Abstract of thesis entitled

A clinical practice guideline for implementation of hair apposition technique for patients with scalp laceration in Emergency Department

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Minor injuries with lacerations is one of the most common reason for people to seek medical help in accident and emergency department (AED), of all of these injuries, scalp lacerations are the most common traumatic wounds being seen in AED (Hollander et al., 1995). Restoring skin integrity is the major objective of wound repair; in the procedure to reduce the infection, scarring and functional impairment is our goal. Without proper care of the wounds, excess scars may form. It increases patients’ risk in wound infection and leads to poor cosmetic outcome.

HAT is a concept that combine of hair by applying glue on a hair knots so to appose a wound on scalp and resulting in wound closure and hemostatic (Hock et al., 2002). Using this technique is to grasped strands of hair on each side of the wound at the scalp and the strands of hair are crossed once, drops of glue are applied on the crossed hair strands so to secure the wound. The idea of using HAT for repairing scalp wound is to shorten the procedure time, reduce wound
complication and increase patients’ acceptance. Moreover there is no need for shaving or trimming of hair, it is cosmetically more acceptable to patient (Ong et al., 2005 and Hock et al., 2002).

To identify the study, a systematic review was done. A search was done for the literatures which were published from 2000 to 2015 and the studies were reporting on implementation of HAT for patients with scalp laceration. Cochrane Library and PubMed were used as the searching electronic database. Total five studies were chosen and the data was extracted and critical appraisal was performed by using the Scottish Intercollegiate Guidelines Network (SIGN, 2014) as a guide. All of the papers suggest that HAT is a good alternative method in managing patients with scalp laceration wound in AED. The results of the five chosen studies provide the evidences that HAT is effective in wound closure of patients with scalp laceration wounds. Implementation of HAT is not only benefit patient’s wound outcome and minimize pain, but also reduce the time used in managing scalp laceration wounds. Significantly low cost for HAT is also suggested by Ozturk et al. (2013) and Ong et al. (2005). The results and suggestions from the five chosen studies should be considered to translate to develop a standardize protocol in using HAT in Hong Kong AED.

Implementation plan of the proposed HAT guideline for scalp laceration wounds management in AED including the communication plan to integrate and maintain the changes in practice with the stakeholders, a three month planned pilot study and evaluation was discussed in the last part of this dissertation.
A clinical practice guideline for implementation of hair apposition technique for patients with scalp laceration in Emergency Department

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Declaration

I declare that this thesis represents my own work, except where due acknowledgment is given and that it has been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma, or other qualifications.

Signed _______________________

Chin Man Ting
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Abbreviation

AED – Accident and Emergency Department
APN – Advanced Practice Nurses
COS – Chief of Service
DOM – Department Operative Manager
HAT – Hair Apposition Technique
NC – Nurse Consultant
RCT – Randomized Controlled Trial
RN – Registered Nurses
SIGN – Scottish Intercollegiate Guidelines Network
TSA – Topical Skin Adhesive
VAS – visual Analog Scale
WM – Ward Manager
Chapter 1: Introduction

1.1 Background

Minor injuries with lacerations is one of the most common reason for people to seek medical help in accident and emergency department (AED), of all of these injures, scalp lacerations are the most common traumatic wounds being seen in AED (Hollander et al., 1995). Restoring skin integrity is the major objective of wound repair; in the procedure to reduce the infection, scarring and functional impairment is also our goal. Without proper care of the wounds, excess scars may form. It increases patients’ risk in wound infection and leads to poor cosmetic outcome.

Traditionally method in managing laceration wounds are suture, staples, surgical tapes and topical skin adhesive (TSA). Each of the method has their advantages and disadvantages. Suturing is the most common method that being using for laceration wound repair in AED (Baker and Lanuti, 1990). It is the most preferable technique and strongest method for wound closure as it allows the best approximation of the wound edge, however local anesthesia is needed and it is relatively time consuming, follow up on removal of suture is needed and this technique requires skill training.

Wound closure via staples is another method for laceration wounds repair, it is useful for the wounds locate on scalp (Karaduman et al., 2009). This method can be applied rapidly and with lower chance of wound infection then using suture but it is painful when removal (Singer et al., 1997; Ritchie et al., 1989 and Hollander et al., 1997). Using surgical tapes and TSA are the noninvasive methods for laceration wound repair. Surgical tapes can only be applied on the wound with minimal tension and sometimes for the conjunction of the wound applied the TSA.
(Quinn et al., 1997). TSA is an alternative method to suture and staples. Procedures in applying this are quick, relatively painless and patients no need follow up visit for removal.

TSA is available in the United States since 1999 (Singer et al., 2002). Numerous studies indicated that TSA is useful for wound repair and is an effective alternation method to suture (Farion et al., 2003 and Singer et al., 2008). Glue is the most common type of TSA being used in the AED (Singer et al., 2010) and it can be applied on the laceration wound for wound closure. Directly to apply glue on the repair of the scalp laceration is used, but complication of inhibiting hair growth or hair loss was recorded as the glue entering the hair follicles and damaged them (Noordzij et al. 1994). Ong et al (2002) suggested a new technique in apply glue for scalp laceration, the hair apposition technique (HAT).

HAT is a concept that combine of hair by applying glue on a hair knots so to appose a wound on scalp and resulting in wound closure and hemostatic (Hock et al., 2002). Using this technique is to grasped strands of hair on each side of the wound at the scalp and the strands of hair are crossed once, drops of glue are applied on the crossed hair strands so to secure the wound. The idea of using HAT for repairing scalp wound is to shorten the procedure time, reduce wound complication and increase patients’ acceptance. Moreover there is no need for shaving or trimming of hair, it is cosmetically more acceptable to patient (Ong et al., 2005 and Hock et al., 2002).

1.2 Affirming the need
Important of HAT

The Ideal wound management on scalp laceration should be painless, can be completed quickly with low risk of complication, have good functional and cosmetic outcome, and patients require minimal further care after the procedure (Singer et al., 1997 and Hock et al., 2002). A national report on emergency services done in United States in 1996 states that there is over 12 million wounds causing by injuries are treated in AED every year and most of the wounds are trauma related which are found on the scalp (DeBoard et al., 2007). Managing wounds effectively are one of the important roles for emergency nurse. Since over-crowding is one of the major problem in AED. According to the statistic from the Hospital Authority (HA) in Hong Kong in 2014, there is 2,253,310 of patients visiting AED every year with shortage of manpower serving a huge number of patients (Hospital Authority, 2014). Time is treasure for each of the procedure, therefore adopting a method or technique which is time-saving method with good wound outcome should be suggested in the AED.

AED is one of the busiest workplace in the clinical setting. Needle stick and sharps injuries are not an unusual incident found in AED and this is an occupational hazards to frontline healthcare providers (Bekele et al., 2015). Reduce the usage of needle and sharps can help decrease the chance of injuries. HAT is a needleless procedure, not like doing suture, no injection of local anesthesia is needed and during the procedure, no sharps or needle is used for wound repair. It is much safer and able to reduce the chance of needle stick and sharps injuries. Furthermore, without using needle, patient’s acceptance to the procedure should be higher.
In Hong Kong, TSA is commonly found in the clinical practice on wound management for patients. However, for scalp laceration, suturing is still the first priority method in wound closure. Since HAT is convenient and effective, it should be adopted in our clinical practice. Lacking of protocol in guiding our practice in use of HAT, it is difficult for clinical staff to implement HAT into practice no matter how effective it is. Therefore, there is a needs in exploring and understand in this topics and so to provide a better form of technique to improve our care in wound management.

1.3 Objectives and significance

An evidence-base protocol is important to aid in guiding our practice. A higher quality of medical care can be delivered by adapting an evident guided protocol into my clinical practice. Providing care following by the guideline can allow patients a right of choose on their wound management and understand the reason on how to treat the scalp wound, it can help in boosting the satisfaction of patients and hope to build up a friendly environment in AED.

Having a translational nursing research can provide evidence-based information to facilitate the clinical staff in scalp wound management. For health care providers, analyzing the concept and skill from the evidence-base studies is essential to help generating a clinical protocol. Frontline staff are difficult to make conclusion in whether this new technique is effective or not to adopt in our routine care. HAT is being proved to be useful in managing scalp laceration wound, a systematic review on HAT can provide evidence whether the technique is necessary to promote or not. This paper will summarized the advantage and disadvantage of HAT comparing with traditional management on scalp wound on practical usage, patients’ outcome and cost effectiveness. It provides staff information about this technique and guides the practice in a
proper and evidentiary way. Moreover, training should be given before adopting this technique in the routine practice. Establishing an evidence-based guideline on HAT can act as a training material for AED staff. In addition, the frontline clinical staff can equip with a new technique in managing patients with scalp laceration in a proper way.

Research Question

To show HAT is effective in managing scalp laceration wounds. A research question is established in PICO format as following. Implementation of HAT to reduce pain and promote wound healing for patients with scalp laceration in AED.

The patient (P) is the patients with scalp laceration in AED, for intervention (I) is the HAT for wound management of scalp laceration, comparison (C) is to compare the traditional method for wound management of scalp laceration with suturing and outcome (O) is set to reduce pain and promote wound healing.

Aims

The aim of this paper is to translate the evidence-based knowledge into clinical practice by establishing a clinical guideline in implementing HAT for patients with scalp laceration in AED.

Objective of the research
1. To review the evidence-based findings to prove the effectiveness of HAT in managing patients with scalp wound in AED.

2. To develop a clinical protocol from the evidence-based findings to standardize the application of HAT in local AED setting.

3. To assess the feasibility in implementing the clinical protocol of HAT in local AED setting.

4. To evaluate the effectiveness of the HAT clinical protocol.
Chapter 2: Critical Appraisal

2.1 Search and appraisal strategies

2.1.1 Selection Criteria

In the search, all studies are included if:

- It was originally full reported in English or Chinese;
- The target population were having scalp laceration and needed for wound repair;
- The target population were not bald;
- It was conducted in emergency setting;
- HAT was used for wound management.

In the search, all studies are excluded if:

- It was a case review or systematic review designed study.

