

Front-Line Physicians' Satisfaction with Information Systems in Hospitals

Laura-Maria PELTONEN^{a,1}, Kristiina JUNTILA^{a,b} and Sanna SALANTERÄ^{a,c}

^a*Department of Nursing Science, University of Turku*

^b*Group Administration, Helsinki University Hospital, Helsinki, Finland*

^c*Developmental Services, Turku University Hospital*

Abstract. Day-to-day operations management in hospital units is difficult due to continuously varying situations, several actors involved and a vast number of information systems in use. The aim of this study was to describe front-line physicians' satisfaction with existing information systems needed to support the day-to-day operations management in hospitals. A cross-sectional survey was used and data chosen with stratified random sampling were collected in nine hospitals. Data were analyzed with descriptive and inferential statistical methods. The response rate was 65 % (n = 111). The physicians reported that information systems support their decision making to some extent, but they do not improve access to information nor are they tailored for physicians. The respondents also reported that they need to use several information systems to support decision making and that they would prefer one information system to access important information. Improved information access would better support physicians' decision making and has the potential to improve the quality of decisions and speed up the decision making process.

Keywords. Hospital, information system, operations-management, physician, satisfaction, survey

1. Introduction

Day-to-day operations management in hospital units is challenging due to frequently varying situations, several actors involved and a vast number of information systems in use. The terminology around health information systems is not constant or well defined, but it includes a variety of information systems available to assist organizations to gather, process and disseminate information in the health care setting, such as electronic health records (EHRs), administrative systems and order entry systems [1]. Several frameworks exist for the evaluation of health information systems. Most of these cover five aspects including: 1) who the system is developed for (e.g. physicians), 2) what content is assessed (e.g. usability), 3) how the assessment is done (e.g. qualitative methods), 4) when the assessment is done (e.g. formative), and 5) why the assessment is done (e.g. efficiency), however, there is a lack of consensus about how these aspects should be adopted [2]. Although the evidence is mixed, health information systems are associated with improved efficiency, higher quality of care and better productivity, as well as lower costs [1].

¹ Corresponding Author, Laura-Maria Peltonen, Department of Nursing Science, 20014 University of Turku, Finland; E-mail: laura-maria.peltonen@utu.fi.

Unit managers are typically responsible for the day-to-day operations during normal office hours, but beyond this time other clinicians, such as registrars, takeover the responsibility [3]. Implementation and use of information systems is not trivial. Physicians have reported poor usability with current clinical information systems that have impeded the physician's routine work by badly supporting documentation and retrieval of patient related information, and a lack of integration between different systems [4]. Additionally, only 25 % of physicians were very satisfied following electronic medical record adoption in a study conducted in Massachusetts, and this satisfaction was associated with the ease of the implementation, the resources available for practice improvement, pre-intervention satisfaction and stress [5]. Further, physicians' satisfaction with the usability of EHRs has not been high nor has it improved much in recent years in Finland [6]. Several issues have also been identified to challenge successful adoption of EHRs in a study conducted in France, including system usability, system performance, training, issue resolution, regulatory compliance, awareness of roles and processes, physician involvement, leadership support, and collaboration between stakeholders [7]. One study even showed an increase in satisfaction when returning to paper based provider order entry system [8]. There is however one study from China where up to 70.7 % of the respondents were considered to be satisfied with the electronic medical record with an overall satisfaction mean of 2.3 on a scale ranging from one (strongly agree) to five (strongly disagree) [9]. Although, a stronger satisfaction with the information system would probably support the clinicians even better.

Nonetheless, studies exploring physicians' satisfaction with clinical information systems have shown needs for improvement. However, studies exploring physicians' satisfaction with all information systems used by them in hospitals are lacking. As the day-to-day operations management in hospital units is characterized with suddenly changing situations and ad hoc decisions [10], fast and easy access to important information is crucial to support decision making and enable safe and smooth care processes. The aim of this study was to describe front-line physicians' satisfaction with existing information systems needed to support the day-to-day operations management in hospitals. The findings can be used to develop information systems to better support the day-to-day operations management in hospital units.

2. Methods

We conducted a cross-sectional survey in nine Finnish hospitals. Three were university hospitals and the remaining six were central hospitals. We targeted physicians who were in charge of the day-to-day management of a hospital unit. The respondents were from emergency departments, radiology departments, inpatient wards and procedure units (e.g. angiographic units, critical care units and operating departments). Cardiac, trauma, acute gastrological and gastro-surgical, neurological and neurosurgical patients were cared for in these units.

