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## Exploratory Survey on the Subjective Meaningfulness of Digitization among Nurses at two Hospitals in Japan

Makoto Suzaki\*, Shizu Hirohata\*, Takashi Koseko\*\*, Sachie Takeuchi\*\*\*, Chiharu Miyata\*\*\*,  
Mayumi Mizutani\*\*\*, Mayumi Okita\*\*\*, Yoshiko Takeda\*\*\*, \*\*\*\*, Hiroki Funao\*\*\*, \*\*\*\*,  
Takemasa Ishikawa\*\*\*, Keiko Fukuroku\*\*\*, Elke Düscher\*\*\*\*, and Yugo Narita\*\*\*, \*\*\*\*\*

\* Kinan Hospital, 4750 Atawa, Mihama town, Minami-Muro county, Mie 519-5293, Japan

[suzaki@kinan-hp-mie.jp](mailto:suzaki@kinan-hp-mie.jp), [hirohata.sys-j@kinan-hp-mie.jp](mailto:hirohata.sys-j@kinan-hp-mie.jp)

\*\* Department of Nursing, Mie University Hospital, 2-174, Edobashi, Tsu city, Mie 514-8507, Japan

[takashi-k@clin.medic.mie-u.ac.jp](mailto:takashi-k@clin.medic.mie-u.ac.jp), [08801508@m.mie-u.ac.jp](mailto:08801508@m.mie-u.ac.jp)

\*\*\* Course of Nursing Science, Graduate School of Medicine, Mie University, 2-174 Edobashi, Tsu city, Mie 514-8507, Japan

[s-takeuchi@nurse.medic.mie-u.ac.jp](mailto:s-takeuchi@nurse.medic.mie-u.ac.jp), [c-miyata@nurse.medic.mie-u.ac.jp](mailto:c-miyata@nurse.medic.mie-u.ac.jp), [m-mizutani@nurse.medic.mie-u.ac.jp](mailto:m-mizutani@nurse.medic.mie-u.ac.jp)

[mokita@nurse.medic.mie-u.ac.jp](mailto:mokita@nurse.medic.mie-u.ac.jp), [y.takeda@doc.medic.mie-u.ac.jp](mailto:y.takeda@doc.medic.mie-u.ac.jp), [h-funao@nurse.medic.mie-u.ac.jp](mailto:h-funao@nurse.medic.mie-u.ac.jp)

[fukuroku@nurse.medic.mie-u.ac.jp](mailto:fukuroku@nurse.medic.mie-u.ac.jp), [yug-n@nurse.medic.mie-u.ac.jp](mailto:yug-n@nurse.medic.mie-u.ac.jp)

\*\*\*\* Center for Medical and Nursing Education, Faculty of Medicine, Mie University, 2-174 Edobashi, Tsu city, Mie 514-8507, Japan

\*\*\*\*\*Department of Economy in Social- and Healthcare, Catholic University of Applied Science Freiburg, 63 Karlstraße, 79104,

Freiburg, Germany. [Elke.Duesch@kh-freiburg.de](mailto:Elke.Duesch@kh-freiburg.de)

\*\*\*\*\*Department of Neurology, Mie University Hospital, 2-174, Edobashi, Tsu city, Mie 514-8507, Japan

[yug@clin.medic.mie-u.ac.jp](mailto:yug@clin.medic.mie-u.ac.jp)

**Abstract:** This survey aimed to evaluate the subjective meaningfulness of digitization using electronic medical records among Japanese nurses at two hospitals. This was based on a suggestion by students from the Catholic University of Applied Sciences in Freiburg, Germany. Data for this cross-sectional, exploratory survey were collected using an anonymous paper-based questionnaire. Participants were clinical nurses aged  $\leq 60$  years working in intensive care units or acute wards at Mie University Hospital and Kinan Hospital. After research ethics committee approval, eligible participants received an explanation about the study and were invited to complete the questionnaire. Responses were retrieved in November 2018, and checked and translated into English. Free-text comments were processed using text-mining software (KH Corder®). Seventy-one valid responses were retrieved. The valid response rate was 77% at Mie University Hospital and 84% at Kinan Hospital. Participants showed similar and positive perceptions of digitization (i.e., “To me digitization in my daily work is a good fit”). The selection of reasons for this perception showed similar patterns, although “Physical relief,” was more commonly selected at Mie University Hospital than Kinan Hospital ( $p=0.001$ ). Participants from the two hospitals also differed in terms of “Other reasons” and corresponding free-text comments. No nurses from Kinan Hospital provided comments, but over one-third of Mie University Hospital participants commented. The relationship analysis of the comments placed “information” at the center, surrounded by “share” and “easy.” This survey showed most nurses perceived positive meaningfulness of digitization in clinical nursing. However, there may be some situation-based differences in meaningfulness.

