

A World Health Organisation (WHO) [4] bulletin which was published in 2003 stated that swabbing clean the skin prior to giving an injection was unnecessary. However, if cleaning was necessary, soap and water would be sufficient. There is very little evidence to support the need for the disinfection of the

skin prior to giving any intra-dermal, subcutaneous and intra-muscular injections. Many studies have reported that a routine skin preparation with the use of an alcohol swab before giving intra-dermal, intra-muscular and subcutaneous injections was unnecessary [5, 10-12, 19-20].

The results of this study clearly showed that the WHO guidelines had only to be implemented after providing sufficient knowledge and after changing the behaviour of health care providers by further training, and that of the patients by awareness programs.

LIMITATIONS OF THE STUDY

The current study has three limitations. Firstly, it is limited by its cross sectional methodology. Secondly, the study population was small and the survey only focused on the healthcare professionals within the hospital. The healthcare professionals from health clinics were not included in this survey and thus the results cannot be generalized to all the healthcare professionals in Penang.

In addition, the third limitation is that the study took place in only one hospital of Penang city. Finally, the data represents the professionals' knowledge; attitude and practice up to a particular point in time and it does not necessarily reflect the future.

CONCLUSION

In general, the doctors had a moderate level of knowledge and the pharmacists were at a good level, while the nurses had poor knowledge about the skin preparation before giving an injection. Most of the respondents reported that healthcare professionals were the major sources of getting information about the use of a skin preparation before giving injections. Success of positive attitude and good practice is dependent upon the level of knowledge of the skin preparation which is carried out by healthcare professionals. It is believed that knowledge is one of the key factors in achieving a positive attitude and practice. It was observed that the healthcare professionals had a perception that swabbing before giving intra-dermal, subcutaneous and intra-muscular injections would minimize the risk of infections and also that injections couldn't be given after just cleaning the site with soap and water. Thus, the results provided a valuable insight into the healthcare professionals' knowledge and attitude towards the routine preparation of the skin with the use of an alcohol swab before giving injections in Malaysia. Arranging seminars and awareness programs can play a major role in this regards and this can facilitate the education of the healthcare professionals about skin preparations.

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REFERENCES

- [1] Khawaja RA. The knowledge, attitude and practice towards a routine skin preparation before giving an injection, among physicians, nurses and patients in a teaching hospital of Saudi Arabia. *World Family Medicine Journal*. March 2010;8.
- [2] Cabana MD, Rand CS, Powe NR, et al. Why don't physicians follow the clinical practice guidelines?: A framework for improvement. *JAMA*. 1999;282(15):1458-65.
- [3] The World Health Organization guidelines best practice for injections and the related procedure toolkit (2010).
- [4] Hutin Y, Hauri A, Chiarello L, et al. Best infection control practices for intra-dermal, subcutaneous, and intra-muscular needle injections. *Bulletin of the World Health Organization* 2003; 81:491-500. <http://www.who.int/bulletin/volumes/81/7/en/Hutin0703.pdf>.
- [5] Dann TC. Routine skin preparation before giving an injection: an unnecessary procedure. *Lancet* 1969;2:96-98.
- [6] Kazuaki Y, Seiichi F, Tomohiko M. Is it necessary to disinfect the skin with alcohol before giving a subcutaneous injection?-A randomized controlled trial on vaccination- *Japanese Journal of Primary Care* 2005; 28(2): 87-91.
- [7] Sutton CD, White SA, Edwards R, Lewis MH. A prospective, controlled trial of the efficacy of the use of isopropyl alcohol wipes before venesection in surgical patients. *The Royal College of Surgeons of England* 1999; 81: 183-86.
- [8] Workman B. Safe injection techniques. *Nursing Standard*. June 16 1999; 13 (39).
- [9] Borders LM, Bingham PR, Riddle MC. Traditional insulin-use practices and the incidence of bacterial contamination and infection. *Diabetes Care* 1984;7:121-27.
- [10] Koivisto VA, Felig P. Is a skin preparation necessary before giving an insulin injection? *Lancet* 1978;1:1072-75.
- [11] Binswanger IA, Kral AH, Bluthenthal RN, Rybold DJ, Edlin BR. High prevalence of abscesses and cellulitis among community-recruited injection drug users in San Francisco. *Clinical Infectious Diseases* 2000;30:579-81.
- [12] McCarthy JA, Covarrubias B, Sink P. Is the traditional alcohol wipe necessary before giving an insulin injection? *Dogma disputed*. *Diabetes Care* 1993;16:402.
- [13] Stepanas TV, Turley H, Tuohy EA. Reuse of disposable insulin syringes. *Medical Journal of Australia* 1982;1:311-13.
- [14] Simmonds BP. CDC guidelines for the prevention and control of nosocomial infections: guidelines for the prevention of intravascular infections. *American Journal of Infection Control* 1983. 11, 5, 183-89.
- [15] Springhouse Corporation. *Medication Administration and IV Therapy Manual*. Second edition 1993. Pennsylvania, Springhouse Corporation.
- [16] Del Mar CB, Glasziou PP, Spinks AB, Sanders SL. Is isopropyl alcohol swabbing before giving injections really necessary? *Medical Journal of Australia* 2001;174:306.
- [17] Ramskogler K, Hertling I, Riegler A, Semler B, Zoghalmi A, Walter H, et al. A possible interaction between ethanol and drugs and their significance for drug therapy in the elderly. *Wien Klin Wochenschr* 2001 May 15;113(10):363-70.
- [18] Elek E SD. Experimental staphylococcal infections in the skin of man. *Ann NY Acad. Sci.* 1956; 65 (3): 85-90.
- [19] Sutton CD, Whitel SA, Edwards R, Lewis MH. A prospective controlled trial of the efficacy of using isopropyl alcohol wipes before venesection in surgical patients. *Ann R Coll Surg England* 1999; 81: 183-18.

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