2.1.2 Search Strategy

A search was done for the literatures which were published from 2000 to 2015 and the studies were reporting on implementation of HAT for patients with scalp laceration. Cochrane Library and PubMed were used as the searching electronic database. The keywords used in the search were “Hair apposition technique” and “scalp laceration”. By using the above keywords search, three possible studies were found in the Cochrane Library and nine possible studies were found in the PubMed, excluding the duplicated studies in the two databases, there was totally six were
found. Screening on the abstracts of the six chosen literature studies, one of them was a case review and so it was excluded. A review on the citrated references in the chosen literatures also done, but there was no result to be retrieved. Finally, in total five studies that were published between July 2002 - 2015 was chosen and three of them were randomized controlled trial (RCT) studies and two of them were cohort studies (Appendix 1).

2.1.3 Appraisal Strategy

Developing a clinical protocol which was evidence-based, review and evaluation of the chosen literatures should be done. Checklist from the version 3.0 of the Scottish Intercollegiate Guidelines Network (SIGN) was used as a tool to carrying out the critical appraisal. This checklist was assessing on the quality of the methodology and the overall assessment of the studies so to ensure the internal validity of each of the chosen study. The SIGN checklist of the five chosen literatures was attached below.

Internal Validity

All the five chosen studies were clearly to address on the focused research question in an appropriated way and purpose of the study are matched with the objective. Among the five chosen studies, three of them were the RCT studies (Hock et al., 2002; Ong et al., 2005 and Eng et al., 2008). All the subjects in the three RCT studies were assigned randomly into the intervention and control group, but for the other two studies were the cohort studies, there was
no randomization done, however, the population of the intervention and the control group was comparable.

Concerning on the recruitment of the subjects, the drop-out rate was mentioned for the three RCT studies. There was zero and 1% drop-out rate for the study by Hock et al. in 2005 and Ong et al. in 2002 respectively. There was 30% drop-out rate (Eng et al., 2008). According to the SIGN guideline, the drop-out rate should not be exceeding 20%, three of two RCT studies met the requirement. For the two cohort studies, there was no mentioning on the drop-out rate. The three studies which did not state the drop-out rate, the overall grading should be lower for them.

For the study of Hock et al. (2002) and Eng et al. (2008), the intervention and control group is blinded. The similarity of both the intervention and control group was positive for the study of Hock et al. (2002), Eng et al. (2008) and Ozturk et al. (2013), but there is not mention for the two other studies. And for all of the five studies has mentioned the length of the study.

Assessment Rating

After performing the critical appraisal of the individual study, according to the guideline of SIGN, a grading should be given to the level of evidence. The coding for the level of evidence was 1++, 1+, 1-, 2++, 2+, 2-, 3 or 4 (Scottish Intercollegiate Guidelines Network, 2011). In the studies of Karaduman et al. (2009) and Ozturk et al. (2013), it was rated 2+ as these two studies had good quality in minimizing the bias. For Eng et al.’s study (2008), despite on the good randomization, with a high drop-out rate, the rating should be lower. Hence, the rating was 1+. Hock et al. (2002)
and Ong et al. (2005) was graded at 1++, both of the studies were the well-designed control studies with good randomization to minimize the bias.

2.2 Results

2.2.1 Search Result

Keyword search on the electronic database was done between 1st October, 2015 and 30th October, 2015. No guideline or systematic reviews were found about HAT. There was total thirteen papers were found in the two electronic database that mention previously. Excluding the duplicated papers and the papers which did not meet the inclusion criteria, there were five papers left. All of the papers are in full text and written in English that found in the electronic database. Three of the papers were RCT studies, Hock et al. (2002), Ong et al. (2005) and Eng et al. (2008) and two of them were cohort studies, Karaduman et al. (2009) and Ozturk et al. (2013). The data from the five chosen papers were summarized in the format of a table of evidence (TOE) and this table was presented in the Appendix 2.

2.2.2 Study Characteristics

All of the subjects from the five chosen studies were recruited in the AED that patients were having one or more scalp laceration wounds and needed to have wound repair. For the study of Hock et al. (2002) and Eng et al. (2008) are conducted in Singapore. Study of Ong et al. (2005)
was conducted by the University of Singapore and the University of Ottawa. Karaduman et al. (2009) and Ozturk et al. (2013) were done in Turkey.

Characteristic of Participant

The median age of the subject was 1 to 90 years old in the study done by Hock et al. (2002), for the intervention group there was ninety-six participants and 68.8% was male. Majority of the nationality of both the intervention and control group was Chinese and with the mean of the length of the wounds were 2.9 cm and 2.6 cm respectively. The median age of the subject was 2 to 92 years old of the study done by Karaduman et al. (2009). Children or elderly were not excluded from the study of Ong et al. (2005), Ong et al. (2008), Karaduman et al. (2009) and Ozturk et al. (2013). In the study of Eng et al. (2008), the mean age of subject was 40.5 years ago and 63.9% was male. The mean of length of the wounds was 2.8 cm and 2.6 cm respectively. For the study carried out by Ozturk et al. (2013), there was in total 134 of participants were recruited, 27.6% of case was allocated into HAT group, 35.6% and 36.6% of subjects were assigned into suture and stapling group respectively. The mean age of the study of Ozturk (2013) was 31.68 years old of the intervention group and the mean age of participants allocated into suture group was 32.35 years old and 32.03 for participants assigned in the stapling group.

Description of Intervention
Participants of the study carried out by Hock et al. (2002), were randomly allocated in to HAT group or suture group, follow up visit was given to all patients 7 days afterwards. For the study of Karaduman et al. (2009), a face to face review of wound visit was given to all subjects two days afterward and a telephone follow up thirty days later for the participant’s satisfaction on the wound. The performance on HAT of nurse and doctor were compared in the study of Eng et al. (2008), all participates were having the wound evaluation seven days after the procedure. Study carried out by Ozturk et al. (2013) was comparing HAT with suture and stapling. A follow up section was given seven days later. A cost and effective analyses was done in the study of Ong et al. (2005), all the related costs included equipment and staff time on implementation of HAT and suture were calculated. Comparison on the expected treatment cost and the predicted complication cost related to HAT and suture was made.

Outcome Measurement

The outcome measurement was well defined in the five chosen papers. They were mainly focused on wound conditions and the complication of the procedures was measured as the outcome. Study done by Hock et al. (2002), the complication on infection, bleeding, wound breakdown and the formation of scarring was measured for comparing any the difference in applying HAT and suture for the scalp laceration wounds. Eng et al. (2008) measured the pain score between two group by the 10 point visual analog scale during the procedure and seven days after the procedures. Besides, infection, bleeding, wound breakdown, formation of scab, wound healing and the time of the procedure were measured for identifying whether HAT was
more effective than suture. For study of Karaduman et al. (2009), infection and participants’ satisfaction on a 10-point verbal scale was taken. The complications of the procedure included serous wound drainage, infection, redness, hair loss and wound dehiscence were measured of Ozturk’s study (2013), besides, the pain score was evaluated by visual analog scale.

Effect size

From the five chosen studies, it was showed that using HAT in managing scalp laceration wound in AED were having positive effect no matter for the wound healing, minimizing the complication of procedure, participant’s satisfaction, time and cost saving. The study Eng et al. (2008) indicated that comparing infection rate with the control group, it was insignificant. This may due to the insufficiency of the sample size of each group.

2.3 Data Summary and Synthesis

Two of chosen papers were well-designed RCT studies, methodology of both RCT studies are systemically planned and the level of evidence was high that can reach the rating of 1++ (Hock et al., 2002 and Ong et al., 2005). For the study of Eng et al. (2008), the level of evidence can reach the rating of 1+. Karaduman et al. (2009) and Ozturk et al. (2013) are the two cohort studies; the level of evidence was 2+.

Summary of the Findings
All of the papers suggest that HAT is a good alternative method in managing patient with scalp laceration wound in AED. Hock et al. (2002) stated that HAT is a better technique for wound closure of scalp laceration. There is a significant different indicated in the study of Hock et al. (2002) that lower chance of scarring was found in using HAT than suturing with effect size of -14.2 and P value of 0.004. Since higher tension may be created by suturing, keloid may form and leading to higher chance in formation of scar. Complication rate are showed to be lower in the group that using HAT (Hock et al., 2002, Ong et al.,2005 and Ozturk et al., 2013), it may due to using HAT is not directly to apply glue onto the glue, but during suturing, because of the suture materials, it may cause a foreign body effect in the wound. Lower infection rate also indicated in using HAT which shows by the effect size of -5.45 and P value > 0.05 (Ozturk et al., 2013).

Ozturk et al. (2013) reported that more patients with hair loss associated with using suture which indicates with effect size of 9.903 with P value > 0.05. As trimming or shaving of hair is required for suturing, the hair growth may be prohibited, but applying HAT, hair are remained unless the wound is full of dirt and needed to be debrided. Higher satisfaction rate is found in the studies of Ozturk et al. (2013) and Karaduman et al. (2009). There is 97% of patients are preferring using HAT for wound repair of their scalp laceration to do suture (Ozturk et al., 2013) and score of 9.8 out of 10 of the patient satisfaction is reported from Karaduman et al. (2009). As the whole procedure is needleless and no need for removal of suture, perception of HAT is more preferable than suturing. Therefore HAT is more welcomed by patients. Lower pain score is suggested in using HAT with effect size of -8.36 and P value > 0.05 (Ozturk et al., 2013). Comparing the performance of doctors and nurses in implementing HAT for the scalp laceration wound repair, there is no significant different (Eng et al., 2008). The duration of time to finish the procedure of
doctors and nurses has no significant different with P value of 0.001 from the study Eng et al. (2008). Ong et al. (2002) suggested that performing HAT for wound repair for scalp laceration is quicker which indicates with effect size of -10 mins and P value < 0.001.

Significantly low cost for HAT is suggested by Ozturk et al. (2013) and Ong et al. (2005). An analysis on the cost-effectiveness was done on HAT and suture. Comparison in performing one HAT and a standard suture with 95% CI 16.3 to 43.4, US$ 43.4 was saved due to less equipment needed, reduced in staff time for the procedure, no follow up visit for stitches removal and reduced chance of complication. HAT is suggested to be a cost-effective method in management patients with scalp laceration.

Data Synthesis

The results of the five chosen studies provide the evidences that HAT is effective in wound closure of patients with scalp laceration wounds. Implementation of HAT is not only benefit patient’s wound outcome and minimize pain, but also reduce the time used in managing scalp laceration wounds. Most of the patients prefer HAT to suture. These outcomes of the studies can be achieved by synthesizing of the data from the five chosen studies. The results and suggestions from the five chosen studies should be consider to translate to develop a standardize protocol in using HAT in Hong Kong AED.