**Keywords:** *subjective meaningfulness, digitization, electronic medical records (EMR), nurses, Japanese*

### 1. INTRODUCTION

Digitization is common in the medical field. Globally, implementation of national electronic health record systems has increased rapidly over the past 15 years [1]. The national government in Japan promotes the digitization of many activities and advanced use of information and communications technology (ICT), even in privatized services [2]. A survey investigating the subjective meaningfulness of digitization in the everyday working lives of clinical nurses was proposed to the present authors by healthcare management and vocational training students from the Catholic University of Applied Sciences in Freiburg, Germany. The 10 students (Burgard

KM, Gomes SP, Heitz L, Jocher M, Klukas D, Korthaus M, Oßwald R, Rimmel R, Ritzi A, and Weiler N) were under the direction of Professor Elke Düscher, and had entered the course after over 3 years as healthcare professionals (clinical nurses, physical therapists, pharmacists, vocational trainers). They were studying while working in their original healthcare profession when they visited Mie University Hospital and Kinan Hospital in Mie prefecture, Japan, from December 17–23, 2017. The students were partly financially supported by the German Academic Exchange Service (Deutscher Akademischer Austauschdienst). Their conception for the survey arose from a previous discussion about digitization

and the clinical field [3,4] and observing the active use of electronic medical records (EMR) at the two Japanese hospitals. The German students observed a high discontent of nurses dealing with EMR etc. on the one hand and understanding of nurses that there's a need for time-saving and clean recording means of patients' data on the other hand. During the visit at the hospitals in Japan, the students found that the Japanese nurses seemed to be more familiar and satisfied with the use of EMR than German nurses are. In contrast, we, as Japanese medical staff, may perceive that ICT should be used without discussion.

The visiting students' proposal offered another perspective on digitization in clinical settings, and prompted us to look for related evidence in the literature. In the UK, the British medical system once painted a "bright future" for a National Health Service transformed by digital technology. However, recent reports indicate it faces failures on practical, technical, and financial aspects [5]. Studies in other well-developed countries have shown that the overall quality of documentation content for the nursing process in electronic systems was no better than in paper-based systems [6]. Patient records were reported to be digitized well, but lacked information about preventive interventions [7]. Although various advantages of digitization have been reported, such as access to information that brings added value in increasing usage and health information exchange, consideration for older professionals was also mentioned in terms of skills needed to use the system [8]. Electronic health records are also reported to have some limitations in optimizing after visit-summaries [9]. However, well-trained nurses showed relatively high rates of ICT manipulation [10].

The "bright aspect" of digitization in clinical fields was represented by the expert panel discussion held at ISASE-MAICS 2018 (Spokane, USA), entitled "Further Electronic Health Records for Better Healthcare." However, we found little published discussion about the subjective meaningfulness of digitization in the everyday working lives of clinical nurses in Japan.

## 2. AIM

This survey aimed to evaluate the subjective meaningfulness of digitization among nurses working at two hospitals in Japan. This will allow a comparative discussion of the situation in Japan and Germany.

## 3. METHOD

### 3.1 Study design

This study used a cross-sectional exploratory design,

with data collected via an anonymous paper-based questionnaire. Participants were clinical nurses aged ≤60 years working in the intensive care units or wards for patients with acute physical illness at Mie University Hospital and Kinan Hospital. After obtaining permission from the Research Ethics Committee at each hospital, the present authors provided an explanation about the survey to eligible participants at the end of nurses' meetings. If the nurses understood all conditions and were interested in participating, we invited them to respond the questionnaire.

### 3.2 Survey instrument

The original questionnaire proposed in February 2018 was written in English, but had some ambiguity. After several discussions between our team and the German students via email and Skype, a final version of the questionnaire (in English) was completed in May 2018 (Table 1).

