



# Nurse Managers' Opinions of Information System Support for Performance Management: A Correlational Study

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## Abstract

**Background** Current information systems do not effectively support nurse managers' duties, such as reporting, resource management, and assessing clinical performance. Few performance management information systems are available and features in many are scattered.

**Objectives** The purpose of the study was to determine nurse managers' opinions of information system support for performance management.

**Methods** An online questionnaire was used to collect data from nurse managers ( $n = 419$ ). Pearson's correlation coefficients and linear regression were used to examine the relationships between variables, which were nurse managers' ability to manage resources, to report and evaluate productivity, and to assess nursing performance and clinical procedures.

**Results** More than half of the managers used performance management systems daily. Managers (60%) felt that they can use information systems to follow the use of physical resources, and in general (63%), they felt that it is easy to perform searches with the systems used for following up activity. Nurse managers' ability to manage resources, to report productivity, and to assess nursing care performance were correlated significantly with each other.

**Conclusion** Currently, managers have to collect data from various systems for management purposes, as system integration does not support performance data collection. The availability of continuous in-service training had a positive effect on information system use.

## Keywords

- ▶ health information technology competencies
- ▶ health information technology
- ▶ in-service training
- ▶ management information systems
- ▶ nurse manager

## Introduction

Health care service providers are under constant pressure to provide meaningful services to citizens based on their needs and expectations. Nurse managers work on the

frontline of service provision, and their responsibilities vary slightly based on their title, role, and place of service. Whether acting as a chief executive or chief nursing officer, nursing director, head nurse, or unit manager, their aim is to manage resources, guarantee proficient care, maintain a

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healthy work environment and advance safety, quality, and efficacy outcomes.<sup>1</sup> As in all managerial roles, nurse managers in executive roles, middle management, and daily leadership have demands on their time, extensive human resource, and fiscal responsibilities and numerous competing duties.<sup>2</sup> Management duties involve high demands from both strategic and clinical level operations. Thus, nurse managers' need for data to manage nursing services across levels is obvious, although the data sources in databases for decision-making may vary and be scattered or scarce.<sup>3</sup> However, a review of nursing management information systems found that they provided user satisfaction, time-saving, and usefulness for nurses.<sup>4</sup>

In many countries, the use of electronic information systems is an integral part of daily nursing practice, and nurses may need to access a variety of systems to record patient data.<sup>5</sup> The aim of information systems designed for nursing management is to provide a large variety of information and support in decision-making and planning. Thus, these systems should be integrated into other hospital information systems to extract the required data. Performance management information systems (PMISs) use data from various databases in hospitals, which makes the quality of data challenging.<sup>3,6</sup> Previous studies have reviewed the requirements for PMISs and found the following features to be important: patient care management, timely evaluation and reporting productivity, safety, staffing, and workload measurement, and the management of human, financial, and physical resources.<sup>6,7</sup> Systems should include analysis and forecast options to reveal trends, facilitate long-term planning, and optimize costs.<sup>7</sup> These features and functionalities are central, and nurse managers and leaders play a role in all aspects of decision-making surrounding the strategic direction, procurement, selection, implementation, use, and evaluation of such technologies.<sup>2</sup> Additionally, the long list of features of a performance management information system, whether being developed for nursing management or for leadership actions, also serves performance management for quality control and for quality improvements in organizations.<sup>8,9</sup>

PMIS had a positive effect on monitoring and improving the performance of clinical departments in a large general hospital.<sup>3</sup> Before implementing the PMIS, it was important to develop data exchange, resource sharing, and interoperability and to unify the management of heterogeneous information systems. Studies have focused on nurse managers' opinions on the effects of electronic information systems on their daily work, concluding that managers wished to increase their overall use of information in daily management.<sup>3,4,10</sup> Thus, it is not only the systems' functionalities that matter, but the data and information the systems aggregate for decision-making. Managers' information needs have been summarized at strategic, tactical, and operational levels,<sup>11-13</sup> and needs for information system support for decision-making in daily management have been identified, revealing a need to improve the flow of information and specify more exact data structures and system features.<sup>14</sup>