The sampling technic was stratified. We divided the country into three geographical parts. One university hospital and two central hospitals were randomly selected from each part. The physician responsible for the unit was often a unit manager during normal office hours, however, during evenings, nights and weekends, the person responsible could be a consultant or a registrar.

Data were collected with a paper based questionnaire. The demographic questions included age, gender, work experience, unit, the patient groups cared for in the

respondent's unit, the number of patient beds or number of patients treated per day, and the time of day when the respondent was responsible for the unit. The questionnaire included six questions exploring satisfaction with current information systems. These were the following: 1) Current information systems support my decision making, 2) current information systems improve ease of access to information, 3) current information systems improve speed of access to information, 4) current information systems are developed to support my work, 5) I use numerous information systems on a daily basis to support my decision making, and 6) I would prefer to use one information system, which would gather all important information into one display. These questions were rated on a five point Likert-type scale (1 = disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, 5 = fully agree). Data collection was coordinated in each hospital by a local assistant. Data collection started in September 2015 and lasted until May 2016.

Descriptive statistics are presented with medians and interquartile ranges (IQR). An overall sum variable was calculated for all questions, by adding up responses to each question and dividing it with the total number of answered questions. The associations with gender, type of hospital, unit, work experience and the time of day when the physician was responsible for the unit on the satisfaction sum variable were determined with a linear model. The linear model results are reported with adjusted means and standard errors. P-values less than 0.05 (two-tailed) were considered significant. Data were analyzed with SPSS 24 for Windows (IBM Corp., Armonk, N.Y., USA).

An ethical statement was received from the Ethics Committee of the University of Turku (18/2014, 16/2015). Administrative approvals were obtained from all hospitals. Responding to the survey was considered as informed consent.

3. Results

The response rate was 65 % (n = 111). Most of the respondents were male (60 % (n = 63) male vs. 40 % female (n = 42)) and 58.6 % (n = 70) worked in central hospitals while 41.4 % (n = 41) worked in university hospitals. Their median age was 41 years (IQR 35–48, n = 109), ranging from 26 to 62 years. They had a median of 15 years of work experience (IQR 9–22, n = 97) ranging from 1 to 40 years. Their median for managerial experience was 5 years (IQR 2–10, n = 65) ranging from 0 to 27 years. Altogether 19.2 % (n = 19) worked in emergency departments, 22.2 % (n = 22) worked in radiology departments, 30.3 % (n = 30) worked on inpatient wards, and 28.3 % (n = 28) worked on procedure units. 60.6 % (n = 63) were responsible for a unit during normal office hours (i.e. 8 a.m. to 4 p.m.), and 23.1 % (n = 24) were responsible for a unit beyond normal office hours. A smaller group 16.3 % (n = 17), was responsible for the unit both during normal office hours and beyond. The unit sizes varied. The respondents reported their units to have patient beds from five to sixty with a median of 23 beds (IQR 19–32). The reported median for the number of patients cared for in a unit was 60 per day (IQR 30–170) ranging from 3 to 318.

The physicians reported that current information systems support their decision making to some extent, but they do not improve access to information nor do they seem to be tailored for physicians as displayed in table 1. The respondents also reported that they need to use several information systems to support their decision making on a daily basis (median 4, IQR 3–5, n = 110) and that they would prefer one information system

that would collect all essential information into one display (median 5, IQR 4–5, $n = 111$).

Table 1. The physicians' satisfaction with current information systems presented with medians and interquartile ranges.

Characteristics of used information systems	n =	Median*	IQR
It supports decision making	111	4	3–4
It eases access to information	111	3	2–4
It speeds up access to information	109	3	2–4
It has been developed to assist me	110	2	2–3

* Medians signify: 1 = disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, 5 = fully agree

There was no association with gender (female adjusted M 2.40 (SE 0.14) vs. male adjusted M 2.48 (SE 0.12), $p = 0.645$), unit (emergency department adjusted M 2.19 (SE 0.21), radiology department adjusted M 2.84 (SE 0.20), procedure unit adjusted M 2.46 (SE 0.15), inpatient ward adjusted M 2.26 (SE 0.16), $p = 0.059$), time of day when the respondent was responsible for the unit (normal office hours adjusted M 2.55 (SE 0.11), beyond normal office hours adjusted M 2.17 (SE 0.16), both normal office hours and beyond adjusted M 2.59 (SE 0.21), $p = 0.137$), work experience (0–10 years adjusted M 2.54 (SE 0.21), 11–20 years adjusted M 2.54 (SE 0.14), 21–30 years adjusted M 2.46 (SE 0.17), 31–41 years adjusted M 2.21 (SE 0.19), $p = 0.516$), or type of hospital (university hospital adjusted M 2.34 (SE 0.14), central hospital adjusted M 2.54 (SE 0.12), $p = 0.212$) with the satisfaction overall sum variable.