From the five chosen studies (Hock et al., 2002, Ong et al., 2005, Eng et al., 2008, Karaduman et al., 2009 and Ozturk et al., 2013), there is no limitation on age group. There is no evidences provided that HAT has any contraindication regarding on different age group. It is suggested that
HAT can be applied for patients with any age who are having scalp laceration needed for wound repair. Moreover, the five chosen studies (Hock et al., 2002, Ong et al., 2005, Eng et al., 2008, Karaduman et al., 2009 and Ozturk et al., 2013) demonstrated that AED is the suitable place for implementation of HAT for patients with scalp laceration. All of the chosen studies conducted their research mainly focusing in AED. No information from the studies supported that HAT can be applicable to other units. AED is the suggested place where is suitable in applying HAT for managing scalp laceration wounds.

Eng et al. (2008) provided that there is no significant different for doctors and nurses in performing HAT. The wound outcome and the rate of complication are similar. Nurses are the main health care provider in providing wound care for patients in AED. As the result from the study, it provides the evidence that nurses can be the one who perform HAT to patient with scalp laceration wound as wound management.

Hair is an essential component in applying HAT. HAT is not suitable for patients who without hair or with very short of hair. Karaduman et al. (2009) and Ozturk et al. (2013) both suggested that the hair should be at least 1 cm long so that strands of hair can be twisted into a hair knot like for applying glue. The best way to grape the hair and make it into a hair knots is to use a pair of forceps or a clamp, so the hair knot can be more secure and help in hemostasis of the scalp laceration wound.

For scalp laceration wound that is profusely bleeding, direct pressure on the wound for at least five minutes is needed. HAT cannot be used is there is profuse bleeding especially for the arterial bleeding. Once the bleeding is controlled, HAT can be implemented.
Study of Hock et al. (2002) and Eng et al. (2008) showed that HAT not only can be applied on liner scalp laceration wound but also the complicated laceration wound. There is no patient suffering from wound breakdown with the usage of HAT for wound repair for both type of the above wound. Bleeding is not found in the both studies. The average length being repair in the studies is 2.8 cm, therefore it is suggested that scalp laceration wound which is lesser than 3cm is suitable for applying HAT (Hock et al., 2002 and Eng et al., 2008)

According to Karaduman et al. (2009) one drop of glue is enough for each strand of hair in the procedure. It was reported that excessive of glue used with HAT may cause exothermic effect. It may lead to damaging of the hair follicles and inhibit the growth of hair. Moreover, hair knots will form as excessive amount of glue has applied during HAT; it is difficult for spontaneous dissolution of the glue even after a week after the procedure. Cutting off of the hair knots may result. For the study done by Karaduman et al. (2009), it showed that one drop of the glue is powerful enough to secure the hair strand and successfully allow in wound closure. From the result of the study, the hair glue knot can keep intact for 7 day while one drop of glue is used (Hock et al., 2002). There is no falling off or detach of the glue and causing wound dehiscence. Besides, the hair glue knots can be removed easly with tweezer or comb.
Chapter 3: Translation and Application

Laceration wounds repair are the one of the most common reason for patients to seek medical help in AED (Hollander et al., 1995). The ideal management of laceration wounds repair is to be painlessness, time saving with low complication rate and patients have good functional and cosmetic result (Hock et al., 2002). HAT is a new technique which uses for scalp laceration wound closure by twisting strands of hair and securing by tissue adhesive, no needles or invasive procedures are required in applying HAT. Evidences provided from the reviewed researches proved that applying HAT for scalp laceration wounds repair would reduce pain and shorten the procedure time, infection and complication rate is also lower relatively to patients undergoing suture for laceration wounds repair (Hock et al., 2002; Ong et al., 2005; Eng et al., 2008; Karaduman et al., 2009 and Ozturk et al., 2013). These reviewed researches all provided that implementation of HAT for scalp laceration wounds repair in local AED setting would be benefit to not only patients but also health care providers. According to Pilot and Beck (2010), assessing the appropriateness of the innovation in local AED setting, potential of the implementation should be considered. In this chapter, the transferability, the feasibility and the cost-benefit ratio in implementing protocol of the innovation will be discussed.

3.1 Implementation Potential

Target Setting

The proposed innovation is to be implemented in one of the AED under the HA in Hong Kong. The selected AED is providing 24 hour emergency services and patients seeking the medical care
in the selected AED would be either brought in by ambulance or walk in by themselves. From the statistic reported by HA in 2014, there is approximately 360 cases attending AED services each day, and among every shift, there is at least 10 patients who have minor injuries with laceration wound and required wound repair (Hospital Authority of Hong Kong, 2014). The selected AED should provide care of at least 2 cases which required scalp laceration wound repairs by implementing the innovation each day.

3.2 Transferability of the findings

Similarity of Setting and Target Population

All the reviewed researches carried out their studies in AED setting. It is transferable for the proposed innovation to implement the protocol in Hong Kong as the natural of the clinical setting is similar between the reviewed researches and local AED setting.

For the target population, both of the target population is the patients who need to receive wound repair in AED setting. It is similar to the reviewed researched and the proposed innovations. In all the reviewed researched, patients are injured with scalp laceration wounds and seek help in the AED setting (Hock et al., 2002; Ong et al., 2005; Eng et al., 2008; Karaduman et al., 2009 and Ozturk et al., 2013). In local AED setting, providing medical care for scalp laceration repair is one of the major roles in emergency services in Hong Kong, therefore the situation is similar to the reviewed researches. The target group in the reviewed studies is not specific to any age group as there is no contraindication for implementing the innovation (Hock et al., 2002; Eng et al., 2008). The situation is also similar in local setting as all age group are
needed to receive suitable medical care in wound repair. All the findings and situation show that target setting and target population is similar and it is transferable in local AED setting.

Philosophy of Care

"People-first" organization is the slogan of HA. The philosophy of care of all hospitals under HA focus on striving to treat patients and their families, staff members and other stakeholders in the community fairly with respect and as equally (Hospital Authority of Hong Kong, 2016). Providing professional care to patients also is the ultimate goal of all healthcare providers. All staff is supported to have continuous life-long training to improve the knowledge and equip with updated skill so to increase the professionalism. To enhance the quality of care, HA keeps promoting and encouraging the implementation of evidence-based practice in local public healthcare system. The aim of the proposed innovation in local AED setting is to improve the wound care for patients with scalp laceration wounds. It can help to improve the quality of wound care by promoting professionalism. It is on the same track of the philosophy of care in local setting and the proposed innovation; the evidence-based practice can be implemented with support by the organization.

Clients Benefit from Innovation

A HA statistical report done in 2014 reported that there is over 360 people attending AED services each day (Hospital Authority, 2014) and the number of people injured with laceration wound is at least about 10 cases in each shift. Using suture as the traditional method in scalp laceration repair needed about twenty minutes for completing the whole procedures, however, averagely
ten minutes is enough for treating patients who have scalp laceration wound by the proposed innovation. Half of the time would be saved and lesser pain experienced during the wound repair procedures as no needles or injections are needed. The standard of wound care would be improved thus the implementation of this proposed innovation protocol should bring benefits to the patients in our local AED setting.

3.3 Feasibility

There may be different challenges may face when implementing a band new innovation or protocol in our clinical practices. To utilize the proposed innovation into the local setting, feasibility of implementation should be considered.

Motivational Readiness for Change

Support from the management level in utilizing the proposed innovation is important. Even though there is evident from the reviewed researches stated that implementing HAT for scalp laceration can beneficial to patients and clinical staff, seeking the approval and support from the head of the service of the department and cluster are necessary. The mission of the local setting is to be highly motivated in equipping ourselves and improve the quality of health care services continuously (Hospital Authority, 2016). A positive attitude from organization in pursuing innovation for upgrading the standard of care can be seen. Our team is confident to implement the proposed innovation protocol in local setting as this innovation provides an advanced evidence-base practice in local setting. For the selected emergency department in utilizing the proposed innovation, the head of the department shows support and encouragement in
advanced nursing care. There is a pilot study held by nurses in 2008 for applying anti-microbial spray for patients which has minor scald wounds with strongly support, the department head and manager welcome the implementation of the anti-microbial spray after the pilot study and the protocol is being used until now. It is showed that they are conductive and supportive in improving the quality of care and service in the department.

The staff of the selected department also show positive attitude in improving the quality of care. A questionnaire done in these department in 2013 reported that standardized and updated guidelines or protocols for clinical practices is preferred so to be more confident in providing the high quality care for patients.

Need of External Assistance

Utilizing the proposed innovation, agreement of the doctors is needed. From the reviewed researched, nurses can be the one other than doctor to apply HAT for patients who need scalp laceration wounds repair (Eng et al., 2008). Doctors should provide choices for patients in either performing suture or HAT in scalp laceration wound repair. Thus, patients able to have choices in managing their wound care. The cooperation between doctors and nurses in wound management help improving the quality of care. Skill demonstration in applying HAT should be provided for both doctors and nurses, so to explore and share the idea for the proposed innovation. It is expected all the doctors of the department is feasible in utilizing the innovation.

Availability of Staff
In the selected AED, there is a designated person in charge of all minor procedures in every shift. The designated person can be a registered nurse or an enrolled nurse; the case doctor can be as the supervisor of the proposed procedure. There is no extra manpower is needed for implementing the innovation.

Availability of Resources

The equipment in applying HAT is already available in AED, such as the dressing set, Hibitane antiseptic solution, sterilized gloves and surgical glue. There is a minor operation theater in AED which is available for all minor procedures. No extra re-designed or resources are required for the proposed innovation.

Require Skills and Training

Applying HAT is a new concept in scalp laceration wound repair in local setting. Clinical Staff may feel difficult or doubtful about the procedures and the correct method in application of the HAT. With the advanced training and knowledge on laceration wound care provided for all AED nurses by AED department at the AED training center, all nurses would able to handle the assessment and perform aseptic technique for laceration wound toileting. Besides, surgical glue is being adopted in the selected AED for simple superficial laceration wound repair for over 5 years, nurses have sufficient experienced in application of surgical glue. In order to implement the proposed innovation successfully for scalp laceration wound management and achieve the goal of the proposed protocol, training and introducing the protocol in application of HAT is essential. Workshop should be provided by department for both doctors and nurses together so to equip
the staff with correct understanding and knowledge upon HAT, introducing the protocol also important, thus to standardize the practices and ensure the quality of care. Staffs are needed to do a return demonstration after the workshop, feedback would be given on the strength and the weakness in applying HAT. Besides, a pocket sized reminder card would be given to all staff after completed the workshop.