In addition to their own information system needs, nurse managers have a supportive role in electronic health information system implementation.<sup>15</sup> A variety of electronic

tools and information systems are used daily in health care settings. Many studies have focused on nurses' opinions of the support of electronic health information systems on their daily work. Results have summarized acceptance, needs for cooperation, and facilitators and barriers to use.<sup>16</sup> Much criticism has focused on usability issues, as nurses feel that health information systems do not follow the information flow of the patient care process<sup>4,17</sup> and that they lack functionality and the same patient data need to be recorded several times.<sup>9,18</sup> Much research has studied the implementation phase of electronic health and patient record systems, so feedback may occasionally be unfair, as respondents may lack confidence, the skills and knowledge to use systems, and experience of newly implemented systems.<sup>5,19</sup> However, during information system implementation, there may be positive impacts of leaders engaging in follow-up activities, such as assisting in the removal of barriers and taking a proactive approach during resistance, requesting updates, and providing feedback through performance data.<sup>3,20</sup>

Studies related to information systems and managerial work have often focused on support for strategic planning and the scheduling of resources concluding deficiencies in interoperability and usability issues.<sup>13,14,21</sup> Competencies managers and leaders need to use health information technology have been less well studied.<sup>2,22</sup> Overall, health information technology competencies are often categorized as requiring basic, intermediate, or advanced skills in using information systems.<sup>23</sup> Today, these competencies are integrated into basic nursing education, but based on skew age distribution, many nurses (age 40+) including managers lack information system literacy.<sup>2,22,24,25</sup> In health care, many systems are used daily, so induction and in-service training are important means to guarantee that professionals use systems safely and securely.<sup>2,7,18,24</sup> However, regardless of competency level, being forced to use various systems and a lack of interoperability between the systems causes frustration for managers.<sup>10,17</sup> In Finland, the features of PIMS are distributed throughout several different information systems.<sup>12</sup> Especially information features and functionalities of systems to monitor and evaluate timely nursing care performance and to report productivity are lacking.<sup>10,12,14</sup> Better outcomes of performance management system use can be achieved through nurse managers' engagement as end-users in the multidisciplinary system specification and development.<sup>4,6,7</sup> More information is needed on the information system support of nurse managers' roles and responsibilities to be able to develop the current status of information systems in Finland with respect to PMIS.<sup>10,24</sup>

## Objectives

The purpose of this study was to determine nurse managers' opinions of information system support for performance management. The study aimed to answer the following questions:

1. How do nurse managers assess information system support for managerial work?

2. How are performance management system features (those used to assess nursing performance and clinical procedures, manage resources, and provide timely evaluation and reporting) related to each other?
3. What is the relationship between managers' demographics and their opinions on using information systems to support performance management?

This research was part of a wider study, 'Monitoring health and social care information systems and services', (STePS 3.0) in Finland.<sup>24</sup> Results of this study can be used in the development of performance management information systems (PMISs) used in daily nursing management. The voice of nurse managers as experts of care processes is important, as many information systems provide scattered data which cause delays in decision-making due to a lack of proactive data.<sup>14</sup>

## Methods

### Design, Sample, and Setting

A national survey of Finnish nurses was conducted in spring 2020 as part of the national eHealth strategy evaluation.<sup>24</sup> Nurses participated in the follow-up survey for a second time. The present 44-item standardized questionnaire was based on earlier studies and assessed health professionals' opinions of information system functionality, usability, and support for daily practice as well as the current status of electronic health record (EHR) usage in Finland.<sup>22,24,26</sup> Respondents rated items on a 5-point Likert scale from 1 (strongly agree) to 5 (strongly disagree) and answered multi-choice and open-ended questions. Respondents could also indicate that they had no opinion. The present questionnaire was tested by 20 nurses. The pilot test was aimed at questions of phrasing and wording and the generic functionality of the questionnaire. No statistical tests were conducted. Clarifications were made as necessary.

