SATISFACTION AMONG USERS OF ELECTRONIC PATIENT ANESTHESIA RECORD IN NEUROLOGICAL INSTITUTE, BANGKOK, THAILAND: A SURVEY

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ABSTRACT:

Background: Anesthesia medical records are important in the recording process for patients undergoing surgery; and act as a legal evidence to protect the communication between medical staffs. The anesthesia medical record indicates the patient information before surgery, during surgery, and postoperative period. Even though the electronic patient anesthesia record has not been implemented generally, the advantage of this system has been recognized. The electronic patient anesthesia record can eventually replace handwritten records because of the accuracy and the completeness of the documents. Neurological Institute, the tertiary neurological center in Thailand, has been using electronic patient anesthesia record since September, 2012 as a first pioneer. But, after the program execution, the attitude of users of electronic patient anesthesia records has not been evaluated. Therefore, we assessed the electronic patient anesthesia record users satisfaction and also its association with socio-demographic factors in order to understand the feasibility of this program.

Methods: This was a cross-sectional survey, conducted on 182 respondents which include recorders and readers. The study was analyzed using descriptive statistics, Chi-Square Test and Man-Whitney test.

Results: Most of the respondents in the reader group, 84%, were found to have moderate satisfaction using electronic patient anesthesia records. In recorder group 50% had high level of satisfaction and 45% felt moderate satisfaction. The association between socio-demographic characteristics and users satisfaction of electronic patient anesthesia record were associated significantly with level of computer knowledge and familiarity with electronic machine (p=0.002 and 0.001 respectively) in reader group respondents.

Conclusions: Users of electronic anesthesia records are moderately satisfied with the electronic recording system. However, the readers group needs more training on computer technology and reading electronic records. More in-depth studies to look at efficiency and cost effectiveness of anesthesia records are needed in the future.

Keywords : Anesthesia, Electronic patient anesthesia record, Thailand

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INTRODUCTION

Anesthesia team services are responsible for providing anesthesia to patients who undergo surgery. Such services include pre-operative, intra-operative and post-operative functional recordings [1]. So far all of these procedures have been manually managed. However, recently there has been an increase use of electronic patient anesthesia record machines. This type of machine has been designed and developed since 1970 [2]. Each care institute has applied machines to measure the accuracy and the completeness of patient records. By this, it means that all information that anesthesiologists and nurse anesthetists have recorded in the handwritten anesthetic record form, will now be switched to the recording machines. The machine is aimed to be used for data quality

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improvement [3].

Electronic patient anesthesia record is an automatic recording system that allows for automatic and reliable data collection, data storage, and patient's data presentation during the intra-operative and post- operative periods [4]. This electronic anesthetic record machine offers many benefits. For instance, it helps to continue care-taking of patients after surgery, particularly in the ward. Previously anesthesia records were handwritten, and problems were that they may not be clear, or incomplete, and could have errors, any of which impedes the effectiveness and safety of care-giving [2, 5]. Electronic patient anesthesia record is user-friendly due to its easiness to read, and more accurate and effective in terms of data recording [1] Also, it is potentially cost-effective, useful for research and development, and advantageous from the aspect of legal issues [6]. However, as electronic patient anesthesia record needs to be connected to the internet, some personnel with less computer experience may be fearful or hesitant in using it as they are unfamiliar with the layout and the replacement of the machine.

Neurological Institute is a tertiary-care level hospital based in Bangkok. It is the center of excellence for neurological diseases ranging from stroke, epilepsy, spinal disorders, brain tumors, and neuro-immunology conditions. In particular, the interest of the anesthesia department is to provide support to the neurosurgical department for all neuro-interventional procedures performed in this institute. By far, Neurological Institute has been the first care institute in the country which implemented the use of electronic patient anesthesia records in its full scale since September 2012, after spending a whole year on development and testing the machine. As of now, electronic patient anesthesia record has been routinely used in the operation theater to record patient's clinical information before anesthesia, data during the intra-operative period and the post-anesthetic care unit. After the implementation of electronic patient anesthesia record program by the Anesthesiology Department at the Neurological Institute, there has been no study to survey the satisfaction of the users toward electronic patient anesthesia record. The objective of this study is to assess the level of satisfaction among users of electronic patient anesthesia records at Neurological Institute, Bangkok, Thailand. Another objective is to determine the association between level of satisfaction and demographic data.