Anticipate Resistance

To minimize the interruption in the routine service, extra time may needed for staff in adopting the new innovation in clinical setting. Conducting a pilot study would help in assessing the feasibility of the proposed innovation. Questionnaires would be done so to collect data from doctors and nurses on the barriers and difficulties face while implementing HAT, hence to improving in proposed protocol. Cooperation between doctors and nurses is needed so to evaluate the effectiveness of the innovation.

Evaluation and Quality Control

It is essential to perform an evaluation of the proposed protocol to ensure the quality of care. There is outcome measurement in evaluating the quality of implementing HAT suggested by the reviewed researches (Hock et al., 2002; Ong et al., 2005; Eng et al., 2008; Karaduman et al., 2009 and Ozturk et al., 2013). For further detail, it will be discuss in next chapter.

3.4 Cost-benefit Ratio of Innovation

Potential Risk
Implementation of HAT can reduce pain experience of the patients while undergoing the procedure of scalp laceration wound repair with no extra follow up is needed after the procedures, however, there may be potential risk to the patients (Karaduman et al., 2009 and Ozturk et al., 2013). To minimize the potential risk, a protocol is need for standardizing the practice and clearly stated the instruction and technique required while adopting the innovation. Comments and suggestions from the questionnaires also need to be collected from the staff, so the effectiveness in implementing the protocol can be discussed and improved during the department meeting.

Potential Benefit

Clients

Adopting HAT for patients with scalp laceration wound repair would reduce the experiences in pain during the procedures. Reported from the reviewed researched, the pain score is significant decrease of the intervention group using HAT for the scalp laceration wound repair (Hock et al., 2002; Eng et al., 2008; Karaduman et al., 2009 and Ozturk et al., 2013). Lower chance of scarring while using HAT is reported by Hock et al. (2002) and lower infection and complication also found (Hock et al., 2002; Ong et al., 2005 and Ozturk et al., 2013). No extra wound follow up session is required; Ozturk et al. (2013) stated that 97% of the patients prefer using HAT rather than suture as the primary scalp wound repair method. High satisfaction rate also find in the patients who receive HAT as method for the scalp laceration wound repair (Karaduman et al., 2009 and Ozturk et al., 2013). HAT is being welcomed by the patients as no needles or injection is needed throughout the whole wound management process (Ozturk et al., 2013). These propose
innovation helps in improving the quality of care in wound management and increasing patient’s satisfaction toward the department.

Nurses
Using HAT as the scalp wound laceration repair helps in reducing the time needed in the procedure (Hock et al., 2002). Introducing a standardized protocol for implementing HAT for AED staff, help them to be more confident in managing scalp laceration wound with HAT in a high quality and time saving way. The protocol helps in increasing the professionalism and autonomy of nurses in wound management. Job satisfaction would also be increased. Furthermore, it is an evidence-base nursing protocol, it can raise the understanding and interest toward evidence-base nursing to promote the update practices and change the transitional practices in clinical setting.

Organization
Ong et al (2005) and Ozturk et al (2013) reported that significant lower cost for HAT comparing with suture for scalp laceration wound repair. Quality of service would also be improved by introducing a new protocol of the proposed innovation. It would encourage an atmosphere in practicing evidence-base nursing among department and establishing an up-today imagine of the organization.

Risks of Maintaining Current Practice
The reviewed researched stated that current practice in scalp laceration wound repair is relatively time consuming and costly (Hock et al., 2002; Ong et al., 2005; Eng et al., 2008; Karaduman et al., 2009 and Ozturk et al., 2013). Choices should be provided for patients in wound management. It is expected that the innovation is beneficial to not only patients but also clinical staff. Therefore the protocol should be implement in the local clinical AED setting.

Tangible Cost

Extra cost is needed in implementing new innovation in the clinical setting. There are costs from the materials and non-materials. The estimated amount of costs for implementation of HAT for patients with scalp laceration wound will be listed in the appendix 4.

Materials Cost

The equipment needs for implementing the innovation is minimum. The major expense of the innovation is manpower. Although there is no extra staff are needed for adopting the protocol in the routine practice, training on HAT is needed. A three hour workshop is proposed in training of the technique and skills. According to the Civil Pay Scales (Civil Service Bureau, 2016), the estimated median monthly salary of nursing officers and is $ 55850 and $37688 respectively and it is approximately around $233 and $157 hourly salary for nursing officers and registered nurses respectively. For holding a three hour workshop, the expense on manpower is approximately $1398 and $471 per each nursing officers and registered nurses. There are total 8 nursing officers and 24 nurses in the selected department and so the total expenses for the department training is $22488.
For the expenses of printed material for workshop will be listed in the appendix 4, the total amount is around $240. And for the material used for HAT included dressing set, Hibitane antiseptic solution, sterilized gloves and surgical glue are available in the department for the routine use.

Non-material Costs

To implement this innovation in clinical setting, extra time in learning the use of HAT is needed. Additional time may require for nurses to practice the skill on HAT, also nurses may need extra time in reporting difficulty and require assistance while implement HAT in the wound manage for scalp laceration.

3.5 Evidence-based protocol

Establishing an evidence-base protocol, recommendations is developed from the five reviewed researches which have summarized and analyzed (Hock et al., 2002; Ong et al., 2005; Eng et al., 2008; Karaduman et al., 2009 and Ozturk et al., 2013). All the recommendations were graded according to the guideline that published by SIGN (2012) and listed in appendix 5.
Chapter 4: Implementation Plan

The five selected studies had shown that HAT is an effective method in repairing laceration wounds over scalp in AED setting. It helps in reducing the pain during procedure and shortens the procedure time. Ozturk et al. (2013) reported patients who undergo HAT for scalp laceration wounds repair have higher satisfaction rate. Our standard in quality of care can be improved by changing the current practice. In the previous chapter, transferability and feasibility in implementing this innovation had been discussed and it also supported this innovation is feasible in local AED setting. In this chapter, communication plan and a pilot study in implementation the HAT for patients with scalp laceration wounds in Hong Kong AED will be discussed.

4.1 Communication Plan

Stakeholders Analysis

Stakeholders are different groups of people who may hinder or influence the implementation of the new innovation. Three levels of stakeholders can be prioritized, which is administrators, managerial staff and operational staff. Chief of service (COS), Department operative manager (DOM), Medical Consultant, Nurse Consultant (NC) and Ward manager (WM) are the administrators of AED. It is essential to have good communication with the administrators in order to get their approval and support in implementation of the project, as they are the people who have the authority in managing and allocating the resource in the department. Besides, all of them have the decision right in continuous or determinate the project.
The managerial staff is the advanced practice nurses (APN) who assigned by DOM to in-charged for this project. The managerial staff is the important person in carrying out the project implementation. The team has all responsibility in preparing and coordinating the whole process of the project. Managing resources, introducing the guideline, promoting the staff training, implementing the pilot study, providing clinical supervision, monitoring the progress, collecting the clinical data and carrying out the project evaluation are all the components required to be done by the managerial staff.

All frontline nurses and medical officers working in AED are the operational staff. All nurses are responsible in applying the protocol on using HAT for patients with scalp laceration into their everyday clinical practice. Nurses need to monitor the wound conditions and outcome of the wound repair while adopting the protocol. To medical officers, they may concern the outcome of the wound healing and disturbance of their routine practice during the implementation phase. To have the success of protocol utilization, it is highly depending on having good understanding and working cooperatively to the protocol.

Communication Process and Strategies

Having the support and ensure the effectiveness in implementation of the innovation, a comprehensive communication plan is essential for the above stakeholders being mentioned. The timeline is showed in Appendix 7 for further details.

In the first phase (week one) of the communication plan, we need to inform the administrators and get the approval before the implementation of the protocol. COS and DOM are the person who having the highest authority in the department, it is important to get their approval as the
initial step. Getting the consent from the medical consultants and WM are also required. All the
detailed information of the innovation going to implement must be present to all administrative
stakeholders including the practice gaps and the problem in our current practice, the newly
updated literature reviews, the significant on utilization of the evidence-based protocol in our
clinical practice, the proposal of the project, the transferability and feasibility of the innovation
and expected clinical outcomes from the project. Once gaining the approval from all the
administrators, second phase (week two) starts. An assigned APN will be invited to be the project
leader, scheduled meetings will be held to discuss the details and further needs for the project.
Afterwards, forming a working team for the implementation of the project is needed. WM and
the project leader will assign 6 registered nurses (RN) as the project team members and allocated
responsible duty according to their interest and relevant experience.
The recruited APN, who is in-charging of the project, is the managerial staff. The APN needs to
attend a compulsory informative talk to emphasis the significance of the project, introduce the
project and explain the details of the project. When the working team of the project which
included WM, APN and six RN is confirmed, meetings on every week will be organized in phase 3
(week three to week five). The phase 3 is the preparation phase. The project team member need
to work on the detail of the staff training on HAT application, promotion on the protocol,
equipment preparation, resources allocation and preparing the pilot study. In the phase 4 (week
six to week eight), the working team continuous the promotion on the protocol. Staff training
session will be held to all the operational staff in AED for preparing the implementation of the
project. To minimizing the worries and stress for the project, feedbacks and doubts are welcome
throughout the implementation of the project so to maximize the cooperation between the
operational staff and the working team. After the preparation done on the environment and staff training, a three month pilot study will be started and it comes to the phase 5.

During the pilot study, the project team is responsible in monitoring the progress and meetings should be held every two weeks so to report and manage the unexpected problems by the operational staff. An evaluation session which is the phase 6 will be carried out after completing the pilot study. In the phase 6, the project team may refine the protocol and a report on the pilot study will be released to all the administrators. A presentation on the modified protocol will be given by the team to all the AED staff included nursing and medical staff. In phase 7, a six months implementation phase of the project with the modified protocol will be started. A final report and the evaluation of the project will be done after the implementation phase immediately and a written report will be handed in to the administrators in hard copy within one month.