To reach the relevant population of nurses and strengthen privacy issues, the questionnaire was sent by the Finnish Nursing Association, the National Association of Health and Welfare Professionals, and the National Professional Association for the interests of experts and managers in health care. The link to the electronic questionnaire provided by the researchers was sent to members of the associations under 65 years of age, a total of 58,276 practicing nurses. This represents 72% (58,276/80,622) of the eligible population of nurses. Statistics show that 80,622 nurses, including midwives and public health nurses, work in the health and social sectors, and they represent the theoretical target group.<sup>26</sup> The agreed consent to participate in the study was given based on the first question in the electronic questionnaire. A total of 10,094 nurses opened the link, and 3,610 nurses responded to the survey, representing 6.2% (3,610 out of 80,622) of the theoretical sample and 36% (3,610 out of 10,094) of those who opened the survey link sent by the associations.

From these data, the responses of 419 nurse managers working in the health sector in Finland were extracted for this study, representing 11.6% (419 out of 3,610) of the

respondents. All nurses who appraised their profession as managerial (head nurses, chief nursing officers, directors of nursing, assistant nurse managers, administrative nurse managers and clinical nurse specialists) to oversee unit operations in the public (hospitals, primary care, and social care) and private health and social care sectors were included in the study. We did not exclude any nurses, as in Finland, nurses in management and leadership positions do not usually participate in direct patient care, but clinical nurse specialists, for example, work closely with nurses in development and follow-up activities.<sup>25,27</sup> In Finnish public health care, EHR coverage has been 100% since 2007.<sup>28</sup> Over 20 EHR brands are used in different health and social care settings.<sup>24</sup>

Data were exported from the Webropol survey tool to Stata/IC 15.1 for Windows. The sample was considered representative, as it corresponded with population age and gender distributions. After cleaning the data and checking for inconsistencies, we examined it using descriptive statistics.

### Instruments

The background variables ( $n = 5$ ) describe the demographics of nurse managers, five variables delineate nurse managers' knowledge and experience in information system use with grading scales, and five variables present nurse managers' opinions on induction and in-service training received with Likert scales. Twelve variables grouped under the theme "information system support for management" in the questionnaire were used to compile dependent variables based on the literature review of Fathian and colleagues<sup>7</sup> indicating the tasks performed by nursing management information systems: the assessment of nursing performance and clinical procedures, the management of resources, and the provision of timely evaluation and reporting, referred to as "nursing," "managing," and "reporting," respectively.<sup>24</sup> Cronbach's alphas were calculated, and adjustments were made to the constructs until working solutions (theory wise and number wise) were met. Definitive Cronbach's alphas were then calculated. All alphas were above the desired limit of 0.7, the lower-bound estimate of reliability, so we continued to calculate variables as the means of answers.<sup>29</sup> Variables ranged from "strongly agree" (1) to "strongly disagree" (5) and were reversed to aid interpretation, so a positive regression coefficient signified a positive outcome. Variables, descriptive statistics, and Cronbach's alphas are shown in [Table 1](#).

Independent variables were used as no transformations or calculations were made. Descriptive statistics are shown in [Tables 2–4](#).

### Data Analysis

To examine the relationship between sum variables, we used Pearson's correlation coefficient. Then, multivariable linear regression models were used to examine relationships between variables. We made identical models for all three dependent variables to examine their commonalities and differences.<sup>30</sup> We used listwise deletion, so the number of observations differed from model to model. In Stata/IC 15.1 for Windows software, the listwise deletion option excludes respondents from analysis if any single value is missing.