MATERIALS AND METHODS

A cross-sectional survey was conducted to assess the level of satisfaction among all the users of electronic patient anesthesia record at Neurological Institute, Bangkok, Thailand. A total 200 personnel have been using these electronic records, consisting of recorders and readers. Recorders include anesthesiologists and anesthetist nurses who worked at the anesthesia department of the institute. Readers include neurosurgeons, neurosurgical residents, and registered nurses.

A structured questionnaire in Thai was used to collect data from all these respondents. A survey questionnaire was developed based on literature reviews and previous studies and consisted of two parts with close-ended questions. The first part was designed to obtain information about socio-demographic data of respondents. Second part consisted of 23 questions; the level of satisfaction of electronic patient anesthesia record use agreement to the statements was measured using Likert's scale. The internal consistency of the rating scales was performed by Cronbach's alpha coefficient for an analysis of the satisfaction in order to get at least more than 0.80 of alpha value. To achieve the validity of the questionnaires, three content experts were sought out. The scores for level of attitude were grouped into 3-high satisfaction (81-100%), moderate satisfaction (60-80%), and low satisfaction (less than 60%). The SPSS statistical software version 22 licensed for Chulalongkorn University was used for all analyses. The descriptive statistics were used - the frequency, percentage, mean and standard deviation, including minimum and maximum values - to explain the distribution of socio-demographic characteristics of the respondents. For analytical statistics, Chi-square and Man -Whitney test were used to explain the association between socio-demographic characteristics and level of satisfaction. The significant level in this study was set up at 0.05. The study was approved by the Ethics Review Committee for research involving human Research Subjects, Health Sciences group, Chulalongkorn University, Thailand (code. 048.01/2015)

In part of data collection, the researcher explained the objective of the study, the components of the questionnaire, principle of confidentiality and ethical consideration. Then the questionnaire was given to the respondents at the ward before morning nursing routine and was then sent back in an envelope to the researcher after 3 days at the anesthesia department.

RESULTS

The sample consisted of 182 respondents divided into readers group 162 (90%) and recorders group 20 (10%). The return rate for this survey was

Table 1 Socio-demographic characteristics of recorder and reader respondents

Characteristics	Recorder group	(%)	Reader group	(%)
Age (years)	Mean 40 SD 10.3 Max 59, Min 27		Mean 35.97 SD 9.57 Max 59, Min 21	
Gender	Male	5	Male	26.5
	Female	95	Female	73.5
Level of education	Bachelor's Degree	80	Bachelor's Degree	80.9
	Master's Degree	15	Master's Degree	19.1
	Doctoral Degree	5		
Job position	Anesthesiologists	20	Nurse	82.1
	Nurse anesthetist	80	Neurosurgeons	6.8
			Resident trainee	11.1
Duration in practice at this hospital (years)	Mean 12.5 SD 9.7 Max 37, Min 0.5		Mean 11.24 SD 9.44 Max 37.0, Min 0.33	
Duration of Electronic patient anesthesia record use (years)	Mean 2.08 SD 0.7 Max 3.0, Min 0.5		Mean 1.93 SD .82 Max 3.0, Min 0.25	
Duration of handwritten anesthesia record use (years)	Mean 10.45 SD 9.7 Max 30, Min 0.5		Mean 7.40 SD 7.67 Max 30, Min 0.0	
Level of English language knowledge	High	15	High	21
	Moderate	80	Moderate	74.7
	Low	5	Low	4.3
Level of computer knowledge	High	15	High	28.4
	Moderate	80	Moderate	68.5
	Low	5	Low	3.1
Familiarity with electronic machine	High	15	High	28.4
	Moderate	80	Moderate	70.4
	Low	5	Low	1.2

Table 2 Satisfaction regarding use of electronic anesthesia records in recorder group

Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	%	%	%	%	%
Information in anesthetic record easy to read	35	65	0	0	0
Time-saving record-keeping system	25	50	10	15	0
Results in accurate recording of vital signs	55	40	5	0	0
Results in accurate documentation of procedures and events	30	65	5	0	0
Allows more time to concentrate on patient care	45	40	15	0	0
Convenient in short cases (1-3 hr.)	25	30	30	10	5
Convenient in lengthy cases (>3hr.)	65	30	5	0	0
Convenient in simple cases (Laminectomy, Tracheostomy)	35	50	10	5	0
Convenient in complicated cases (Brain tumour, Aneurysm)	45	50	5	0	0
Beneficial in complicated or emergency cases	25	55	15	5	0
Convenient in record-keeping for emergency (eg. CPR) situations	15	50	25	10	0
Easy to review the record during and after the case	30	65	5	0	0
Convenient for data collection and research use	40	35	25	0	0
Overall satisfied with the electronic patient anesthesia record	35	55	10	0	0
Safe for patient	40	55	5	0	0
Safe for personal	45	50	5	0	0
Advantageous for legal protection	40	45	10	5	0
Prefer electronic patient anesthesia record over handwritten anesthetic record	45	35	20	0	0
Value investing in the future	45	45	10	0	0
Easy to maintain	40	35	10	15	0

Table 2 Satisfaction regarding use of electronic anesthesia records in recorder group (Cont.)

Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	%	%	%	%	%
Understand the interpretation of the electronic patient anesthesia record more than handwriting record	25	45	25	5	0
Understand of the electronic patient anesthesia record more than handwriting record	30	35	25	10	0
Electronic patient anesthesia record appropriate to Global technology	45	55	0	0	0

Table 3 Satisfaction regarding use of electronic anesthesia records in readers group

Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	%	%	%	%	%
Information in anesthetic record easy to read	13.0	75.3	11.1	0.6	0.0
Time-saving record-keeping system	7.4	72.8	19.8	0.0	0.0
Results in accurate recording of vital signs	13.6	77.8	8.6	0.0	0.0
Results in accurate documentation of procedures and events	11.7	76.5	11.7	0.0	0.0
Allows more time to concentrate on patient care	5.6	64.2	30.2	0.0	0.0
Convenient in short cases (1-3 hr.)	6.8	74.1	6.8	0.0	0.0
Convenient in lengthy cases (>3hr.)	6.2	75.9	17.9	0.0	0.0
Convenient in simple cases (Laminectomy, Tracheostomy)	6.2	75.3	18.5	0.0	0.0
Convenient in complicated cases (Brain tumour, Aneurysm)	7.4	70.4	22.2	0.0	0.0
Beneficial in complicated or emergency cases	6.2	73.5	20.4	0.0	0.0
Convenient in record-keeping for emergency (eg. CPR) situations	6.2	77.8	16.0	0.0	0.0
Easy to review the record during and after the case	12.3	79.0	8.6	0.0	0.0
Convenient for data collection and research use	20.4	72.8	6.8	0.0	0.0
Overall satisfied with the electronic patient anesthesia record	9.9	79.0	10.5	0.6	0.0
Safe for patient	8.0	74.1	17.9	0.0	0.0
Safe for personal	7.4	77.8	14.8	0.0	0.0
Advantageous for legal protection	14.2	69.1	16.7	0.0	0.0
Prefer electronic patient anesthesia record over handwritten anesthetic record	13.0	75.3	11.7	0.0	0.0
Value investing in the future	10.5	74.7	14.8	0.0	0.0
Easy to maintain	8.6	75.9	15.4	0.0	0.0
Understands the interpretation of the electronic patient anesthesia record more than handwriting record	8.6	74.7	16.0	0.6	0.0
Understands electronic patient anesthesia record more than handwriting record	8.6	76.5	14.2	0.6	0.0
Electronic patient anesthesia record appropriate to Global technology	19.1	77.2	3.7	0.0	0.0

91%. In recorders group the mean age was 40 years (maximum 59, minimum 27).The majority of respondents were female 95% and 5 % were male. The results of education level showed that 80.0% of respondents had graduate bachelor's degree. 80% of job positions in respondents were nurse anesthetists and 20% were anesthesiologists. The level of English language knowledge, level of computer knowledge and familiarity with electronic machine in recorders group found 80% had moderate level of knowledge.