4.2 Pilot Study

Objectives

A pilot test will be performed as a trial test to collect the data of the implementation in early stage on a small number of patients in the clinical setting. The flow and the feasibility of the project will be examined. Unexpected issues would be identified during the pilot study and it allows the project team to review and refined the project plan so to ensure the effectiveness in the future implementation phase. In addition, data from the operation staff and the other stakeholders will be collected in the pilot study. It can provide information to help increasing the competence and confidence in cooperate the project so a full-scale of implementation of the innovation can be performed. The objective of the pilot study mentions in the followings:
1. To measure the pain score of the patients who receiving HAT during scalp laceration wound repair
2. To exam the feasibility of the application of HAT protocol in AED setting
3. To assess the acceptance of patients receiving HAT on scalp wound management
4. To identify barriers on the application of HAT by the operation staff
5. To assess the acceptance and compliance of nursing staff to the new protocol

Study Design

A non-experimental posttest design is used in the pilot study.

Responsible Staff

A core project team which included one assigned APN as the project leader and the team members of 6 RNs is responsible for the HAT implementation team.

Setting and Duration

A pilot test will be carry out in a designated AED in Hong Kong. An optimal number of participants will be recruited within the planned three month pilot study.

Sampling Plan

The target participants, who present with a scalp laceration and needed wound management, have the hair length over 1 cm, and able to give informed consent is included in the pilot study. Those who are unwilling to participate the study would be excluded.
Based on the mentioned literature studies and the attending rate in the local AED setting, total one hundred patients should be the optimal sample size in this pilot study. However the number of case reported in AED on the site of injuries which having laceration wounds is unpredictable. Therefore, the target numbers of the sample is thirty and it is optimal number of patients can be recruited within the time frame of the pilot study.

Workflow of Pilot Study

Once patients who present with scalp laceration wound and go through triage assessment, information sheet (Appendix 8) for the pilot study will give to patient. This information sheet helps the patients to understand more on the new idea on scalp laceration wound repair while waiting time to receive the medical consultation and details for a follow up section in one week will be informed to patients. An informed consent (Appendix 9) should be signed by the participant before joining the pilot study and the signed consent will keep in individual file. A wound care pamphlet (Appendix 10) will attach to the discharge document after completing the HAT for scalp laceration repair in AED. There will be a follow up sessions for the participants after 7 days and the participants will be contacted by phone interview and the length of the phone interview will be around 10 to 15 minutes on each session. Pain scare score and the satisfaction rate will be rated by the participants in the phone interview, all the data will be documented in data collection form by the project team and the documented data will be gathered for analysis.

Evaluation of pilot study
The effectiveness of the newly proposed protocol and the process of the implementation are needed to be evaluated after the implementation in the pilot study. The details of the evaluation will be discussed in the next chapter. In the evaluation plan, process outcome on the view of the nurses toward the innovation will be evaluated. A staff evaluation form (Appendix 11) will be distributed to all involved staff to evaluate the acceptance and collect feedback on the innovation after implementation of the protocol. All the collected data and information will be analysis and used to review and refine the new protocol.
Chapter 5: Evaluation Plan

The feasibility and acceptability of the protocol need to be assessed for the effectiveness of the implementation of HAT as patients experience lesser pain during the procedure. The process and outcome measures will be assessed in the evaluation plan after completing the pilot study.

5.1 Intervention Outcome Evaluation

There is a different aspect of the outcome need to be measure so to evaluate the innovation and the protocol. Three categorizes can be divided according to the outcome, includes (1) patients, (2) AED nurses and (3) the AED department.

Reducing pain for patients during the wound repair process in AED is the major objective of the innovation. To assess the outcome, a designed assessment scoring measurement is used. In the protocol, visual analog scale (VAS) is chosen to assess the pain level while the participant undergoes HAT for scalp wound laceration repair. The pain score will be interviewed right after the procedure completed.

Patient’s acceptance toward the protocol is the other outcome. Once the participant receives the leaflet and inform by the nurses on the implementation of HAT for scalp laceration wound repair. They have opportunity to decide whether accept or reject the new method for wound management. By the number of accepted and refused cases documented, it can as an index to show whether this innovation is needed and accepted by the public. At the phone interview at day 7, views of the participants or further suggestions on the innovation with open-ended question will be asked and the data will be analyzed by the project team.
For AED nurses, there is training session on protocol introduction, implementation plan explanation and application technique on HAT before the pilot study. Therefore, it is better to equip them with knowledge and enhance the competency to the innovation. In the training session, the performance on applying HAT with the protocol checklist will be assessed by a checklist; constructive feedback will be offered by the project leader, hence to improve performance. Moreover, to evaluate the feasibility of this innovation, the satisfaction towards the protocol will be interviewed.

The cost-benefit analysis is essential in determining the protocol a worthwhile to proceed in AED department. The cost spending on extra expenditure on manpower and implement the protocol which benefit from the innovation such as reduce pain, minimize the time consuming in procedure, and thus raise the nursing care standard provide in AED should be weighted. The comparison of the cost and the benefit will be done in the evaluation plan.

5.2 Nature of Participants and Sample Size

The nature of participant and the pilot study will be similar. The inclusion criteria of the target population will be the same as mentioned previously, and there is no demographic information will be set to exclude participants from the study. The project team members will follow up on the recruited cases that failed on the innovation or terminated for collecting further relevant clinical information.

The sample size is calculated by a free online statistic program called G power, which available on the web site of - http://download.cnet.com/G-Power/3000-2054_4-10647044.html. From the estimation of the program, 111 cases will be needed to reach effect size of 0.3 and power of
80%. With accounting of 20% possible attrition rate during the study, the actual sample size needed to be recruited for the study rounded up to be 140 cases. From the previous report on the attending case in AED, there are at least 200 to 300 attending case each month in local AED (Hospital Authority, 2014). It is reasonable to set the time frame of the actual implementation study in 6 months.

5.3 Timing and frequency of evaluation

The compliance on the patient outcomes will be monitored by the project team leader during the actual implementation study. The data will be collected in a designed record form and the document will be computerized every week for further analysis. There is a month evaluation period after the actual implementation study. The project team leader will be responsible for data analysis and carry out an evaluation report. Meetings will be held within the evaluation period to review on the protocol, discuss on strategies and suggestions on future implementation plan.

Effectiveness of training sessions will be evaluated. Nurses who attend the training need to complete a post-lecture assessment and the result will be evaluated after the training sessions. In addition, the satisfaction and acceptance of the frontline staff on the protocol implementation will be evaluated. A satisfaction survey which is a 5-point Likert scale (Likert, 1932), will be distributed to the frontline staff within one week after the accomplishment of the study, the result will be collected and analyzed by the project team.
5.4 Data analysis

One paired t test will be applied for data analysis by the project team leader within one month after the accomplishment of the implementation study. The descriptive statistics will be used for presenting the result of the pain score survey of participant and the satisfaction survey of participant and the involved nurses, 5% significance level will be used and the result will be reported with 95% confidence interval. Furthermore, for the costing of the materials preparation and the difference between the actual and estimated total expenses of the innovation will be presented in the evaluation report. And for the opinions provides from the administrator, the feedback and suggestions from frontline staff and the recommendation of the project team will be gathered and presented in the written report.

5.5 Basis for determining guideline effectiveness

It is considered that the proposed protocol is effective if all of the following criteria can be meet in the findings. For patients, the pain score is recorded to be lower with an increasing satisfaction rate on the implementation of the protocol. For AED nurses, there is over 90% on the application of the protocol compliance rate and over 70% of the AED nurses shows satisfy on implementing the protocol in their clinical practice. For the AED department, a higher nursing care quality can be provided with a reduction of the expenses for instance no need in off sutures, and there is no extra expense is needed for completing the actual implementation study.
Chapter 6: Conclusion

Minor injuries with lacerations is one of the most common reason for people to seek medical help in accident and emergency department (AED), of all of these injures, scalp lacerations are the most common traumatic wounds being seen in AED (Hollander et al., 1995). Pain is the most concerning issue of patients while managing the laceration wounds. From the five reviewed studies, all of them show that implementation of HAT able to management scalp laceration wounds which can minimize pain and promote wound healing. In Hong Kong AED setting, suture is the major traditional method for laceration wound repair. It is time to introducing an evidence-based laceration wound repair method which is not expensive and complicate to implement into our local AED setting. With evidence based protocol, education workshop and a core team monitoring on the proposed innovation, it is believe that the quality in wound care management can be improved.
Reference List


10. Hospital Authority (2014) Hospital Authority statistical report. Hong Kong: Hospital Authority


Appendix 1

PRISMA 2009 Flow Diagram

Records identified through PubMed searching (n = 9)

Records identified through Cochrane Library (n = 3)

Records after duplicates from two database which removed (n = 6)

Records screened (n = 6)

Records excluded as it is a case review (n = 1)

Studies included in qualitative synthesis (n = 5)

Full-text articles excluded, with reasons (n = 0)
## Appendix 2 Table of evident

<table>
<thead>
<tr>
<th>Citation/design / level of evident</th>
<th>Sample characteristics</th>
<th>Intervention</th>
<th>Control</th>
<th>Outcome (assessment time)</th>
<th>Effect size (intervention-control)</th>
</tr>
</thead>
</table>
| Eng et al. (2008) / RCT / 1+       | 1. Intervention mean age = 42.9 (SD=20.8) Control mean age = 38.1 (SD=20.8) | Receive HAT for scalp laceration repair by nurse (n=76) | Receive HAT for scalp laceration repair by doctor (n=88) | Pain (10 point visual analog scale is used which 0 indicate with no pain and 10 is the highest score of pain)  
  - After procedure  
    - 7 days | After procedure -0.1 (95% CI=-0.9 to 0.7) p=0.83 |
|                                   | 2. Intervention: 47 male (61.8%) Control: 58 male (65.9%) | | | Infection (By observation of any redness, swelling, hot sensation and pain over the wound)  
  - Present/absent | At 7 days -0.1 (95% CI= -0.6 to 0.4) p= 0.7 |
|                                   | 3. AED patient with scalp laceration wound | | | Bleeding | 0.3% (95% CI =-3.9 to 4.4) |
(By observation of any sign of bleeding over the wound)
- Present/absent

Wound breakdown (By observation of any dehiscence over the wound)
- Present/absent

Scab formation (By observation of any presence of excessive wound crusting)
- Present/absent

Wound healed
- Present/absent

Complication (Presence of any infection, scab formation, bleeding or wound breakdown)
- Present/absent