**Table 1** Features of performance management information systems (PMIS)

	<i>n</i>	median	IQR	min	max
Assessing nursing performance and clinical procedures ( $\alpha = 0.751$ )					
Information systems have improved the efficacy of my unit in the last few years.	249	3	2	1	5
I use some systems facilitating follow-up of activity every day	286	3	2	1	5
Follow-up data provided by the systems is reliable.	273	3	2	1	5
Information systems facilitate measurement and monitoring the quality of operations.	282	3	2	1	5
Managing resources ( $\alpha = 0.714$ )					
I can use information systems to follow the use of physical resources, for example, equipment.	242	5	1	1	5
I can use information systems to follow the use of facilities, for example, number of beds.	251	3	3	1	5
I can use information systems to follow the use of human resources.	280	3	2	1	5
Information systems help me to monitor the achieving of the targets set by my unit (e.g., numbers of patients, periods of treatment, types of operations).	279	2	2	1	5
Providing timely evaluation and reporting ( $\alpha = 0.713$ )					
It is easy to perform searches with the systems used for following up activity.	262	4	1	1	5
The notifications provided by the system are useful.	329	3	2	1	5
The number of notifications from information systems is appropriate.	334	3	2	1	5
It is easy to obtain necessary patient information using the information system.	404	2	2	1	5

**Table 2** Demographic of nurse managers

Variable	<i>n</i>	%
Age (mean 48.76, SD 9.86)	419	
Gender	414	
Male	29	7.0
Female	385	93.0
Education	419	
RN, postsecondary education	147	35.1
RN, bachelor's in health care	144	34.4
RN, master's in health care	75	17.9
Bachelor's in nursing science (university degree)	12	2.9
Master's in nursing science (university degree)	41	9.8
Employer	419	
Public hospital	171	40.8
Public health center	82	19.6
Private health services	29	6.9
Social care	106	25.3
Not known	31	7.4
Position	406	
Chief nursing officer	21	5.2
Head nurse	189	46.6
Assistant head nurse (other leadership position)	102	25.1
Clinical nurse specialist	94	23.2

Abbreviations: RN, registered nurse; SD, standard deviation.

## Results

The mean age of nurse managers was 49 years, 40% (171 out of 419) worked in public hospitals, and 93% (385 out of 414) were female. Characteristics of the study sample are presented in **Table 2**. Most (210 out of 406, 52%) were unit managers or head nurses in middle management, 25% (102 out of 406) were in other leadership positions, and 23% (94 out of 406) were clinical nurse specialists. More than half the managers were bachelor-level registered nurses (RNs), more than a third of respondents had postsecondary RN education, and 10% (41/419) had a university master's degree in health care or nursing science.

In terms of information system support for assessing daily performance and clinical procedures, nurse managers (249 out of 419, 60%) assessed that information systems have improved the efficacy of their unit. However, they did not agree (279 out of 419, 67%) that information systems help them to monitor the achievement of the targets set by their unit (e.g., numbers of patients, periods of treatment, and types of operations). Managers had concerns regarding the ability of information systems to facilitate and monitor the quality of operations (282 out of 419, 70%) (**Table 1**). Half of the managers (236 out of 419, 56%) had used the systems for more than 3 years and 17% rated their skill level in using information systems as average (63 out of 406). Most managers (318 out of 419, 79%) assessed their skills as experienced or very experienced. Most managers (277 out of 406, 68%) logged into one or two different information systems during their daily work. Some (28 out of 406, 7%) had to log into five or more systems daily (**Table 3**).

