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## Original

Variable	n	%	
Age (year)	20-30	69	64.8
	31-40	14	13.3
	41-50	2	1.9
Areas of Living	Near hospital areas	60	57.1
	Out of hospital areas	45	42.9
Gender	Male	23	21.9
	Female	82	78.1
Level of Education	Senior high school	2	1.9
	Diploma (3 years)	46	43.8
	Diploma (4 years)	19	18.1
	Bachelor	36	34.3
	Master	2	1.9
Occupation	Medical doctor	5	4.8
	Radiologist	4	3.8
	Laboratories analysis	4	3.8
	Information technologist (IT)	2	1.9
	Administrative staff	16	15.2
	Sanitarian	4	3.8
	Dental	3	2.9
	Nurse	32	30.5
	Midwifery	10	9.5
	Pharmacist	2	1.9
	Nutrition	2	1.9
Medical record	21	20	
Length of works	Less than 1 years	31	29.5
	1 – 5 years	69	65.7
	6 – 10 years	4	3.8
	10 – 15 years	1	1
Status of users	Active user	70	66.7
	Passive user	35	33.3
Experiences using Computer	Less than 1 years	14	13.3

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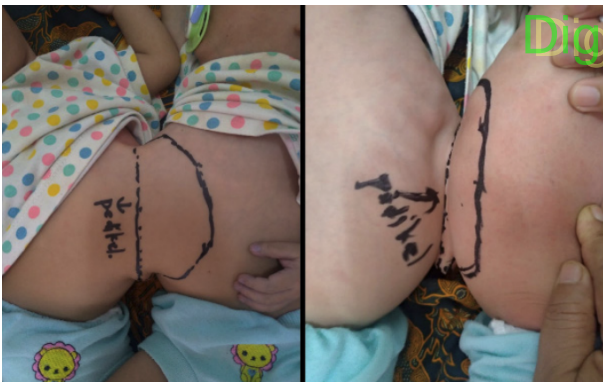
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# Analysis of hospital management information system satisfaction using the end-user computing satisfaction method: A cross-sectional study

Nindy Shara Meiyana<sup>1</sup>, Tantut Susanto<sup>2</sup>, Dewi Rokhmah<sup>3</sup>, Rismawan Adi Yunanto<sup>4</sup>, Ira Rahmawati<sup>5</sup>

<sup>1</sup>Post graduated of Master of Public Health, School of Graduated of Universitas Jember, Jember, Indonesia

<sup>2</sup>Department of Community, Family & Geriatric Nursing, Faculty of Nursing, Universitas Jember, Jember, Indonesia

<sup>3</sup>Department of Health Promotion & Behavior Sciences, Faculty of Health, Universitas Jember, Jember, Indonesia

<sup>4</sup>Department of Emergency and Critical Care Nursing, Faculty of Nursing, Universitas Jember, Jember, Indonesia

<sup>5</sup>Department of Pediatric Nursing, Faculty of Nursing, Universitas Jember, Jember, Indonesia

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#### Corresponding author

**Tantut Susanto\***  
Department of Community, Family & Geriatric Nursing, Faculty of Nursing, Universitas Jember, Indonesia, Address: Jalan Kalimantan 37 Jember, Jawa Timur, Indonesia 68121, Phone: 0331323450, E-mail: [tantut\\_s.psik@unej.ac.id](mailto:tantut_s.psik@unej.ac.id)

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## Abstract

**Background:** The completeness of patient information can help improve the patient service process. However, the application of the hospital management information systems (HMIS) is experiencing obstacles that affect user satisfaction. The end-user computing satisfaction (EUCS) method was developed for improvement of HMIS in accordance with the needs of user in the field of medical records.

**Purpose:** To analyze the correlation satisfaction of HMIS and EUCS in hospital setting.

**Methods:** Quantitative descriptive design with a cross-sectional approach was conducted among 105 healthcare providers at Graha Sehat Medika Hospital from June to July 2022. The EUCS questionnaires related to aspects of content, accuracy, format, timeliness, and ease of use were used to measure user satisfaction of HMIS. A Pearson Product Moment was used to analyze the correlation between HMIS and EUCS user satisfaction.