4. Discussion

The findings of this study reflect a need for information management improvements and better access to important information for physicians responsible for the day-to-day operations management in hospitals. The findings are in line with earlier research reporting dissatisfaction with clinical information systems [4, 5, 6, 7]. Further, this need for improvement seems to exist throughout the hospital in both university and central hospitals as the need was not associated with any of the characteristics of the respondents. Improved access to important information would better support physicians' decision making and has the potential to improve the quality of decisions as well as speed up the decision making process.

The hospital day-to-day operations management needs advanced information management that fully supports the responsible decision makers. Determining important information necessary for physicians in the day-to-day operations management would enable the development of user tailored information systems that would increase access to important information while decreasing information overload. This however requires an increase in the collaboration with system developers and clinicians [7].

This study is limited by the simplicity of the survey and a more detailed questionnaire could have provided more qualitative data about specific issues that need improvement. This study does however give insight to physicians' satisfaction with contemporary information systems used in hospitals. Regardless of the research about existing information system implementations in the clinical setting, little evidence exists on how to best support physicians' decision making in the day to day operations

management. Therefore, research is needed to further develop information systems based on the users' needs and to assess the impact of these systems on the physicians day-to-day operations management in hospitals.

5. Acknowledgements

The authors wish to thank the physicians who participated in the study, the research coordinators of the hospitals and the data manager. Funding was received from The Finnish Work Environment Fund [grant number: 114249].

References

- [1] J. Sligo, R. Gauld, V. Roberts, L. Villa, A literature review for large-scale health information system project planning, implementation and evaluation, *International Journal of Medical Informatics* **97** (2017), 86-97.
- [2] A.E. Andargolia, H. Scheepers, D. Rajendran, A. Sohal, Health information systems evaluation frameworks: A systematic review, *International Journal of Medical Informatics* **97** (2017), 195-209.
- [3] S. Craig, & J. Dowling. Registrar in charge shifts: learning how to run a busy emergency department, *Emergency Medicine Australasia* **25** (2013), 168-174.
- [4] J. Viitanen, H. Hyppönen, T. Lääveri, J. Vänskä, J. Reponen, I. Winblad, National questionnaire study on clinical ICT systems proofs: physicians suffer from poor usability, *International Journal of Medical Informatics* **80** (2011), 708-25.
- [5] L. Heyworth, F. Zhang, C.A. Jenter, R. Kell, L.A. Volk, M. Tripathi, D.W. Bates, S.R. Simon, Physician satisfaction following electronic health record adoption in three massachusetts communities, *Interactive Journal of Medical Research* **1** (2012), e12.
- [6] J. Kaipio, T. Lääveri, H. Hyppönen, S. Vainiomäki, J. Reponen, A. Kushniruk, E. Borycki, J. Vänskä, Usability problems do not heal by themselves: National survey on physicians' experiences with EHRs in Finland, *International Journal of Medical Informatics* **97** (2017), 266-281.
- [7] M. E. Huang, IT Is From Mars and Physicians From Venus: Bridging the Gap, *PM & R: the Journal of Injury, Function, and Rehabilitation* **9** (2017), S19-S25.
- [8] N. Griffon, M. Schuers, M. Joulakian, M. Bubenheim, J.P. Leroy, S.J. Darmoni, Physician satisfaction with transition from CPOE to paper-based prescription, *International Journal of Medical Informatics* **103** (2017), 42-48.
- [9] L. Jia-lin, L. Siru, L. Fei, Physician satisfaction with electronic medical record in a huge hospital (China), *Studies in Health Technology and Informatics* **192** (2013), 920.
- [10] H. Lundgrén-Laine, E. Kontio, J. Perttilä, H. Korvenranta, J. Forsström, S. Salanterä, Managing daily intensive care activities: an observational study concerning ad hoc decision making of charge nurses and intensivists, *Critical Care* **15** (2011), R188.