

# Randomised Controlled Trial on the Effectiveness of Audible Timed Reminders for Simulated Serial Pain Score Documentation in an Emergency Department

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## ABSTRAK

*Kesakitan adalah satu gejala yang paling kerap dijumpai di Jabatan Kecemasan (JK). Kajian terdahulu menunjukkan pesakit tidak mendapat penahan sakit yang memadai di JK. Walau bagaimanapun, beberapa kajian mencadangkan kaedah yang khusus dan praktikal untuk meningkatkan ketepatan masa dan kekerapan kawalan tahap kesakitan pada keadaan kecemasan. Kajian yang dilakukan adalah dalam keadaan terkawal, secara rawak dan dijalankan di dalam persekitaran JK secara simulasi dengan menggunakan alat pemasa. Ini dapat memperingatkan kakitangan untuk menilai kesakitan dan menyediakan ubat tahan sakit pada selang masa yang ditetapkan berbanding kumpulan terapi piawai. Skor prestasi dokumentasi min antara kumpulan alat pemasa dan kumpulan kawalan adalah  $94.45\% \pm 5.85$  vs  $72.22\% \pm 17.57$  ( $p < 0.05$ ). Penggunaan alat pemasa tidak mempunyai kesan positif pada ketepatan masa dalam merekodkan pemerhatian skor kesakitan pertama selepas ubat tahan sakit diberikan,  $1.74 \text{ min} \pm 0.41$  (pemasa) vs  $1.78 \text{ min} \pm 0.82$  (kawalan);  $p = 0.89$ . Skor prestasi dokumentasi menunjukkan bahawa 50% peserta dikumpulan alat pemasa hanya mencatatkan satu peninggalan rekod berbanding 90% peserta kumpulan kawalan yang mencatatkan sekurang-kurangnya satu peninggalan rekod. Masa pemerhatian yang berikutnya untuk kumpulan kawalan adalah lebih berleluasan (min: 4 minit, max: 36 minit) berbanding dengan kumpulan alat pemasa (min: 11 minit, max: 22 minit). Median selang waktu untuk dokumentasi skor sakit per subjek di dalam kedua-dua kumpulan adalah 15 minit, tetapi IQR dalam kumpulan alat pemasa adalah 1 berbanding dengan 7 dalam kumpulan kawalan. Kesimpulannya, penambahan alat pemasa mempunyai kelebihan untuk memperbaiki skor prestasi dokumentasi dan dokumentasi skor kesakitan bersiri dalam JK.*

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*Kata kunci:* analgesia, dokumentasi, kecemasan, kesakitan

## ABSTRACT

Pain is one of commonest presentations at Emergency Department (ED). Previous studies showed inadequate pain control in ED. However, few have addressed specific, practical methods of improving the timeliness and frequency of pain control in emergency setting. This study was a randomized controlled trial in a simulated environment of an actual functioning ED using a timer device to remind care personnel to assess pain and provide analgesia at set intervals versus a "standard therapy" group without visual/audio aids. The mean documentation performance scores between timer and control groups were 94.45%  $\pm$  5.85 vs 72.22%  $\pm$  17.57 ( $p < 0.05$ ) respectively. The use of timer device did not appear to have any effect on the timeliness of recording the first pain score observation following analgesia, 1.74 min  $\pm$  0.41 (timer) vs 1.78 min  $\pm$  0.82 (control) ( $p = 0.89$ ). The documentation performance score showed 50% of the timer device group recorded only one omission compared to 90% of control group recorded more than one omission. The range of observations time for the control group is widespread (min: 4 minutes, max: 36 minutes) compared to the intervention group (min: 11 minutes, max: 22 minutes). The median time intervals for pain score documentations per subject in both groups were 15 minutes, however, the IQR in timer group was 1 compared to 7 in control group. In conclusion, the addition of timer device had the advantage to improve documentation performance score and subsequently the serial pain score documentation in ED.