General:
Age: · under 20, · 20-29, · 30-39, · 40-49, · 50≤
1.To me digitization in my daily work is a good fit.
· strongly disagree, · disagree, · agree, · strongly agree
2. What are the reasons for your decision? Multiple answers are possible
If you answered strongly disagree/disagree to question 1:
· complicated application
· difficult access
· lack of explanation about technology
· money could be better used elsewhere
· no need
· development of new systems and equipment too fast
· other reasons: [free comments]
If you answered agree/strongly agree to question 1:
· time savings
· physical relief
· personal preference
· easier work due to reduction of complexity
· improved monitoring of patient data [protection of patients]
· improved accuracy (less/no mistaken identities)
· other reasons: [free comments]

Table 1. Questionnaire items.

Next, a Japanese version of the questionnaire was developed and confirmed by professional bi-lingual speakers using a translation and back-translation process. This process was completed in June 2018. The questionnaire comprised three items: 1) age group; 2) subjective meaningfulness of digitization for individual nurse's daily work, which was assessed using the statement "To me, digitization in my daily work is a good fit" (response options from strongly agree to strongly disagree); and 3) reasons for the response to item 2. Six possible reasons were listed for those that agreed/strongly

agreed digitization was a good fit, and six for those that disagreed/strongly disagreed (multiple answers were allowed). Free-text comments were invited for “other reasons.” The definition of digitization in healthcare in this survey included: the use of electronic data-processing tools, electronic transmission of vital data, electronic patient records, electronic warehouse orders, video surveillance, and automatic transmission of monitoring data.

We also added explanations for each item on the last page of the questionnaire to help participants answer the questions (Table 2).

For “disagree” / “strongly disagree”
1) Complicated application: It is not about the time employees have to work, it is about the amount of tasks nurses have to do during their shift.
2) Difficult access: It is not only getting access to computers and equipment, it’s also about not having enough computers or computers with a lack of maintenance. Another point could be that staff have problems with their login.
3) Lack of explanation about technology: This could related to factors such as no briefing for new equipment, poor or incomplete explanations.
4) Money could be better used elsewhere: Nurses may think that the money that was used for digitization would be better used to pay another employee or investment in other areas of healthcare.
5) No need: This it could mean that nurses think digitization is not necessary.
6) Development of new systems and equipment too fast: There could be not enough time to get used to the new equipment, development, or working methods. The progress of development could also be too fast, meaning nurses cannot get used to it.
For “agree” / “strongly agree”
7) Time savings: Faster completion of everyday tasks allows more time for patients and human relationships.
8) Physical relief: Less movement between nurses and patient rooms, for example with video surveillance or monitoring.
9) Personal preference: Personal/individual interest and experience in digital media and innovations.
10) Easier work due reduction of complexity: The work becomes less challenging and stressful because of more structure and a better overview. Tasks are easier to deal with.
11) Improved monitoring of patient data: The safety of patients is improved by permanent monitoring of vital data which is immediately transferred to the computers. This reduces the time to react.
12) Improved accuracy: The documentation is readable by every employee. Fewer (or no) cases of mistaken identity.

Table 2. Additional explanations for each item.

### 3.3 Data collection and analysis

After providing written informed consent, participants were asked to anonymously complete the questionnaire (in Japanese), enclose it in a blank envelope and place the envelope into a collection box situated in the locker-rooms. Participants were allowed to withdraw from the survey until it was placed into the collection box. The envelopes were retrieved at the end of November 2018, and checked and translated into English by the

present authors. Data analysis was performed using a statistical application (JMP® 8.0, 2008 SAS Institute Inc). The free-text comments in the questionnaires were translated into English and processed using the KH Corder® text-mining software (KH Corder, <http://kncoder.net/en/>).

## 4. Results

### 4.1 Demographic characteristics

In total, 90 copies of the questionnaire and a briefing document on the survey were distributed, and 71 questionnaires were retrieved. The retrieval rate of valid responses was 77% (50/65) at Mie University Hospital and 84% (21/25) at Kinan Hospital. Participants’ demographic details are shown in Table 3. Kinan Hospital had one participant aged 20–29 years, whereas 80% of participating nurses at Mie University Hospital were aged 20–29 years ( $p < 0.001$ , Pearson’s chi-square test). There were no registered nurses younger than 20 years old.