More than half the managers (241 out of 418, 57%) felt that they had received enough orientation to changes in practice

**Table 3** Knowledge and experience in information system use

Variable	n	%
How well do you feel you master skills required to use information system	406	
Beginner	7	1.7
Elementary	18	4.4
Intermediate	63	15.5
Experienced	160	39.4
Very experienced	158	38.9
Computer literacy	404	
Weak	4	1.0
Moderate	37	9.2
Good	159	39.4
Excellent	204	50.5
Experience using systems	419	
Less than 6 mo	53	12.6
6 months to less than a year	35	8.4
1 to 3 yr	95	22.7
3 to 6 yr	61	14.6
More than 6 yr	175	41.8
Number of daily systems logins	406	
None	2	0.5
One	167	41.1
Two	108	26.6
Three	59	14.5
Four	22	5.4
Five or more	28	6.9
Did not participate in nursing	20	4.9
Participate in information system development	406	
I have time to participate in information system development	54	13.3
I participated in information system development in addition to my own work	131	32.3
Did not participate	221	54.4

caused by the implementation of new information systems. Half the managers (192 out of 381, 50%) disagreed that they had received a good introduction to the use of the information system as new staff members. In-service training was available regularly for 40% of managers. More than half (163 out of 277, 59%) used information systems daily for follow-up activities. Most managers (218 out of 280, 78%) had to collect data from various systems (→Table 4).

In these data, the sum variable Nursing describes the assessment of nursing performance, for example, efficacy and quality of clinical procedures. Nursing correlated quite strongly with the sum variable Managing in describing information system use for managing resources, for example, human, equipment, or number of beds ( $r = 0.638$ ). Managing

**Table 4** Opinions on induction and in-service training received

Variable	n	%
I have received enough induction training to use information systems	419	
Strongly disagree	40	9.9
Disagree	90	22.3
Neither agree nor disagree	33	8.2
Agree	176	43.6
Strongly agree	65	16.1
As a new employee, I received a good introduction to information system use	381	
Strongly disagree	92	24.2
Disagree	100	26.3
Neither agree nor disagree	54	14.2
Agree	100	26.3
Strongly agree	35	9.2
In-service training is available constantly	393	
Strongly disagree	69	17.6
Disagree	117	29.8
Neither agree nor disagree	54	13.7
Agree	115	29.3
Strongly agree	38	9.7
I use some systems facilitating follow-up of activity every day	277	
Strongly disagree	31	11.2
Disagree	46	16.6
Neither agree nor disagree	37	13.4
Agree	88	31.8
Strongly agree	75	27.1
I have to collect performance management data from several information systems	280	
Strongly disagree	10	3.6
Disagree	30	10.7
Neither agree nor disagree	22	7.9
Agree	91	32.5
Strongly agree	127	45.4

( $r = 0.509$ ) also correlated significantly with Reporting in describing system functionalities for timely evaluation, for example, searches, alerts, or accessibility, but the association was weak ( $r = 0.352$ ; →Table 5).

Results of the three regression analyses are summarized in →Table 6. Good computer literacy and being employed in social care had positive associations with all features of the PMIS. The claim “I use some systems facilitating follow-up of activity every day” also had a positive association with all features. The claim “I have received enough in-service training to use information systems” was positively associated with Nursing and Reporting but not with Managing. Further, the claim “I use some systems facilitating follow-up of

**Table 5** Intercorrelations of dependent variables

	Assessing nursing performance and clinical procedures	Managing resources	Providing timely evaluation and reporting
Assessing nursing performance and clinical procedures	1		
Managing resources	0.638 <i>n</i> = 290	1	
Providing timely evaluation and reporting	0.509 <sup>a</sup> <i>n</i> = 292	0.352 <sup>a</sup> <i>n</i> = 291	1

activity every day” had a strong association with Nursing and Managing. Finally, the claim “In-service training is available constantly” had a strong positive association with Nursing and Managing.