**Keywords:** analgesia, documentation, emergency, pain

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## INTRODUCTION

Pain is one of the most common presentation patient visits in Emergency Department (Cordell et al. 2002). Pain, as a presenting complaint, account for up to 78% of visits to the Emergency Department (ED) (Tanabe & Buschmann, 1999). Pain is subjective and various assessment tools have been used to measure pain. Visual analogue scale (VAS) is one of the most commonly used pain measurement tools in emergency-based research because of high reliability in acute

pain measurement (Bijur et al. 2001).

Clinical research has documented the positive impact of measuring pain in ED and strongly associated pain score documentation with analgesic used (Kellogg et al. 2012). Several studies have attempted to assess the adequacy of pain management in the ED and demonstrated that analgesia is frequently under prescribed (Ducharme & Barber 1995; Wilson & Pendleton 1989).

Application of timer device for taking medication could improve

the compliance with weekly bisphosphonate medication in patients with osteoporosis (Nho et al. 2016). However, there is inadequate study on the use of timer device with pain score documentation.

The objectives of this study are i) to document and compare the mean of documentation performance score (DPS), the variability of time intervals from giving medication to documentation of first pain score and the time intervals of subsequent pain score observation between timer device group and control group, and ii) to determine user acceptance of timer device in pain score documentation based on utility, suitability and preference.

## MATERIALS & METHODS

This was an experimental study in the form of a randomized controlled trial design, using simulated environment of an actual functioning ED. This study combined the timer device with pain score documentation to develop a more reliable, convenient and easily trainable method to improve the accuracy, frequency and quality of pain score documentation in a busy and crowded ED. The intervention arm was provided with a timer device with audible alarms at set intervals and the control "standard therapy" arm did not utilise any visual or audio aid. A survey form about the suitability and preference of using timer device in pain score documentation was completed by participants in the timer device group at the end of the task. Favorable acceptance for the use of timer device

for pain score documentation was represented by more than three points on the Likert scale.

Staff nurses in ED with minimum qualification of Diploma in Nursing were recruited in the study. Those with hearing impairment, less than 3 month experiences in ED and without consent were excluded. The participants were randomly picked from staff nurse at ED. With a guide of sequentially-numbered, opaque, sealed envelopes (SNOSE) method, participants were stratified according to their experience in ED and post basic qualifications. Following the stratification process, participants selected a number from box 1 to 4 according to their group. In the box contained a total of 20 cards marked A or B, which represented groups with and without timer device respectively. All participants were briefed regarding the details of each task prior to the assessment and were given 5 to 10 minutes to familiarize with the set up and equipments. The participants in the intervention group were briefed on the functions and operations of the timer device. Standardized Patients (SP) were trained of their role prior to the study.

Each participant began with three SPs in both groups. The task required each participant to carry out the doctor's plan for each SP. Additional SP were introduced into the scenario at 20 minutes and 40 minutes intervals of the simulation. At the end of the exercise, there were total of 5 SPs for each participant. The times of initial pain score, administration of medication and reassessment of pain score were recorded. Reassessment of

pain score were performed following the alarm in the intervention group or according to their usual practice in the control group.

## DOCUMENTATION PERFORMANCE SCORE

Documentation performance score was the percentage completed task within each run per subject, which was out of a total of nine specific tasks. In this pilot study, participants were given 1 hour in a simulated ED condition. A total of five SPs were provided in sequentially to carry out the doctor's plan. Three SPs were initially placed with a case scenario, and each participant was required to carry out the doctor's plan accordingly. Subsequently, the fourth and fifth patients were introduced into the simulation at 20 minutes and 40 minutes time intervals, respectively. All SPs were expected to have first pain score documented. For the first SP, subsequent pain reassessments were expected after 15 minutes, 30 minutes and 45 minutes. For the second and third SP, subsequent pain scores were expected after 15 minutes and 30

minutes. Only one pain score was expected after 15 minutes for the fourth and fifth patient. In total, participants were expected to have 9 documented pain scores at the end of the simulation. All participants were required to record the time of assessment based on digital clock provided and the pain score.