Characteristics of the reader respondents presented with mean of age 35.97 years (maximum 59, minimum 21). The majority of respondents were female 73.5% and 26.5 % of respondents were male. 82.1% of job position in respondents were registered nurses**.** Mean of duration in practice at Neurological Institute showed 11.2 years (maximum 37, minimum 0.3), duration of use on electronic patient anesthesia record showed mean 1.9 years (maximum 3, minimum 0.25) and mean of duration to use handwritten anesthesia record form showed 7.4 years (maximum 30, minimum 0.0), Table 1.

Information about satisfaction questionnaire

Table 2 shows information on satisfaction

Table 4 Satisfaction among recorder and reader respondents of electronic patient anesthesia record

Satisfaction	Number of Reader group	%	Number of Recorder	%
Low	5	3.1	1	5
Moderate	136	84	9	45
High	21	13	10	50
Total	**162**	**100**	**20**	**100**

Table 5 Association between socio-demographic characteristics and reader satisfaction among users of electronic patient anesthesia record

Characteristics	Satisfaction N (%)		*p-value*
	High	Moderate and low	
Age (years)	Mean 37.57 max 56 min 25	Mean 35.73 max 59 min 21	0.38
Gender			0.07
Male	9 (42.9)	34 (24.1)	
Female	12(57.1)	107(75.9)	
Level of education			0.239
Bachelor's Degree	15(71.4)	116(82.3)	
Master's Degree	6(28.6)	25(17.7)	
Job position			0.065
Nurse	14(66.7)	119(84.4)	
Neurosurgeons	2(9.5)	9(6.4)	
Resident trainee	5(23.8)	13(9.2)	
Duration in practice at this hospital (years)	Mean 10.89 max 31 min 0.75	Mean 11.29 max 37 min 0.33	0.725
Duration of AIMS use (years)	Mean 2.03 max 3 min 0.25	Mean 1.92 max 4 min 0.25	0.433
Duration of handwritten record use (years)	Mean 6.86 max 20 min 0	Mean 7.48 max 30 min 0	0.889
Level of knowledge English language			0.36
High	6(28.6)	28(19.9)	
Moderate & low	15(71.4)	113(80.1)	
Level of computer knowledge			0.002*
High	12(57.1)	34(24.3)	
Moderate & low	9(42.9)	106(75.7)	
Familiarity with electronic machine			0.001*
High	13(61.9)	8(38.1)	
Moderate & Low	33(23.4)	108(76.6)	

regarding use of electronic records in recorders group. Most participants showed general satisfaction towards the use of electronic patient anesthesia record in the operating room. Most respondents strongly agreed that automated system is convenient in lengthy cases over 3 hours (65%), respondents agreed that anesthetic record is easy to read (65%), results in accurate documentation of procedures and events (65%), easy to review the record during and after the case (65%). Recorders disagreed on time saving record keeping system (15%) and this system being easy to maintenance (15%). Another result showed strongly disagreed on convenient in short case 1-3 hours (5%).

According to respondents in reader group it was found that they strongly agreed with convenient for data collection and research use (20.4%), agreed that this system easy to review the record during and after the case (79%) and over all satisfied with the electronic patient anesthesia record (79%). On the other hand, results found this group disagreed with satisfaction with electronic patient record in topic information in anesthetic record easy to read, over all satisfied with the Electronic patient anesthesia record, understand the interpretation and understand system of the Electronic patient anesthesia record more than handwriting record (0.6%), Table 3.

Satisfaction among users of electronic patient anesthesia record

The result of the study showed 50% of recorders group were highly satisfied with the electronic patient anesthesia records and 45% felt moderate satisfaction with this program, and only 5% showed

low level of satisfaction. However, 84 % of readers group were moderately satisfied with the electronic patient anesthesia record, 13% were highly satisfied and only 3.1 % had low level of satisfaction (Table 4).

Association between socio-demographic characteristics and satisfaction among users of electronic patient anesthesia record

In recorders group it was found that there was no significant association between socio-demographic characteristics and level of satisfaction of electronic patient anesthesia record. But in readers group, significant association between level of computer knowledge familiarity with electronic machine and reader respondent's satisfaction of electronic patient anesthesia record was found. ($p<0.05$), Table 5.