### Discussion

The purpose of the study was to determine nurse managers’ opinions of information system support for performance management. PMIS features were defined based on the systematic review by Fathian and colleagues.<sup>7</sup> Based on our findings, the current information systems nurse managers used had PMIS features to assess nursing performance and clinical procedures, manage resources, and provide timely evaluation and reporting. However, it seems that system support is not very useful in nurse managers’ work, as they need to use various systems daily to have timely information. This study confirmed that the systems were not effectively integrated, and data had to be extracted from various databases as described in earlier studies.<sup>3,7,9,31</sup> Assessment of nursing performance and clinical procedures, as well as resources management, is operations nurse managers do constantly.<sup>10,12</sup> With advanced system integration and interoperability, nurse managers would get better support from various information systems, especially when nursing performance and clinical procedures depend on available resources. Further, current information systems only provide timely data; they lack the functionalities to use data for forecasts.<sup>7</sup> These functionalities would facilitate the use of performance data not only for daily management but also for strategic planning.<sup>18</sup> The theme of this study is topical in Finland, as due to the national reform, the previous regional health and social services will be provided on the basis of the county from 2023 onwards. This means that information systems will require modifications not only for patient data management but also to provide managerial data for governance.<sup>28</sup> Thus, information before this renewal is crucial to be able to assess the change.

#### Nurse Managers’ Opinions of Information System Usage

Nurse managers were very experienced users of information systems. Almost half of nurse managers had used information systems for more than 6 years. Most respondents logged into one or two and some even five or more different

information systems during their daily work. Even so, our study suggests that the active use of various systems demonstrated positive outcomes, as almost all nurse managers assessed their knowledge and skills as good or excellent. Induction and in-service training were highlighted in terms of the implementation of new information systems and the need to guarantee the safe and secure use of the systems.<sup>2,7,19,22–24</sup> In this study, a third of the respondents felt that, as new staff members, they had received a good introduction to information system use. Fewer than half felt that in-service training was regularly available. More than half felt that they had received sufficient orientation to required changes in practice when using the information systems. However, they felt that, as new employees, they did not receive a good introduction to information system use. Thus, it seems that the timing for induction is very important for the use of information systems to assess nursing performance and clinical procedures, manage resources, or provide timely evaluation and reporting. Overall, in terms of information system use for nurse managers’ managerial work, half of the managers used the systems daily. Resource management features should provide information for planning procedures<sup>14</sup> and in this study, half of the managers used information systems to follow the use of physical resources, for example, equipment. Furthermore, more than half of the managers felt that information systems do not help to monitor the achievement of the targets (e.g., numbers of patients, periods of treatment, and types of operations). Nursing intensity measures have been used for resource allocation for decades, and in many countries, special software and information systems are used to collect nursing intensity data.<sup>31,32</sup> In this study, the claim “I can use systems to follow the use of human resources” did not reflect any special focus, such as nurse-patient ratios, staffing and skill mixes, competencies, or overall staffing requirements.<sup>32</sup> For managers, this kind of in-depth information would be relevant in this pandemic situation when the shortage of nurses is a global phenomenon.<sup>33</sup>

#### Performance Management System Features’ Relation to Each Other

In this study, the relationships between the PMIS features were analyzed through three sum variables describing PMIS features: assessing nursing performance and clinical procedures (Nursing), managing resources (Managing), and

**Table 6** Association of Nursing, Managing and Reporting to nurse managers' demographics, knowledge, and opinions (linear regression models)