**Results:** There was significant correlation between satisfaction of HMIS and components of EUCS ( $p=0.001$ ), including content ( $r=0.705$ ), accuracy ( $r=0.651$ ), format ( $r=0.538$ ), timeliness ( $r=0.706$ ), and ease of use ( $r=0.875$ ). Furthermore, there were differences between ease to use of EUCS method and attending a computer course ( $10.93\pm 2.66$ ;  $p=0.022$ ) and gender ( $10.74\pm 2.58$ ;  $p=0.007$ ) of healthcare providers.

**Conclusion:** The EUCS method is important for improving HMIS satisfaction. Therefore, training and socialization of EUCS should improve to maintain ease of use of computers to increase satisfaction of management systems in hospitals.

**Keywords:** hospital; information; management; satisfaction

## Introduction

Hospitals are required to implement a hospital management information system (HMIS) and provide guidance and supervision to improve health services. All health services provide information to managers in the process of managing health services in the hospitals (Machmud, 2018). Hospitals that have implemented HMIS require hardware and software to run HMIS in supporting the HMIS operations (Dinata & Deharja, 2020). Implementation of HMIS can operate optimally if there is integration between subsystems. Therefore, the system does not stand alone and data transactions become faster (Odelia, 2018).

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HMIS is a communication information technology system that processes and integrates the entire flow of hospital service processes in the form of a network of coordination, reporting and administrative procedures to obtain precise and accurate information, and is part of the health information system (The Ministry of Health of The Republic of Indonesia, 2013). HMIS has several benefits, including improving service quality, making decisions, and becoming a consistent control function (Salim, 2018). The hospital management information system (SIMRS) used in a hospital must provide convenience in operations and must be able to overcome patient service constraints (Setyawan, 2016).

The HMIS data from the Ministry of Health at the end of November 2016 reported that 1257 of 2588 hospitals in Indonesia (48%) had HMIS. The data also show that 5% of hospitals already have HMIS but are not running, 16% of hospitals do not have HMIS, and 28% of hospitals do not report whether they have HMIS or not. Meanwhile, HMIS was found in type C hospitals (597 hospitals) followed by type B hospitals (267 hospitals). However, in terms of proportion, HMIS is more common in type A hospitals (79%) and type B hospitals (73%) (Herlyani et al., 2020). This data indicated that HMIS is important to support management of services in hospital.

The HMIS is implemented as a form of electronic data exchange between healthcare workers, so as to ensure the availability of complete and efficient patient information with an indicator in the success of system development being user satisfaction (Sabdana, 2019). System user satisfaction is seen through response and feedback raised by the user after using the information system (Machmud, 2018). Completeness of patient information can help the patient service process improve, but the implementation of HMIS has problems that affect user satisfaction (Molly & Itaar, 2021) in the aspect of facilities and infrastructure, especially in terms of computer network instability which is considered to be too long and needs to be replaced, and expected software applications. adjust to the needs of the user (Sari et al., 2021), such as a system error occurred during service and there are some menus that are still lacking (Alfiansyah et al., 2020).

Furthermore, it is necessary to conduct a study related to the analysis of the satisfaction level of HMIS users using the (EUCS) method. Previous research related to SIMRS user satisfaction was the application of user satisfaction of the Integrated Admissions Information System using the End User Computing Satisfaction (EUCS) method at Dr. Saiful Anwar Malang Hospital. In the study respondents expressed satisfaction with the content aspect, while expressing dissatisfaction with the aspects of accuracy, shape, timeliness, and ease of use (Putri et al., 2020). Previous study using Electronic Health Record (EHR) user satisfaction using the EUCS (End User Computing Satisfaction) method at the Central Medical Record Unit of RSUPN Dr.