DISCUSSION

In the recorder group half of the respondents felt high level of satisfaction with electronic patient anesthesia records (50%) moderate and low satisfaction were (45%, 5%) and majority of the anesthetic practitioners in Neurological institute felt positive satisfaction in this system. But in readers group 84% of respondents had moderate level of satisfaction to electronic patient anesthesia record, and those with high and low satisfaction in this system were 13%, 3.1% respectively.

The recorder group level of satisfaction with electronic patient anesthesia record was similar to study by Hyun Seung Jin et al. [5] that evaluated the attitude of the anesthesiologists, trainees and nurse anesthetists towards electronic patient anesthesia record and to compare finding with manual documentation in the operating room. After 1 year routine use of computer system it was revealed that there was very positive attitude towards electronic patient anesthesia record in all personnel's [5]. One more result in this study found that group with trainees and nurses seemed to have higher preferences for the electronic anesthesia record, compared to the attending anesthesiologists, and this difference was statistically significant ($P = 0.002$ and $P = 0.029$, respectively). However, reader respondents group strongly agreed on the following: convenient for data collection and research use (20.4%), easy to review the record during and after the case (79%) and overall satisfaction with electronic patient anesthesia record (79%). But when asked about disagreement on electronic patient anesthesia record, only 0.6% of respondents felt information in anesthetic record was easy to read, understand the interpretation of the electronic patient anesthesia record more than handwriting record. Another result of this study is that the respondents needed time to adapt the electronic medical records for 1 to 4 weeks.

Another, study at faculty of medicine Vajira Hospital [7] reviewed the problems of the development of anesthesia records from hand written medical records and recommended the use of electronic patient anesthesia records and these results coincide with the study perception score of anesthetic records in Prince of Songkla University [8, 9].

According to satisfaction of registered nurses at the wards in anesthesia service at Srinagarind Hospital, Khon Kaen University, Thailand [10] the overall finding of other studies found high level of satisfaction (3.03 ± 0.36) by following a) administration $2.72 + 0.50$; b) service $3.30 + 0.46$; c) knowledge $2.90 + 0.45$; and d) personnel $3.22 + 0.46$. The open-ended questions indicated that nurses expected better communication and relationship amongst all the members of the anesthetic team. After the implementation of the electronic patient anesthesia record at the Neurological Institute, they felt that the level of knowledge distribution was inadequate, and wanted more training on reading the electronic patient anesthesia record for the readers group.

CONCLUSIONS

This cross-sectional study attempted to assess the satisfaction among users of electronic patient anesthesia record in Neurological institute, Bangkok, Thailand.

Most of the respondents in readers group found 84% of this group showed moderate satisfaction of electronic patient anesthesia record and in recorder group, showed a high level of satisfaction 50% and 45% felt moderate satisfaction in this system. This result is a normal situation for both group because in readers group, they think that this system is a new technology and they might not understand but most of the recorder group were positive because this system is an automatic record which can reduce work load, and they could do a training on how to use this system in recorder before routine use.

The association between socio-demographic characteristics and users satisfaction of electronic patient anesthesia record were associated significantly with level of computer knowledge and familiarity with electronic machine ($p=0.002$ and 0.001 respectively) in reader respondents. However, in recorder group no significant association was

found between socio-demographic characteristics and satisfaction of electronic patient anesthesia record.

In recorder group more time needed to adapt the electronic medical records, need more training on computer technology and to read electronic records to prevent errors in medical practice.

LIMITATIONS

This study is small and conducted only at one institute the Neurological Institute, Bangkok, due to time constraints. It cannot be a representative of users of anesthetic medical records from other institutions in Thailand.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations should be considered. According to the results this study will give the baseline data about the user's satisfaction of the electronic medical record used at Neurological institute. Further study, of phase 2 of the project should be to find in-depth the factors that correspond to the satisfaction and dissatisfaction of the users. Phase 3 of the project can be to study the effectiveness of the use of electronic patient anesthesia record at Neurological institute. The conclusion may be useful for other care institutions on the tertiary level with similar nature to Neurological institute for electronic patient anesthesia record implementation when all factors are carefully taken into consideration

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