	Assessing nursing performance and clinical procedure	Managing resources	Providing timely evaluation and reporting
Education	n.s.	n.s.	n.s.
Position (ref. chief nursing officer)			
Head nurse	-0.048	0.191	0.129
Assistant head nurse	-0.033	<b>0.292<sup>a</sup></b>	0.167
Clinical nurse specialist	0.02	0.112	0.04
I have participated to development of information systems	n.s.	n.s.	n.s.
Employer (ref. public hospital)			
Primary care	-0.032	0.051	0.003
Private health services	0.013	0.115	0.077
Social care	<b>0.160<sup>a</sup></b>	<b>0.240<sup>b</sup></b>	<b>0.268<sup>b</sup></b>
Not known	-0.067	-0.009	-0.033
Number of daily logins to different systems (ref. one system)			
2	-0.031	-0.12	-0.003
3	0.019	-0.11	0.019
4	-0.014	-0.054	<b>-0.160<sup>a</sup></b>
5 or more systems	-0.111	-0.087	-0.043
I don't participate in nursing	-0.009	-0.087	-0.004
Experience using systems (ref. less than 6 mo)			
6 mo-1 yr	-0.015	-0.108	0.072
1-3 yr	0.049	-0.114	0.001
3-6 yr	-0.02	<b>-0.180<sup>a</sup></b>	-0.026
More than 6 yr	-0.103	-0.107	-0.043
Computer literacy (ref. excellent)			
Good	<b>0.129<sup>a</sup></b>	<b>0.140<sup>a</sup></b>	<b>0.146<sup>a</sup></b>
Moderate	<b>0.127<sup>a</sup></b>	0.073	0.096
Weak	0.045	0.007	-0.005
I use some systems facilitating follow-up of activity every day	<b>0.369<sup>c</sup></b>	<b>0.427<sup>c</sup></b>	0.106
I have to collect information needed for management from several information systems.	n.s.	n.s.	n.s.
Experience using information systems	n.s.	n.s.	n.s.
I have received enough in-service training to use information systems	<b>0.241<sup>c</sup></b>	0.074	<b>0.267<sup>c</sup></b>
As a new employee I received good training in information systems	n.s.	n.s.	n.s.
In-service training is available constantly	<b>0.155<sup>a</sup></b>	<b>0.197<sup>b</sup></b>	0.128
Observations	247	247	247
Missing	132	132	132
R-squared	0.4	0.318	0.263
Adjusted R-squared	0.313	0.219	0.157

Abbreviation: n.s. nonsignificant.

Note: Standardized  $\beta$  coefficients.<sup>a</sup> $p < 0.05$ .<sup>b</sup> $p < 0.01$ .<sup>c</sup> $p < 0.001$ .

providing timely evaluation and reporting (Reporting). The correlation of Nursing, describing information system use for nurse managers' daily operations, had a significant correlation to Managing, describing the need for information about available resources. This correlation can be interpreted as these features supporting each other. Obviously, managers need to know how their units make progress and what kind of resources are available.<sup>12,14</sup> This study did not have elements that measured opinions of costs, which would give additional information about the link between cost and procedures.<sup>7</sup> In terms of the relation between Managing and Reporting, the correlation existed but was weak. This can be interpreted as indicating that the information systems lack the ability to provide relevant data for daily management, for example, allocating human resources, which makes the correlation weak.<sup>17,32</sup>

### The Relationship between Managers' Demographics and Their Opinions on Using Information Systems

Nurse managers' educational backgrounds did not correlate with the performance management features. In a previous review of the effectiveness of nursing management information systems, personnel work patterns produced mostly positive outcomes.<sup>4</sup> In our study, the opinions of nurse managers who were also assistant head nurses correlated statistically with the sum variable describing managing resources. This may reflect the job description of an assistant head nurse who often takes care of the various resources needed in practice.<sup>13</sup> More frequent use of information systems may also influence a more positive attitude toward information system usage, which has also been found in previous studies.<sup>14-16</sup> The role of the employer also influenced PMIS features. Working in social care was associated with more positive views about all three PMIS features. In Finland, home care is often organized through joint health and social care services.<sup>24,27</sup> This may explain partly the result as information for care coordination is important. The information systems used in social care are also newer than those used in health care, and their functionalities may thus be more useful for managers.<sup>26</sup> The claim "I use some systems facilitating follow-up of activity every day" was associated with Nursing (assessing nursing performance and clinical procedures) and Managing (resources). Further, it seems that Managing and Reporting were not associated, which may reflect the frequency of nurse managers evaluating and reporting performance, which may be conducted once a month or even less frequently.<sup>32</sup>