Cipto Mangunkusumo resulted in the significance of the variables of 69.2%, content, 73.28% accuracy, 71.6% format, 65.66 timeliness and 69.33% ease of use (Alfiansyah et al., 2020).

Graha Sehat Medika Hospital (RSGSM) Pasuruan City is one of the type D private hospitals that have implemented a hospital management information system (SIMRS) starting in 2018. SIMRS at RSGSM has been implemented in all service units. However, in its implementation, it is still not fully using SIMRS because the application of SIMRS inpatient services does not support all the needs in filling out medical records so that hospitals still use manual medical records to support services. With the HMIS analysis, the next development and improvement of hospital management information systems can be in accordance with user needs both in terms of content, accuracy of information, form or interface display, ease of use, and timeliness in providing information so as to improve the quality of services at hospital. Therefore, the purpose of this study was to analyze the level of user satisfaction of HMIS and the EUCS method in hospitals in East Java Province, Indonesia.

## Materials and Methods

### Design

This study used a quantitative descriptive study with a cross-sectional approach from June to July 2022. This study analyzed the correlation satisfaction of HMIS and components of EUCS (including: content, accuracy, format, timeliness, and ease of use).

### Sample and setting

This study was conducted at Graha Sehat Medika Hospital, East Java of Indonesia. The sample in this study was 135 healthcare providers (including medical doctor, nurse, midwifery, nutritionist, etc.) obtained using purposive sampling. The inclusion criterion of the study was healthcare providers who have a username and password to be able to access HMIS in the hospital. Meanwhile, 30 people were excluded from the study because they did not have the authority to access SIMRS and did not have a username and password into the hospital's EUCS system. Finally, 105 healthcare providers were included in this study.

### Variable

This study measured characteristics of participants, including age, gender, areas of living, educational background, the profession, and length of work. Then, it also collected data of status of user the HMIS, experiences using computer, attending computer course, and level using computers to support using the management system of information in the hospital.

User satisfaction was collected by the EUCS satisfaction method, which included five components such as content, accuracy, format, timeliness, and ease of use. This variable is used to measure the



**Table 1. Characteristic of participants (n= 105)**

	Variable	n	%
Age (year)	20-30	89	84.8
	31-40	14	13.3
	41-50	2	1.9
Areas of Living	Near hospital areas	60	57.1
	Out of hospital areas	45	42.9
Gender	Male	23	21.9
	Female	82	78.1
Level of Education	Senior high school	2	1.9
	Diploma (3 years)	46	43.8
	Diploma (4 years)	19	18.1
	Bachelor	36	34.3
	Master	2	1.9
Occupation	Medical doctor	5	4.8
	Radiologist	4	3.8
	Laboratories analysis	4	3.8
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	Dental	3	2.9
	Nurse	32	30.5
	Midwifery	10	9.5
	Pharmacist	2	1.9
	Nutrition	2	1.9
	Medical record	21	20
	Length of works	Less than 1 years	31
1 – 5 years		69	65.7
6 – 10 years		4	3.8
10 – 15 years		1	1
Status of users	Active user	70	66.7
	Passive user	35	33.3
Experiences using Computer	Less than 1 years	14	13.3
	1 – 3 years	49	46.7
	4 – 6 years	25	23.8
	More than 6 years	17	16.2
Attending course of Computer	Yes	15	14.3
	No	90	85.7
Level using computers	Beginner	4	3.8
	Basic	31	29.5
	Middle	61	58.1
	Advance	9	8.6

satisfaction of HMIS in the hospital.