Demographic variables	Kinan Hospital (n=21)		Mie University Hospital (n=50)		Total (n=71)	
	n	%	n	%	n	%
Age range, years						
Under 20	0	0	0	0	0	0
20–29	1	5	40	80	41	58
30–39	7	33	0	0	7	10
40–49	8	38	4	8	12	17
over 50	3	14	3	6	6	8
blank	2	10	3	6	5	7
Job position						
Staff	18	86	47	94	65	92
Nurse manager	3	14	3	6	6	8

Table 3. Participating nurses’ demographic characteristics.

### 4.2 Subjective meaningfulness of digitization

Responses to the first item (“To me digitization in my daily work is a good fit”) indicated participants in the two hospitals held similar and positive perceptions of digitization (Table 4). Only one nurse at Kinan Hospital checked both “agree” and “disagree,” despite the instructions requesting a single answer.

(n = valid answers)	Strongly agree	Agree	Total	p	
Kinan Hospital (n = 20)	2	18	20	0.2584	n.s.
Mie University Hospital (n = 50)	13	36	50		
Total	15	54	70		
	Pearson’s chi-square test				

Table 4. Participants’ responses regarding the subjective meaningfulness or digitization

### 4.3 Reasons for the perceived meaningfulness of digitization

Participants’ selected reasons for this perception showed similar patterns across multiple possible items. However, “Physical relief” was more commonly selected by nurses at Mie University Hospital than at Kinan

Hospital (Table 5). The pattern of selection of “Other reasons” and corresponding free-text comments differed between the hospitals (Table 5). No nurses from Kinan Hospital provided comments, but more than one-third of those at Mie University Hospital commented. These comments are detailed in Table 6. The analysis using KH Corder® produced a relationship chart and map, although a sufficient amount of words had not been accumulated (Figure 1).

Reasons		Yes	Blank	Total	p
Time saving	Kinan	16	5	16	0.282
	Mie University	44	6	44	
		60	11	71	
Physical relief	Kinan	5	16	21	0.001
	Mie University	34	16	50	
		39	32	71	
Personal preference	Kinan	2	19	21	0.712
	Mie University	8	42	50	
		10	61	71	
Easier work because of reduced complexity	Kinan	10	11	21	0.106
	Mie University	35	15	50	
		45	26	71	
Protection of patients	Kinan	9	12	21	0.613
	Mie University	25	25	50	
		34	37	71	
Improved accuracy	Kinan	14	7	21	0.302
	Mie University	26	24	50	
		40	31	71	
Other reasons	Kinan	0	21	21	0.001
	Mie University	18	32	50	
		18	53	71	

Fisher's exact test

**Table 5.** Comparison based on reasons for the perceived meaningfulness of digitization

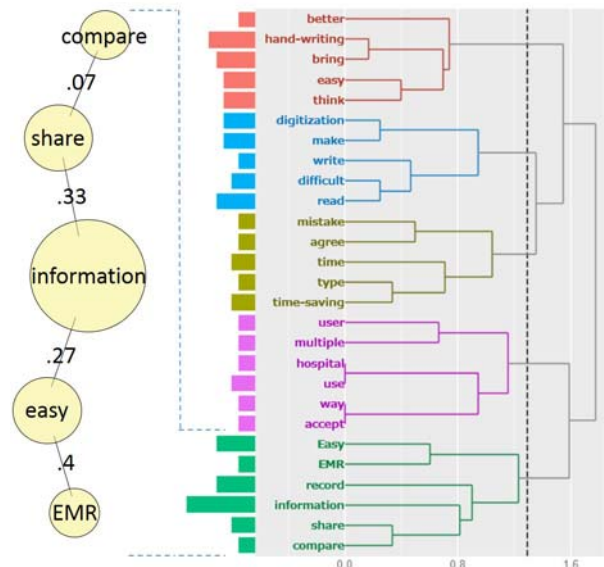
Comments translated into English
Easy to manage the records. I have no feeling of wrongness, because I have been using the system since I began the job at the hospital.
I didn't say "disagree." But actually, I have been accepting the digitization [as] that's the way it is. It may be time-saving, but it may be time consuming when I make a mis-typing. It becomes physical burden. My eyesight has deteriorated.
Compared with paper records, I think that electronic records are easy to share the latest information among medical staff.
Digitization has no information mistake caused by hand-writing, which someone may make it difficult to be read. But, depending on the contents, nurses need to type them after polishing hand-written notes. In such cases, it means doing it all over again and it's not always time-saving. So, I selected "agree" instead of "strongly agree."
Digitization makes things easy to read and brings less misunderstanding! (Hand-writing sometimes makes it difficult to read what was written.)
Easy to collect and read the information in the systematic arrangement of EMR
Easy to get the patient's old information.
Easy to review what I recorded on EMR.
Easy to share the information [and] increases work efficiency.
Electronic records can store a large amount of information and can provide it to be seen immediately.
Quickness of sharing information. Compared with papers, less risk to be lost or damaged.
I accepted to use digitized equipment, because I have been using the system since I entered the hospital. I think it brings less mistakes than hand-writing, and it seems to be easy to trace, when the user looks for information precisely all the way.
I think that digitization is better than hand-writing, which sometimes brings mis-reading.
It is time-saving when I feel easy to type, while it may become time-consuming when I have no time to record. Typing gives me tired eyes, which is the demerit for me. But I think it's better than hand-writing.
Its convenience is to be seen by multiple users simultaneously and to be delivered as coded data.
Multiple healthcare professionals can see the information at the same time.
Quirky hand-writing brings misunderstandings.
There is nothing difficult to read what was written.