Most managers assessed their computer literacy as good or excellent, which correlated positively to the performance management features. These results were better than in many other surveys, in which managers' knowledge and skills were unsatisfactory.<sup>2,21</sup> Overall, good computer literacy had a positive association with each sum variable. This may be because the managers' opinions reflect that they are confident users of information systems that focus on performance management at operational (nursing and management) and strategic (evaluation and reporting) levels within managerial roles.<sup>11-13</sup> The results of this study suggested

that nurse managers' engagement in system development has the potential to improve PMIS functionality as they identify deficiencies in the systems to support their work.<sup>14,15</sup> The research also highlights the importance of participatory design and the involvement of a multidisciplinary team for information system development.<sup>6,13</sup> The development of PMISs requires an analysis of data exchange as well as the identification standards for interoperability, needs for resource sharing, and unified information systems, which are all important factors that would benefit from managers' involvement.<sup>3,4,7</sup> In this study, more than half the managers had not participated in the development of information systems in their work. However, almost a third of the nurse managers were committed to participating in development activities in addition to their work.

### Strengths and Limitations

This study is part of a wider study, "Monitoring health and social care information systems and services."<sup>24</sup> The aim is to produce follow-up data from the implementation of the eHealth and eSocial Strategy for the Ministry of Social Affairs and Health in Finland.<sup>28</sup> The monitoring has been running since 2010 and RNs' experiences were surveyed for the first time in 2017. The second survey in 2020 targeted all nurses, and those with a management position were included in the analysis in this study. The results cannot be generalized directly to an international context. However, they are valid within the context of this Finnish correlational study design. Data collection occurred at the beginning of March 2020, when the COVID-19 pandemic was just beginning. Overall, it seems that the pandemic did not have a negative effect on data collection, as there were slightly more participants than there were in the first survey conducted three years previously.<sup>24</sup> However, the number of nurse managers was slightly lower, as the number of nurse managers responding in 2017 was 485. This decrease may be associated with the unexpected situation of nurse managers reorganizing the care (e.g., reduction of elective surgery and increase nonface-to-face appointments).

Nurse managers in this study represented the eligible population in Finland regarding regionality, employment sector, age, and gender.<sup>27</sup> In this study, the mean age of nurse managers was 49 years, which can be understood to be due to the education and experience needed in managerial positions. In terms of the representativeness of this sample, it is difficult to estimate the theoretical number of the target group, as in Finland, nurse managers belong to various academic associations and trade unions and their roles and positions vary considerably.<sup>27</sup> However, it is important for the voices of nurse managers to be heard, as nursing PMIS are still rare and badly needed.

This study should be considered as preliminary. To our knowledge, this was a new approach to study the phenomenon of management, since the dependent variables were based on a previous study.<sup>7</sup> Although the number of questions focusing on managerial duties and on management and leadership per se was low, the  $\alpha$  values of the sum variables Nursing, Managing, and Reporting were satisfactory,



considering their newly established nature. More research is needed to establish more robust measures of nursing performance management information systems. In addition to the studied PMIS features, it would be beneficial to have more in-depth knowledge of fiscal performance. Economic aspects were not clearly stated in the questions or claims, meaning that analyzing the role of costs in performance management was difficult. Still, the questions and claims could be used to assess PMIS features described in the literature review.<sup>7</sup> In the future, this analysis can be used to develop a survey tool to assess features and functionalities of systems for nursing performance management.

## Conclusions

Nurse managers have the knowledge and skills to use various information systems. However, induction and in-service training seemed to be a significant prerequisite for using data for performance management. Assessing nursing performance and conducting clinical procedures are activities which nurse managers perform daily using performance management information systems. Managing resources for daily operations is a crucial feature of PMIS for care coordination and management. However, the present system integration does not support performance data collection.

### Ethical Considerations

Finnish Institute for Health and Welfare provided ethical approval (THL/482/6.02.01/2020) for the study. The use of the membership databases of the nurses' associations was selected as it protected participant anonymity when the researchers were not in contact with the members.

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### Conflict of Interest

None declared.

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