<table>
<thead>
<tr>
<th>Event</th>
<th>Percentage (%)</th>
<th>95% CI</th>
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<tbody>
<tr>
<td>0%</td>
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<td>-1.4% (95% CI =-0.4 to 1.3)</td>
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<tr>
<td>-3.6% (95% CI =-17.1 to 9.9)</td>
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<tr>
<td>-0.3% (95% CI =-4.6 to 3.9)</td>
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<td></td>
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<tr>
<td>-3.2% (95% CI =-17.2 to 10.7)</td>
<td></td>
<td></td>
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<tr>
<td>Study: Hock et al. (2002) / RCT/1++</td>
<td>1. Intervention</td>
<td>Mean age = 32.7 (SD=22.5)</td>
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<td>--------------</td>
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<tr>
<td></td>
<td>Intervention 66</td>
<td>Male (68.8%)</td>
</tr>
<tr>
<td></td>
<td>AED patient with scalp laceration</td>
<td>Receive HAT for scalp laceration repair</td>
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<tr>
<td></td>
<td></td>
<td>Receive suturing for scalp laceration repair</td>
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<td></td>
<td></td>
<td>Infection</td>
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<td></td>
<td></td>
<td>Scarring</td>
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<td></td>
<td></td>
<td>Bleeding</td>
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<td></td>
<td></td>
<td>Wound Breakdown</td>
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<tr>
<td>Duration of procedure (minutes) which record from preparing the procedure until finish the procedure</td>
<td>Mean = 3.8 mins (95% CI=1.7 to 5.8) p=0.001</td>
<td></td>
</tr>
<tr>
<td>Infection</td>
<td>0%</td>
<td>-14.2 (95% CI=-23.8 to -4.6)</td>
</tr>
<tr>
<td>Scarring</td>
<td>-1.1 (95% CI=-3.2 to 1.0)</td>
<td></td>
</tr>
<tr>
<td>Bleeding</td>
<td>-4.3 (95% CI=-8.5 to -0.1)</td>
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<tr>
<td>Complication</td>
<td>Duration of procedure (minutes) which record from preparing the procedure until finish the procedure</td>
<td>Pain (Visual Analogue Scale is used for patients to describe the pain sensation during the procedure, 0 score indicates no pain and 10 score indicates unbearable pain)</td>
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<tr>
<td>-------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Presence of any infection, scarring, bleeding or wound breakdown on the wound</td>
<td>-14.1 (95% CI =-24.1 to -4.3)</td>
<td>Median =-10mins (range 5 to 20) p&lt; 0.001</td>
</tr>
<tr>
<td>Duration of procedure (minutes) which record from preparing the procedure until finish the procedure</td>
<td>Median =-2 (range 0 to 4 ) p&lt;0.001</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Ong et al. (2005)/RCT/1++</th>
<th>AED patient has scalp laceration</th>
<th>Cost on receive HAT for scalp laceration</th>
<th>Cost on receive suturing for scalp laceration</th>
<th>Procedure time (Minutes) which refer to the expected time for the procedure</th>
<th>Expected time of HAT : 8 (95% CI 7.07 – 8.93) Expected time of standard suture : 15.2 ( 95% CI 13.51 – 16.89)</th>
</tr>
</thead>
</table>


| Expected value of infection from the procedure | Expected time of suture removal: 5 (95% CI 4.42 – 5.58)
Calculated effect size: -12.2 |
| Expected value of bleeding from the procedure | Expected vale of HAT: 0.02 (95% CI 0.002 – 0.055)
Expected value of standard suture: 0.02 (95% CI 0.003 – 0.056)
Calculated effect size: 0 |
| Expected value of wound breakdown from the procedure | Expected vale of HAT: 0.01 (95% CI 0.000 – 0.037)
Expected value of standard suture: 0.02 (95% CI 0.003 – 0.056)
Calculated effect size: -0.01 |
| Expected value of standard suture: 0.02 (95% CI 0.003 – 0.056) | Expected vale of HAT: 0.01 (95% CI 0.000 – 0.037)
Expected value of standard suture: 0.05 (95% CI 0.017 – 0.102)
Calculated effect size: -0.04 |
<table>
<thead>
<tr>
<th>Karaduman et al. (2009) / cohort study/ 2+</th>
<th>1. Age range: 2-92</th>
<th>Receive HAT for scalp laceration (n=67)</th>
<th>Receive suture for scalp laceration (n=35)</th>
<th>Infection (By observation of any redness and swelling over the wound) ● Present/absent</th>
<th>Satisfaction of the procedure is scored by patients 30 days after the procedure (10-point verbal scale is used, 0 score indicates the not satisfy with the procedure and 10 score</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. AED patient with scalp laceration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>At day 30, 0.3 (p=0.25)</td>
</tr>
<tr>
<td>3. The scalp laceration wound is a linear wound</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Expected value of scarring from the procedure

Total cost of treatment (US dollar)

Percentage of complication

Expected vale of HAT: 0.07 ( 95% CI 0.029 – 0.127 )

Expected value of standard suture: 0.15 ( 95% CI 0.666 – 0.835 )

Calculated effect size: -0.08

-28.5 ( 95% CI 16.3-43.4)

-13% ( 95% CI 25-27%)
<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention</th>
<th>Control 1</th>
<th>Control 2</th>
<th>Control 3</th>
<th>Control 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozturk et al. (2013) / cohort study/ 2+</td>
<td>1. Intervention mean age= 31.68 (SD =8.7)</td>
<td>Control 1 mean age= 32.35 ( SD = 9.5)</td>
<td>Control 2 mean age= 32.02 (SD = 9.1)</td>
<td>2. Intervention male (89.2%)</td>
<td>3. AED patient with scalp laceration wound</td>
</tr>
<tr>
<td></td>
<td>2. AED patient with scalp laceration wound</td>
<td>Control 1 male (75%)</td>
<td>Control 2 male (87.8%)</td>
<td>4. The scalp laceration wound is a linear wound</td>
<td>5. The laceration wound is less than 10 cm long</td>
</tr>
<tr>
<td></td>
<td>3. AED patient with scalp laceration wound</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. The scalp laceration wound is a linear wound</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. The laceration wound is less than 10 cm long</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Receive HAT for scalp laceration (n=37)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Receive suture for scalp laceration (n=48)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Receive staples for scalp laceration (n=49)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pain ( Visual analogue scale is used for indicating the pain sensation of patients in the procedure, which 0 score is no pain and 10 score indicates the unbearable pain found in the procedure)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serous Wound Drainage (By observing presence of any serous drainage over the wound)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infection (By observing any sign of infection for example redness, swelling, hot sensation and pain over the wound)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>With control 1: -8.36% (X²=2.56, p&gt;0.05)</td>
<td>With control 2: 0.3% (X²=2.56, p&gt;0.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infection (By observing any sign of infection for example redness, swelling, hot sensation and pain over the wound)</td>
<td>With control 1: -5.45% (X²=3.05, p&gt;0.05)</td>
<td>With control 2: -1.89% (X²=3.05, p&gt;0.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedure</td>
<td>Redness (By observation of any redness over the wound after the procedure)</td>
<td>With control 1: -18.33% ($x^2=5.54$, $p&gt;0.05$) With control 2: -10.2% ($x^2=5.54$, $p&gt;0.05$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hair loss (By observation of any hair loss over the wound area after the procedure)</td>
<td>With control 1: -9.093% ($x^2=4.78$, $p&gt;0.05$) With control 2: -3.77% ($x^2=4.78$, $p&gt;0.05$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wound Dehiscence (By observing any sign of wound breakdown over the wound after the procedure)</td>
<td>With control 1: 2.7% ($x^2=3.15$, $p&gt;0.05$) With control 2: -2.96% ($x^2=3.15$, $p&gt;0.05$)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3 Critical Appraisal (SIGN) Checklists

Methodology Checklist 2: Controlled Trials

Study identification (Include author, title, year of publication, journal title, pages)
Eng et al. (2008) Hair apposition technique for scalp laceration repair: a randomized controlled trial comparing physicians and nurses (HAT 2 study), American Journal of Emergency Medicine, 26, 433 – 438

<table>
<thead>
<tr>
<th>Guideline topic: Applying HAT for patients with scalp laceration</th>
<th>Key Question No:</th>
<th>Reviewer:</th>
</tr>
</thead>
</table>

Before completing this checklist, consider:

1. Is the paper a randomised controlled trial or a controlled clinical trial? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a controlled clinical trial questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+

2. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

Reason for rejection: 1. Paper not relevant to key question ☐ 2. Other reason ☐ (please specify):

SECTION 1: INTERNAL VALIDITY

<table>
<thead>
<tr>
<th>In a well conducted RCT study…</th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 The study addresses an appropriate and clearly focused question.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.2 The assignment of subjects to treatment groups is randomised.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.3 An adequate concealment method is used.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.4 The design keeps subjects and investigators 'blind' about treatment allocation.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.5 The treatment and control groups are similar at the start of the trial.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.6 The only difference between groups is the treatment under investigation.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.7 All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
<td>30%</td>
</tr>
<tr>
<td>1.9</td>
<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites.</td>
</tr>
</tbody>
</table>

**SECTION 2: OVERALL ASSESSMENT OF THE STUDY**

| 2.1 | How well was the study done to minimise bias? *Code as follows:*  
High quality (+++)  
Acceptable (+)  
Low quality (-)  
Unacceptable – reject 0 |  
Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? | Yes as the systemic methodology was used and the outcome is statistically significant. However, there was a high dropout rate in the study. |
| 2.2 | |  
Are the results of this study directly applicable to the patient group targeted by this guideline? | Yes |
| 2.4 | **Notes.** Summarise the authors’ conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above. |
**Methodology Checklist 2: Controlled Trials**

<table>
<thead>
<tr>
<th>Study identification</th>
<th>(Include author, title, year of publication, journal title, pages)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Guideline topic: Applying HAT for patients with scalp laceration</th>
<th>Key Question No:</th>
<th>Reviewer:</th>
</tr>
</thead>
</table>

Before completing this checklist, consider:

1. Is the paper a randomised controlled trial or a controlled clinical trial? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a controlled clinical trial questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+

2. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

Reason for rejection: 1. Paper not relevant to key question □  2. Other reason □  (please specify):