## SAMPLE SIZE CALCULATION AND DETERMINATION

Sample size was calculated using PS Power and Sample Size calculation base on the following formula

$$n = \left[ \frac{(Z_{\alpha/2} + Z_{\beta}) (\delta)}{(\mu_1 - \mu_0)} \right]^2$$

Whereas the assumed meaningful difference in the mean performance scores between the two groups were 2 with a standard deviation of 1.5, power of 80% and 95% of significance level resulting in 10 subjects per arm.

In alpha testing, it was found that the difference in performance score is 33.3. The values used for this sample size calculation was projected from the alpha testing. There was no similar

Table 1 : Baseline characteristic of in timer device group and control group

Characteristic	Mean (SD)		Mean Difference (95% CI)	t Statistic (df)	P value
	Timer Device Group	Control Group			
Age (year)	30.0 (1.43)	30.7 (0.88)	0.70 (-4.23, 2.83)	-0.427 (18)	0.682
Nursing Experience (year)	7.9 (4.12)	7.8 (3.19)	1.0 (-3.36, 3.56)	0.61 (18)	0.95
ED Experience (year)	7.4 (4.6)	6.1 (3.57)	1.3 (-2.57, 5.17)	0.71 (18)	0.49
PPUKM experience (year)	7.4 (4.6)	6.1 (3.57)	1.3 (-2.57, 5.17)	0.71 (18)	0.49

Table 2: Documentation Performance Score in timer device group and control group

Characteristic	Mean (SD)		Mean Difference (95% CI)	t Statistic (df)	P value
	Timer Device Group	Control Group			
Documentation Performance score	8.5 (0.53)	6.5 (1.58)	2.0 (0.84, 3.16)	3.8 (11.0)	0.003
Documentation Performance score in percentage	94.44% (5.86)	72.22% (17.57)	22.22 (9.33, 35.11)	3.8 (11.0)	0.03

study documented in literature that is appropriate for use.

### RESULTS

A total of 20 participants were recruited into the study with 10 participants randomly assigned into each group. None were excluded from the study. There were no significant differences in the baseline characteristic of all participants (Table 1). Post basic qualification was available in 3 participants in intervention group versus 1 in control group ( $p=0.582$ ). There were 9 diploma and 1 degree in intervention group vs 10 diploma and 0 degree in control group ( $p=1.000$ ).

The mean documentation performance score in timer device group was  $8.5 \pm 0.53$  or  $94.45\% \pm 5.85$  versus  $6.5 \pm 1.58$  or  $72.22\% \pm 17.57$  in control group ( $p<0.05$ ) (Table 2). The intervention group was able to reduce omission number and rate of pain score reassessment compared to the control group. There were 5 (50%) participants achieved 100% completeness of recording pain score while the control group only had 1 (10%) participant achieving completeness. The control group documented more omission

of pain score recording with 7 (70%) participants omitted more than two recordings. However, the Fisher's Exact test failed to show a significant difference ( $p=0.141$ ) (Table 3). The overall mean time between first pain score and serving analgesia is  $1.74 \pm 0.41$  (timer) vs  $1.78 \pm 0.82$  (no timer);  $p=0.89$ .

The range of observation time for the control group were wide (min: 4 minutes, max: 36 minutes) compared to the intervention group (min: 11 minutes, max: 22 minutes). Wilcoxon/Mann-Whitney Test showed that median time intervals for pain score documentations per subject in both groups were 15 minutes, however, the IQR in timer group was 1 compared to 7 in control group (Table 4).

The survey form only documented the point of view of the participants in timer device group. The result showed that the 90% agreed that timer device helps to improve pain score documentation, 90% agreed that the timer device suitable to use for improve pain score documentation, 90% agreed that the timer device help to assist them for pain score documentation and 80% prefer to have timer device in pain score documentation.