### Instruments

Self-administered questionnaire was used in this study. This questionnaire measured characteristics

of participants and EUCS user satisfaction (Lim et al., 2008). Instrument of EUCS user satisfaction is a questionnaire that measured satisfaction of healthcare providers regarding HMIS in hospital management system of information. This

Table 2. Differences EUC of Satisfaction by Gender, attending course of computer, and status of users (n= 105)

	Gender		Attending course of Computer						Status of users						
	Male	Female	p	95% CI		Yes	No	p	Active		Passive		p	95% CI	
				Mean ± SD	Min				Max	Mean ± SD	Mean ± SD	Mean ± SD		Min	Max
Content	18.96±3.17	18.27±3.03	0.888	-0.74	2.12	19.27±3.65	18.28±2.95	0.213	0.70	2.68	18.40±3.17	18.46±2.86	0.929	-1.32	1.20
Accuracy	17.87±4.00	17.62±2.95	0.199	-1.25	1.75	18.27±3.43	17.58±3.16	0.747	-1.08	2.46	17.66±3.46	17.71±2.63	0.932	-1.37	1.26
Format	15.04±2.27	14.01±2.35	0.248	-0.60	2.12	15.27±1.58	14.07±2.43	0.017	-0.09	2.49	14.26±2.49	14.20±2.11	0.908	-0.92	1.03
Ease to use	10.74±2.58	10.65±1.77	0.007	0.83	1.26	10.93±2.66	10.62±1.83	0.022	0.78	1.40	10.54±2.18	10.91±1.42	0.362	-1.18	0.43
Timeliness	7.26±1.74	7.02±1.24	0.337	0.40	0.87	7.07±1.87	7.08±1.26	0.118	-0.76	0.74	7.13±1.43	6.97±1.20	0.297	-1.07	0.33
EUC of Satisfaction	69.87±11.98	67.57±9.56	0.486	-2.44	7.04	70.80±11.46	67.62±9.88	0.694	-2.41	8.77	67.98±10.76	68.26±8.86	0.898	-4.45	3.90

Note: Significance in Bold. Significance is determined by T-Independent Test

questionnaire included 19 questions using a Likert scale (1= strongly disagree to 5= strongly agree). The 19 questions were divided to five components of EUCS satisfaction method, such as content (5 items), accuracy (5 items), format (4 items), timeliness (3 items), and ease of use (2 items).

We tested the EUCS user satisfaction of instruments to measure the validity and reliability of the instrument among 30 of respondents at Mitra Sehat Medika Hospital. The validity is 0.70 and the reliability is 0.80. Therefore, the EUCS of satisfaction questionnaire is valid and reliable to perform in this study.

### Data collection

Data collection in this study was by using self-administered questionnaire. This research stage was carried out by distributing questionnaires according to the specified sample who met the inclusion criterion at Graha Sehat Medika Hospital. The questionnaire was circulated using Google Form (G-form). Participants were submitted directly to the G-form to access information of characteristics of participants and the EUCS satisfaction.

The questionnaire was distributed using the help of a WhatsApp group. Instructions for filling out the questionnaire and the G-Form link we redistributed to the head of the room and the medical unit (SMF) at the hospital. The head of the room or SMF was given an explanation first by the researcher, then a briefing on how to fill out the questionnaire. The head of the room or SMF distributed via WhatsApp group in their room. If participants experiences difficulties in completing the questionnaire, then participants had a follow-up explanation by the head of the room or SMF regarding obstacles in filling out the questionnaire. If there was a misperception between the participants and the head of the room or SMF, then the researcher made clarification related to filling out the questionnaire.

### Data analysis

SPSS version 27.0 software was used to analyze the data with significance  $p < 0.05$ . The descriptive data were presented in frequencies for categorical data (including age, area living, gender, level of education, occupation, length of work, status of users, experiences using computers, attending computer course, and level using computers), while mean and standard deviations were presented for numerical data (EUCS of satisfaction). Independent t-test was used to analyze the differences in satisfaction regarding EUCS of satisfaction based on gender, attending computer course, and status of users. Then, Pearson Product Moment test was used to analyze the correlation between components of EUCS satisfaction method for HMIS in the hospital.