**SECTION 1: INTERNAL VALIDITY**

<table>
<thead>
<tr>
<th>In a well conducted RCT study…</th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 The study addresses an appropriate and clearly focused question.</td>
<td>Yes, Can’t say, No</td>
</tr>
<tr>
<td>1.2 The assignment of subjects to treatment groups is randomised.</td>
<td>Yes, Can’t say, No</td>
</tr>
<tr>
<td>1.3 An adequate concealment method is used.</td>
<td>Yes, Can’t say, No</td>
</tr>
<tr>
<td>1.4 The design keeps subjects and investigators ‘blind’ about treatment allocation.</td>
<td>Yes, Can’t say, No</td>
</tr>
<tr>
<td>1.5 The treatment and control groups are similar at the start of the trial.</td>
<td>Yes, Can’t say, No</td>
</tr>
<tr>
<td>1.6 The only difference between groups is the treatment under investigation.</td>
<td>Yes, Can’t say, No</td>
</tr>
<tr>
<td>1.7 All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>Yes, Can’t say, No</td>
</tr>
<tr>
<td>1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
<td>1%</td>
</tr>
<tr>
<td>1.9 All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
<td>Yes, Can’t say, No</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites.</td>
</tr>
</tbody>
</table>

**SECTION 2: OVERALL ASSESSMENT OF THE STUDY**

| 2.1 | How well was the study done to minimise bias? *Code as follows:*  
High quality (+++)  
Acceptable (+)  
Low quality (-)  
Unacceptable – reject 0 | Yes as the methodology used was acceptable, besides, the study had a low dropout rate. |
| 2.2 | Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? | Yes |
| 2.3 | Are the results of this study directly applicable to the patient group targeted by this guideline? | Yes |
| 2.4 | **Notes.** Summarise the authors’ conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above. |
Methodology Checklist 2: Controlled Trials

Study identification  *(Include author, title, year of publication, journal title, pages)*

Guideline topic: Applying HAT for patient with scalp laceration  
Key Question No:  
Reviewer:

**Before** completing this checklist, consider:

1. Is the paper a randomised controlled trial or a controlled clinical trial? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a controlled clinical trial questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+

2. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

Reason for rejection: 1. Paper not relevant to key question  
2. Other reason □ (please specify):

**SECTION 1: INTERNAL VALIDITY**

*In a well conducted RCT study...*

<table>
<thead>
<tr>
<th></th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>The study addresses an appropriate and clearly focused question.</td>
</tr>
<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomised.</td>
</tr>
<tr>
<td>1.3</td>
<td>An adequate concealment method is used.</td>
</tr>
<tr>
<td>1.4</td>
<td>The design keeps subjects and investigators 'blind' about treatment allocation.</td>
</tr>
<tr>
<td>1.5</td>
<td>The treatment and control groups are similar at the start of the trial.</td>
</tr>
<tr>
<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.</td>
</tr>
<tr>
<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.</td>
</tr>
<tr>
<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
</tr>
<tr>
<td>1.9</td>
<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites.</td>
</tr>
</tbody>
</table>

**SECTION 2: OVERALL ASSESSMENT OF THE STUDY**

| 2.1 | How well was the study done to minimise bias? *Code as follows:* |
|     | High quality (++) |
|     | Acceptable (+) |
|     | Low quality (-) |
|     | Unacceptable – reject 0 |

| 2.2 | Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? |

Yes as it was a high quality of RCT with systematic methodology used. Statistically significant in the outcome.

| 2.3 | Are the results of this study directly applicable to the patient group targeted by this guideline? |

Yes

| 2.4 | **Notes.** Summarise the authors’ conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above. |


Methodology Checklist 3: Cohort studies

Guideline topic: Applying HAT for patient with scalp laceration

Before completing this checklist, consider:

1. Is the paper really a cohort study? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist.

2. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

Reason for rejection: 1. Paper not relevant to key question □ 2. Other reason □ (please specify):

Please note that a retrospective study (ie a database or chart study) cannot be rated higher than +.

SECTION 1: INTERNAL VALIDITY

<table>
<thead>
<tr>
<th>In a well conducted cohort study:</th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 The study addresses an appropriate and clearly focused question.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.2 The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.3 The study indicates how many of the people asked to take part did so, in each of the groups being studied.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.4 The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.5 What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed.</td>
<td>11.7%</td>
</tr>
</tbody>
</table>


Study identification (Include author, title, year of publication, journal title, pages)

Key Question No: Reviewer:
Comparison is made between full participants and those lost to follow up, by exposure status.
### Methodology Checklist 3: Cohort studies

**Guideline topic:** Applying HAT for patient with scalp laceration

**Key Question No:**

**Reviewer:**

---

**Before** completing this checklist, consider:

1. Is the paper really a cohort study? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist.

2. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

**Reason for rejection:**

1. Paper not relevant to key question □

2. Other reason □ (please specify):

**Please note that a retrospective study (ie a database or chart study) cannot be rated higher than +.**

### SECTION 1: INTERNAL VALIDITY

**In a well conducted cohort study:**

<table>
<thead>
<tr>
<th>Does this study do it?</th>
<th>Yes</th>
<th>Can't say</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 The study addresses an appropriate and clearly focused question.</td>
<td>Yes</td>
<td>Can't say</td>
<td>No</td>
</tr>
</tbody>
</table>

#### SELECTION OF SUBJECTS

<table>
<thead>
<tr>
<th>Does this study do it?</th>
<th>Yes</th>
<th>Can't say</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation.</td>
<td>Yes</td>
<td>Can't say</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Does this study do it?</th>
<th>Yes</th>
<th>Can't say</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3 The study indicates how many of the people asked to take part did so, in each of the groups being studied.</td>
<td>Yes</td>
<td>Does not apply</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Does this study do it?</th>
<th>Yes</th>
<th>Can't say</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4 The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis.</td>
<td>Yes</td>
<td>Can't say</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Does this study do it?</th>
<th>Yes</th>
<th>Can't say</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed.</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Ozturk et al. (2013) A Retrospective observational study comparing hair apposition technique, suturing and stapling for scalp laceration. World Journal of Emergency Surgery, 8:27
Comparison is made between full participants and those lost to follow up, by exposure status. ¹⁰
Appendix 4

Estimated Cost of the implementation of HAT

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unit cost</th>
<th>Quantity</th>
<th>Expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printed material for workshop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Printed education notes</td>
<td>$2</td>
<td>30</td>
<td>$60</td>
</tr>
<tr>
<td>• Pocket sized remind card</td>
<td>$5</td>
<td>30</td>
<td>$150</td>
</tr>
<tr>
<td>• Questionnaires</td>
<td>$1</td>
<td>30</td>
<td>$30</td>
</tr>
<tr>
<td>Workshop (3hrs)/nurse</td>
<td>NO: $1398</td>
<td>8</td>
<td>$11184</td>
</tr>
<tr>
<td></td>
<td>RN: $471</td>
<td>24</td>
<td>$11304</td>
</tr>
<tr>
<td>Printed materials for Evaluation</td>
<td>$1</td>
<td>30</td>
<td>$30</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>$22758</td>
</tr>
</tbody>
</table>
Appendix 5

XXX Hospital

Department of Accidently and Emergency Department

Evidence-based guideline:

Implementation of HAT for patients with scalp laceration wound in AED

Background:

Minor injuries with lacerations is one of the most common reason for people to seek medical help in accident and emergency department (AED), of all of these injuries, scalp lacerations are the most common traumatic wounds being seen in AED (Hollander et al., 1995). Restoring skin integrity is the major objective of wound repair in the procedure, to reduce the infection, scarring and functional impairment are also our goal. Without proper care of the wounds, excess scars may form. It increases patients’ risk in wound infection and leads to poor cosmetic outcome.

HAT is a concept that combine of hair by applying glue on a hair knots so to appose a wound on scalp and resulting in wound closure and hemostatic (Hock et al., 2002). Using this technique is to grasped strands of hair on each side of the wound at the scalp and the strands of hair are crossed once, drops of glue are applied on the crossed hair strands so to secure the wound. The idea of using HAT for repairing scalp wound is to shorten the procedure time, reduce wound complication and increase patients’ acceptance. Moreover there is no need for shaving or trimming of hair, it is cosmetically more acceptable to patient (Ong et al., 2005 and Hock et al., 2002).
Goal:
To reduce pain and promote wound healing for patients with scalp laceration in AED by implementing HAT.

Intended users:
All nurses worked in AED

Target population:
Patients who injured with scalp laceration wound required wound repair

Exclusion population:
Bald hair or short hair lesser than 1cm

Equipment (to each patient):
Dressing set, Hibitane antiseptic solution, sterilized gloves and surgical glue

Methodology:
To identify the study, a systematic review was done. A search was done for the literatures which were published from 2000 to 2015 and the studies were reporting on implementation of HAT for patients with scalp laceration. Cochrane Library and PubMed were used as the searching electronic database. The keywords used in the search were “Hair apposition technique” and
“scalp laceration”. By using the above keywords search, three possible studies were found in the Cochrane Library and nine possible studies were found in the PubMed, excluding the duplicated studies in the two databases, there was totally six were found. Screening on the abstracts of the six chosen literature studies, one of them was a case review and so it was excluded. A review on the citrated references in the chosen literatures also done, but there was no result to be retrieved. Total five studies that were published between July 2002 - 2015 was chosen and three of them were randomized controlled trial (RCT) studies and two of them were cohort studies.

Guideline:

Recommendation 1 - Age limit for applying HAT
Grade of recommendation: A

From the five chosen studies (Hock et al., 2002) [1++], (Ong et al., 2005) [1++] , (Eng et al., 2008) [1+], (Karaduman et al., 2009) [2+] and (Ozturk et al., 2013) [2+], there is no limitation on age group. There is no evidences provided that HAT has any contraindication regarding on different age group. It is suggested that HAT can be applied for patients with any age who are having scalp laceration needed for wound repair.

Recommendation 2 - Location on implementation of HAT
Grade of recommendation: A

Finding from the studies provided that AED is the suitable place for implementation of HAT for patients with scalp laceration (Hock et al., 2002) [1++] and (Eng et al., 2008) [1+]. All of the five chosen studies conducted their research mainly focusing in AED. No information from the studies
supported that HAT can be applicable to other units. AED is the suggested place where is suitable in applying HAT for managing scalp laceration wounds.