Table 3: Achievement completeness of records

Characteristic	Achievement completeness of record, n(%)		P value
	Yes	No	
Timer Device Group	5 (83.3)	5 (35.7)	0.141
Control Group	1 (16.7)	9 (64.3)	

Table 4: Overall mean of time in minute between first pain score and serving analgesic

Characteristic	Mean (SD)		Mean Difference (95% CI)	t Statistic (df)	P value
	Timer Device Group	Control Group			
Mean of time in minute between first pain score and medication	1.74 (0.412)	1.78 (0.819)	-0.4 (-0.65, 0.57)	-0.14 (11.0)	0.892

## DISCUSSION

Most common presentations for patient's visits in ED was pain related and the pain score documentation remained unsatisfactory (Cordell et al. 2002). Many studies had shown inadequate analgesia and pain control in the ED (Beel et al. 2000; Fosnocht et al. 2001; Tanabe & Buschmann 1999). Both VAS and Numerical Rating Scale (NRS) were validated to use for pain measurement at ED and this two validated scale were very easy to perform at the busy and crowded environment like ED (Bijur et al. 2001; Bijur et al. 2003). However, only 23% of patients with complain of pain had initial assessment of pain using pain scale and the number dropped to 19% for the subsequent pain assessment after analgesia or treatment (Eder et al. 2003).

On the other hand, limited publications had addressed specific, practical methods of improving the timeliness and frequency of pain

control at emergency setting. Most of the publication suggested using electronic medical record and a large scale plan-do-check-act (PDCA) cycle which required good financial support from ministry of health and repetitive education with bedside coaching which was very difficult to implement at majority of ED (Gordon et al. 2008; Nelson et al. 2004). Electronic medical record also failed to improve pain assessment documentation (Saigh et al. 2006). Another study also implemented a structured education programme in patients using patient-controlled analgesia (PCA) via infusion pump to improve effectiveness of pain control, patient satisfaction and comfort level but it seen to be not financially practical at ED (Ho et al. 2016). Education programme also showed a short term beneficial effect in pain control but not long term effect and required a continual education for the health care provider (Doig & Simpson 2005; Stalnikowicz et al. 2005).

This study was a pilot study and no similar intervention previously to employ a timer device to alert emergency staff nurse to reassess the pain level of patient and administer appropriate therapy in a controlled simulated environment. With the presence of assessment of pain, for example, using verbal pain score (VPS), increased the likelihood of analgesia administration in the ED and subsequently reduced pain (Silka et al. 2004). Additional of a timer device in pain score assessment was inexpensive, eased to operate and did not require extensive training to incorporate into practice. This study showed that the intervention group had the advantage to improve pain score documentation and optimizing pain control process. The use of timer device proved to have a positive impact in improving medication compliance (Nho et al. 2016).

This study showed that the mean of the documentation performance score was statistically significant in the intervention group and achieved a more complete documentation. The reason for the inability of the intervention group to achieve 100% documentation performance score were probably due to inadequate time to familiarise i) with the setting; ii) with the timer device. The use of timer device did not appear to have any effect on the timeliness of recording the first pain score observation following provision of analgesia. However, the reassessment of pain score following analgesia showed a larger variability in the time intervals in control group. The use of timer device

also appeared to reduce the omission rate of pain score documentation. This was probably due to equal level of participant's awareness to identify the initial pain score and the timer device act as a good reminder to reassess pain score at targeted time. The frequent assessment of initial pain without follow up assessment in the control group may result of medical record format which required the participants to document the pain score before administer analgesia and a traditional view of pain as diagnostic indicator rather than an outcome deserved for attention and treatment (Todd et al. 2007). Participants at the intervention group had high acceptance in the usage and suitability of in cooperating timer device for pain score documentation in ED.

The study involved simulation in a control environment and small in number of sample size. Despite statistically significant difference in documentation of pain score in between intervention group and control group, it is unclear whether this difference has any clinical significance in real ED environment where there is a higher patient load with various conditions and noisier environment. Future research should consider applying the timer device in a real ED environment.

## CONCLUSION

This study showed that addition of a simple and inexpensive timer device in pain score documentation had the potential and benefit to improve the timeliness and frequency of

pain control at ED. With this simple intervention, the pain management at ED perhaps would be more effective and precise. Furthermore, a good acceptance level by the nurses in the intervention group towards timer device usage in the management of pain was found in this study. By raising the awareness of emergency personnel on the importance of optimal pain documentation, pain control and patient's satisfaction can be improved.

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