EMR, electronic medical records.

**Table 6.** Comments left to explain “Other reasons”

## 5. DISCUSSION

This survey showed that most nurses perceived positive meaningfulness of digitization, which reflected their



**Figure 1:** Relationship chart and map from the KH Corder® analysis

direct use of electronic medical records in clinical nursing. Most agreed or strongly agreed that digitization was a good fit in their daily clinical work, and many left positive comments (Table 6). However, there might have been some differences in meaningfulness depending on participants' age or the situation in each hospital. For example, one hospital was a large national-university hospital (685 beds, mostly for acute patients), with responsibility for educating young healthcare professionals. The other was a medium sized hospital (244 beds, 140 for acute patients) located in a rural area, with responsibility for the regional integrated community care system. The situation of each hospital may also explain the different age distribution of participants at the two hospitals, as young nurses tended to be good at using digitization equipment and responded well in terms of leaving comments. Older nurses may not be able to perceive the advantage of digitization in terms of physical relief, partly because of unfamiliarity with such equipment, although this may not be the case for well-trained nurses [10]. Acute situations may explain the higher rate of use of electronic health records than institutions for chronic patients in the USA [11].

Digitization has two different aspects. First, it has a high ability to discriminate letters and efficient sharing of information. For example, the KH Corder® analysis showing the relationships among the free-text comments suggested “information” was at the center, surrounded by “share” and “easy” (Figure 1). The second aspect is low permissible ambiguity, which depends on human literacy in handing equipment. Therefore, consideration for older

professionals is important in using such systems [8]. In addition, young people may have different levels of ICT literacy, which may deteriorate with heavy workloads and tiredness. Managers may also need to keep in mind that digitization has not always been handled in ideal ways [5-9]. We are awaiting a comparison between data from our hospitals and data from Freiburg.

Limitation of the study: This survey had a small sample size (n=71) and collected data from two hospitals in the same prefecture. This limits the generalizability of the findings. However, our study offers an exploratory survey on an important topic in clinical nursing.

## 6. CONCLUSION

Nurses at two hospitals in Japan positively responded to the statement that “To me digitization in my daily work is a good fit.” However, meaningfulness of digitization may differ depending on nurses’ age or the situation in their hospital.

## 7. AUTHOR CONTRIBUTIONS

All authors are responsible for the study conception. M.S., S.H., T.K., S.T., E.D., and Y.N. designed the study methodology and undertook data collection, analysis, and interpretation. All authors made critical revisions of the manuscript for important intellectual content. All authors approved the final version of the manuscript.

## 8. CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest with regard to this study.

## 9. ETHICAL APPROVAL

This study was approved by the Kinan Hospital Research Ethics Committee on June 26, 2018 (No.2018-013), and the Mie University Hospital Research Ethics Committee on October 25, 2018 (No. U2018-019).

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