Recommendation 3 - Person to adopting HAT

Grade of recommendation: B

Eng et al. (2008) [1+] provided that there is no significant different for doctors and nurses in performing HAT. The wound outcome and the rate of complication are similar. Nurses are the main health care provider in providing wound care for patients in AED. As the result from the study, it provides the evidence that nurses can be the one who perform HAT to patient with scalp laceration wound as wound management.

Recommendation 4 - Types of patients is appropriate for HAT

Grade of recommendation: A

Hair is an essential component in applying HAT. HAT is not suitable for patients who without hair or with very short of hair. Karaduman et al. (2009) [2+] and Ozturk et al. (2013) [2+] both suggested that the hair should be at least 1 cm long so that strands of hair can be twisted into a hair knot like for applying glue. The best way to grape the hair and make it into a hair knots is to use a pair of forceps or a clamp, so the hair knot can be more secure and help in hemostasis of the scalp laceration wound.

For scalp laceration wound that is profusely bleeding, direct pressure on the wound for at least five minutes is needed. HAT cannot be used is there is profuse bleeding especially for the arterial bleeding. Once the bleeding is controlled, HAT can be implemented (Eng et al., 2008) [1+].
Recommendation 5 - Characteristic of the scalp laceration wound

Grade of recommendation: B

Study of Hock et al. (2002) [1++] and Eng et al. (2008) [1+] showed that HAT not only can be applied on liner scalp laceration wound but also the complicated laceration wound. There are no patients suffering from wound breakdown with the usage of HAT for wound repair for both type of the above wound. Bleeding is not found in the both studies. The average length being repair in the studies is 2.8 cm. Therefore it is suggested that scalp laceration wound which is lesser than 3cm is suitable for applying HAT (Hock et al., 2002 [1++] and Eng et al., 2008 [1+])

Recommendation 6 - Appropriate method in HAT

Grade of recommendation: B

According to Karaduman et al. (2009) [2+] one drop of glue is enough for each strand of hair in the procedure. It was reported that excessive of glue used with HAT may cause exothermic effect. It may lead to damaging of the hair follicles and inhibit the growth of hair. Moreover, hair knots will form as excessive amount of glue has applied during HAT; it is difficult for spontaneous dissolution of the glue even after a week after the procedure. Cutting off of the hair knots may result. For the study done by Karaduman et al. (2009) [2+], it showed that one drop of the glue is powerful enough to secure the hair strand and successfully allow in wound closure. From the result of the study, the hair glue knot can keep intact for 7 day while one drop of glue is used (Hock et al., 2002) [1++]. There is no falling off or detach of the glue and causing wound dehiscence. Besides, the hair glue knots can be removed easily with tweezer or comb.
Reference


Appendix 6

Level of evidence

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1++</td>
<td>High quality meta-analysis, systemic review of RCTs, or RCTs with a very low risk of bias.</td>
</tr>
<tr>
<td>1+</td>
<td>Well conducted meta-analysis, systemic review of RCTs, or RCTs with a low risk of bias.</td>
</tr>
<tr>
<td>1-</td>
<td>Meta-analysis, systemic reviews of RCTs, or RCTs with a high risk of bias.</td>
</tr>
<tr>
<td>2++</td>
<td>High quality systemic reviews of case-control or cohort studies. High quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is casual.</td>
</tr>
<tr>
<td>2+</td>
<td>Well-conducted case control or cohort study with a low risk of confounding, bias, or chance and a moderate probability that the relationship is casual.</td>
</tr>
<tr>
<td>2-</td>
<td>Case control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not casual.</td>
</tr>
<tr>
<td>3</td>
<td>Non-analytical studies, e.g. case report, case series.</td>
</tr>
<tr>
<td>4</td>
<td>Expert opinion.</td>
</tr>
</tbody>
</table>

Grades of Recommendation

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>At least one meta-analysis, systemic review, or RCT rated as 1++, and directly applicable to the target population: or A systemic review of RCTs or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of result.</td>
</tr>
<tr>
<td>B</td>
<td>A body of evidence including studies rated as 2++, directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+.</td>
</tr>
<tr>
<td>C</td>
<td>A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2++.</td>
</tr>
<tr>
<td>D</td>
<td>Evidence level 3 or 4; or Extrapolation of evidence from studies rated as 2+.</td>
</tr>
</tbody>
</table>

Reference:

## Appendix 7

### Project timeline

<table>
<thead>
<tr>
<th>Phase</th>
<th>Task</th>
<th>Organizer(s)</th>
<th>Target(s)</th>
<th>Months</th>
</tr>
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<td></td>
<td></td>
<td></td>
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<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
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<tr>
<td>1</td>
<td>Approvals seeking</td>
<td>Project leader</td>
<td>COS DOM Consultants (Medicine) WM NC</td>
<td>Week 1</td>
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<td>2</td>
<td>Project director recruitment</td>
<td>Project leader</td>
<td>APN (1)</td>
<td>Week 2</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Project team member recruitment</td>
<td>Project leader</td>
<td>APN (1) RN (6)</td>
<td>Week 2</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3</td>
<td>Project team meeting</td>
<td>Whole Project leader</td>
<td>Whole project team</td>
<td>★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Project development</td>
<td>Whole Project leader</td>
<td>Whole project team</td>
<td>Week 3-5</td>
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<td>4</td>
<td>Protocol promotion</td>
<td>Whole Project leader</td>
<td>Nursing staff</td>
<td>Week 6</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Staff training</td>
<td>Whole Project leader</td>
<td>Nursing staff</td>
<td>Week 7-8</td>
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<td></td>
</tr>
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<td>5</td>
<td>Pilot test</td>
<td>Whole Project team</td>
<td>Nursing staff Patients</td>
<td>★ ★ ★</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pilot test review</td>
<td>Project leader</td>
<td>Nursing staff &amp; Patients</td>
<td>★</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pilot test report</td>
<td>Project leader</td>
<td>Nursing staff &amp; Patients</td>
<td>★</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Implementation</td>
<td>All operational staff (Nurses and MOs)</td>
<td>Patients</td>
<td>★ ★ ★ ★ ★ ★ ★</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Evaluation</td>
<td>Project leader</td>
<td>Hospital Administrators in AED</td>
<td>★</td>
</tr>
<tr>
<td></td>
<td>- Project report</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Evaluation report</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 8

Implementation of Hair Apposition technique (HAT) for scalp laceration wound in AED

Information Sheet for Participants (Sample)

Study in the HAT in reducing pain experience during the procedure in wound repair in AED

We would like to invite you to take part in a study which examines the implementation of Hair Apposition technique (HAT) for scalp laceration wound in AED. HAT provides an option for you to choose your wound management in scalp wound laceration with the health care professions. The objective is to examine whether application of HAT able in reducing patients’ pain experience during the procedure in wound repair in AED.

Your participation in the study is voluntary and you may withdraw at any time. The information obtained will be kept confidential. You will be expected to have a follow-up phone interview and reply a simple questionnaire after 7 days the care provided.

The investigator will be available if further information is needed at any time. If you have any problems or enquiries at any time please contact Chin Man Ting (investigators) on phone no xxxxxxxx

Thank you for your participation.
Appendix 9

Consent for Study (Sample)

Study in applying hair apposition technique for scalp laceration wound repair in AED

- I confirm that I have read and understand the information sheet for the above study.
- I have had the opportunity to consider the information, ask questions and have had the answer satisfactorily.
- I understand that my participant is voluntary and that I am free to withdraw at any time, without giving any reason, without any medical care or legal rights being affected.
- I understand that all the information provided will be kept confidential strictly for use of evaluation purpose.
- I agree and allow the use of the provided information for evaluation purpose.
- I hereby agree to take part in the above study.

_________________________  _________________________
Name of Participant        Name of Witness

_________________________  _________________________
Signature of Participant    Signature of Witness

_________________________  _________________________
Date                      Date
Appendix 10

XXXXXXX Hospital

Accidently & Emergency Department

Instruction for wound care after implementation of hair apposition on scalp laceration

1. Keep wound clear and dry.
2. Cover the wound with dressing for wounds of children or only when it is required.
3. Do not apply topical ointment or medications to the wound.
4. Do not scratch or rub the wound.
5. Avoid soaking the wound in water or going to swimming before the wound is healed.
6. If there is redness, swelling or increasing pain of the wound, come back to A&E department for further management.
7. The polymerized film of topical adhesive will be sloughed off by itself usually after 5 to 10 days. The red discoloration of the wound scar may be gradually decreased in few months’ time.
Appendix 11

Staff Evaluation Form on implementation of HAT in AED (Sample)

To assist us to improve the protocol and education session, please complete the following question by circling the appropriate rating.

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part A Training Session</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The objectives of the training session were clearly defined.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I understand the materials being presented.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>The speakers reply and explain my question clearly.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>The duration of the training session is adequate.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I can perform the skills in the real situation after attending the training session alone.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>The training session was held on a convenient time and place</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Part B General evaluation on the protocol</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think the new implementation would improve the quality of nursing care.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I can find adequate support when I perform the implementation.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I can communicate well with the relatives during the implementation.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I think the new implementation would not disturb route practice.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I recommend to implement the innovation in other clinical settings</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Suggestion

1. What did you like MOST about the application of HAT?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

2. What did you like LEAST about the application of HAT?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

3. What suggestion do you have to improve the application of HAT?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
Appendix 12

Nurse satisfaction survey

To evaluate the effectiveness of the new-implemented nursing care protocol on the application of HAT in AED, your comments are valuable to us.

❖ Please circle the appropriate number to describe your level of satisfaction towards the guideline implementation.
❖ Please fill the following blanks:
  ➢ Year of experience in AED: _____________
  ➢ Rank: _____________

<table>
<thead>
<tr>
<th>Item</th>
<th>Highly Disagree</th>
<th>Slightly Disagree</th>
<th>Neutral</th>
<th>Slightly agree</th>
<th>Highly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I reckon the training session is useful and efficient to promote the staff’s competency.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I understand the reason to apply this protocol into clinical area.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I reckon the protocol is able to improve the quality of care in AED.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I reckon the protocol is easy to be followed and be applied in the routine care.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am confident to demonstrate HAT as indicated by the proposed protocol.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I reckon the protocol implementation make inconvenient to me and others staff in AED.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have received sufficient support from the project team during entire innovation.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>In general, I am satisfied with the proposed protocol implementation in NICU.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Any other comments or suggestions?