### Ethical consideration

This study was approved by The Ethical Committee of Clearance from Faculty of Dentistry, Universitas

**Table 3. Correlation between components of End User Computing of Satisfaction (n= 105)**

	Content (r)	Accuracy (r)	Format (r)	Ease to use (r)	Timeliness (r)	EUC (r)
Content	1	0.705**	0.651**	0.538**	0.706**	0.875**
Accuracy	0.705**	1	0.652**	0.599**	0.703**	0.890**
Format	0.651**	0.652**	1	0.627**	0.592**	0.836**
Ease to use	0.538**	0.599**	0.627**	1	0.606**	0.772**
Timeliness	0.706**	0.703**	0.592**	0.606**	1	0.824**
EUC	0.875**	0.890**	0.836**	0.772**	0.824**	1

Note: EUC= End User Computing. \*\*p<0.001. Significance is determined by Pearson product moment

Jember with No. 1567/UN25.8/KEPK/DL/2021. All participants were informed as to the aim and objective of the study. Then, all participants voluntarily sign informed consent and attended to this study. Informed consent was given as an introduction at the beginning of the Google Form, while strengthening of informed consent was carried out by the head of the room or SMF who convinced participants about the study to be carried out.

## Results

This study measured 105 healthcare providers in Graha Sehat Medika Hospital. Table 1 shows that age of participants was 20-30 years (84.8%) and female (78.1%) graduated with Diploma of Health (43.8%). Majority of participants had worked between 1-5 years (65.7%) and the majority were active users (66.7%). Regarding their experiences using computers to support management system of information the findings reflected that the majority had been using computers for 1-3 years (46.7%) with middle level of operation of computers (58.1%), although most had not attended of computers course (85.7%).

Table 2 shows the differences EUCS of satisfaction by gender, attending course of computer, and status of users. The use of computers in SIMRS related to EUCS is highly dependent on the operation of computer systems. Therefore, it was analyzed regarding the differences in user satisfaction of this EUCS system based on gender, computer course history and user status in hospitals. There were differences between ease to use EUCS method and attending computer course (10.93±2.66; p= 0.022) and gender (10.74±2.58; p= 0.007) of healthcare providers.

Table 3 reflects the correlation between components of EUCS method and HMIS in the hospital. There was significant correlation between satisfaction of HMIS and components of EUCS (p= 0.001), including of content (r= 0.705), accuracy (r= 0.651), format (r=0.538), timeliness (r= 0.706), and ease of use (r= 0.875).

## Discussion

This study identified that there was significant correlation between satisfaction of HMIS and

components of EUCS. Furthermore, there were differences between ease to use EUCS method and attending computer course of healthcare providers. The results indicated that the EUCS method is important for improving HMIS satisfaction (Htay et al., 2013). The EUCS method is relevant to measure user satisfaction in hospitals regarding management and information of systems (Aggelidis & Chatzoglou, 2012). The HMIS improved using integrated EUCS for delivery of services in hospitals (Bakar et al., 2020). Content on SIMRS should add various menus that are required by the user. Accuracy in SIMRS should add data validation to the system so that a warning will appear if there are data that are not filled or there is data duplication.

End User Computing Satisfaction (EUCS) is a method to measure the level of satisfaction of users of an application system by comparing the expectations and reality of an information system. The definition of End User Computing Satisfaction of an information system is an overall evaluation of information system users based on their experience in using the system (Syahrullah et al., 2016). Research reveals several findings that the information generated by the medical record system is enough to help the work of medical record staff, which can reduce workload and is considered more effective; therefore, it is highly recommended to adopt Electronic Health records & Management information systems (Safdar et al., 2019). However, there are some disadvantages of the medical record system such as the absence of guidelines for using the system, the high occurrence of errors in the system and the recording of diagnoses is still done manually (Machmud, 2018).

The system information administrator has access to the entire hospital management information system, to maintain that the application always in a state of operational readiness. In addition, the system administrator is the center of all activities using the information system in the hospital (Rustiyanto, 2011). Analysis is the elaboration of a complete information system into various component parts with the intention of being able to identify or evaluate various kinds of problems that will arise in the system, so that the problem can be corrected or developed (Septiani et al., 2020). It is necessary to develop and improve the system in order to produce an information system that is easy to use according to user needs so that user satisfaction is achieved



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optimally, by providing a help menu on the system, because the help menu can help users when experiencing problems when using it.

This study identified that there was significant correlation between satisfaction of HMIS and components of EUCS. This finding is relevant with previous study that EUCS is a method for measuring the level of satisfaction of users of an application system by comparing the expectations and reality of an information system (Aggelidis & Chatzoglou, 2012). The application of EUCS in Malaysia shows that all EUCS dimensions (content, accuracy, format, timeliness and user convenience) greatly affect end-user satisfaction (Salim, 2018). Then, the form of system interface and timeliness in producing information from the system needs to be good enough and maintained and developed again to be even better.

The application of EUCS in Indonesia on user satisfaction shows that the level is in the very satisfied category. Dimensions that have a relationship with user satisfaction are content, accuracy, format and ease of use. The timeliness dimension has no relationship with user satisfaction. Therefore, this study recommends that all the information in the system is always updated according to the conditions in the field and the help links are optimized. The format on SIMRS should be improved, especially for the format of patient legibility letter items on the patient visit form by adjusting to user needs.

This study found that ease to use of EUCS method is dependent on the history of attending a computer course of healthcare providers. The EUCS model using this model emphasizes end-user satisfaction with the technology aspect, by assessing the content, accuracy, format, time and ease of use of the system (Doll & Torkzadeh, 1988). This model has been tested by many other researchers to test its reliability and the results show no significant difference even though this instrument is translated into different languages (Torkzadeh & Doll, 1991). So that with SIMRS that are attractive, easy to understand, and a system that works on time in producing information, it will facilitate the work of users, besides that it can also affect the level of satisfaction and effectiveness of work from users and improve the quality of service in hospitals.

In previous research related to HMIS user satisfaction using the EUCS method at Dr. Hospital. Saiful Anwar Malang, respondents stated that they were satisfied with the content aspect, while they were dissatisfied with the aspects of accuracy, format, timeliness, and ease of use (Sugandi & Halim, 2020). Therefore, training using technology and system information integrated by computers is important for healthcare providers to improve their satisfaction in hospital. Ease of use on SIMRS should provide a help menu on the system, because the help menu can help users when experiencing problems when using it.

This study found that ease to use of EUCS method has differences with gender of healthcare

providers. Previous study on the satisfaction of Electronic Health Record users using the EUCS method at the Central Medical Record Unit of Dr. RSUPN. Cipto Mangunkusumo resulted in the significance of the variables of components of EUCS satisfaction (Alfiansyah et al., 2020). Graha Sehat Medika Hospital (RSGSM) Pasuruan City is a type D private hospital that has implemented a hospital management information system (SIMRS) starting in 2018. SIMRS at RSGSM has been implemented in all service units including the front office, outpatient installations, emergency department, inpatient installation (ward, perinatology, delivery room, operating room), support unit (laboratory, radiology, pharmacy, nutrition, medical record), billing unit and cashier. However, in practice it still does not fully use SIMRS because the implementation of SIMRS in inpatient services does not support all the needs in filling out medical records so that hospitals still use manual medical records to support services. Timeliness in SIMR requires carrying out periodic evaluation and maintenance of the system to monitor the performance and use of the system and its effect on hospital activities.

## Conclusion

The EUCS of user satisfaction is correlated with satisfaction of HMIS for each component, such as content, accuracy, format, timeliness, and ease of use. The ease to use the EUCS method depends on attending a computer course and gender of healthcare providers. The EUCS method is important for improving HMIS satisfaction. Therefore, training and socialization of EUCS should improve to maintain ease of use of computers to increase satisfaction of management systems in hospital. It is necessary to develop and improve the system in order to produce an accurate information system according to user needs so that satisfaction is achieved, by adding data validation to the system, so that a warning system will appear if there are data that are not filled or there is data duplication.

## Declaration of Interest

This study is stated that there is no conflict of interest of this study.

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### Data Availability

Research thesis of Post graduated Master of Public Health, Universitas Jember.

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