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What the work of nurses really looks like: Identifying factors influencing the work of nurses in hospital

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Summary

Aim: The aim of this study was to gain deeper understanding of the work of nurses and shed light on the factors influencing their work in acute care. Professional nursing care makes a difference to patient outcomes. Therefore it is important to identify potential improvements in nurses' work to make better use of their knowledge and time for the benefit of patient safety.

Method: Participants were 8 registered nurses (RNs) and 10 practical nurses (PNs) in one university hospital, observed during their work. Rich multilayer real-time quantitative data were collected with qualitative field notes on nurses' work, factors influencing their work, movements and time. Following each shift, participants were interviewed by observers. Data were entered onto a handheld computer and a digital recorder during observation. Data collection took place in 2008 and data analysis in 2009-2010.

Results: Nursing work was characterized by frequent shifting of attention, interruptions, operational failures, multitasking and constant movements which influenced their work. On average, RNs and PNs encountered influencing factors 4.2 and 2.0 times per hour, respectively, the most common one being face-to-face communication initiated by a co-worker. However, participants described their shifts as quiet and manageable, and without interruptions and delays.

Conclusions: Study findings provide a picture of the complex interplay of nurses' work, influencing factors and movements, with frequent attention shifting in chronological order. Participants were interrupted within an interruption leading to layers of interruptions, adding to the complexity of their work. Study findings demonstrate the importance of approaching and measuring nursing work as a complex phenomenon.

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INTRODUCTION

The staffing of nurses, nurses' educational level, and the quality and safety of the work environment, are linked to patient safety and outcomes such as mortality rates [1-4]. Since staffing and workload in nursing are unlikely to improve in the near future, it is, therefore, vital to make the best use of the existing nursing workforce. With evolving technology and other ongoing changes in health care services, leading to substantially shorter hospital stays, there is an urgent need for the re-evaluation and redesign of the work and work environment of nurses. Critical resources, such as nurses, should be defended from being disturbed, enabling them to carry out their work for the benefit of the total process [5]. Nurses may not be able to carry out their work in the same way now, nor in the future, as they did in the past. This is true for all countries in the world, although the skill mix of nursing personnel may vary from one place to another [6-8].

Reports indicate that nurses in acute inpatient care frequently encounter factors influencing their work such as interrupted and operational failures during their daily work [9-11]. Interruptions in nursing have been defined as actions by others or occurrences from the environment which disrupt the work of nurses [11-13]. Although most failures impose minimal risk upon

patients, a number of failures need attention as they may relate to work requiring special alertness by the nurse; and thus an interruption may risk the safety of patient care. Nurses are frequently interrupted while preparing and administering medications [10, 13-16], which causes risks of medication errors. Frequently, interruptions occur immediately prior to cognitive shifts in the work of nurses [14]. One study in acute care indicated an increased risk of severe medication administration errors by nurses with more frequent interruptions [13]. Tucker [17] weighted interruptions and systems failures to predict their seriousness or risk, and attempted to calculate related costs based on time used to solve the problem caused by the failure. The results indicated that substantial costs were incurred by interruptions and operational failures in the work of nurses.

There is still much that is unknown about human information processing and the influence of individual cognitive characteristics on work performance [18, 19]. The extent of influence which frequent interruptions and operational failures have on the memory and attention of nurses, and their work performance may differ between individuals. It may also depend on the work undertaken, where in the process it is interrupted, and the kind of interruption [20-22]. However, according to the best available knowledge to date, there are limits to how many tasks or mental activities a person can pay attention to at one time and how much information the working memory retains [18].

This study was carried out to gain deeper understanding of the work of nurses and shed light on the factors influencing their work in acute care. To serve this purpose, the workflow of registered nurses (RNs) and practical nurses (PNs), was observed.

MATERIALS AND METHODS

This was a descriptive study using mixed methods [23] with a human factors engineering (HFE) approach [24]. Observers collected data while observing participants during whole shifts. In addition to quantitative data, qualitative data has potential to add value and move towards a richer understanding of quantitative data and the context of the study [23, 25]. The study constructs are defined in the following way:

Work: Workflow categories and work activities of patient care and unit-related work.

Influencing factors: Actions or factors on the part of other staff or occurrences from the environment that affect or disrupt the RN's or PN's work.

Movements: Going from one location to another within the unit.

Attention shifting: Shifting from one work activity to another, encountering influencing factors, or going from one location to another.

Setting

Data were collected in four inpatient acute care units at a university hospital in Iceland. These units were identified by nursing directors as quality units, wellstaffed, without any major recent or planned changes. These units do not have unlicensed nursing assistants; however, a unit secretary works on each unit, as well as an assistant in the pantry.

In acute inpatient care in Iceland, direct nursing care is provided by RNs, of whom 70-80% have a four-year baccalaureate degree and 20-30% a three-year diploma, and PNs, who have a three-year vocational level education. PNs are defined as nursing assistive personnel working under the supervision of RNs. In Iceland only RNs are eligible to carry out medication work and other complex care activities.

Sample

The participants, 8 RNs and 10 PNs, were observed during a total of 141.18 hours. Data collection took place in May-June 2008 during 9 morning shifts (08:00-16:00 hrs) and 9 evening shifts (15:30-23:30 hrs) on weekdays and weekends. Ten of the shifts were from medical units and 8 shifts from surgical units. All participants had at least three years' experience on this unit or a comparable unit, were employed at least half time, and spoke Icelandic. Participants were selected from a list of eligible RNs and PNs from each unit.

Data collection

Six observers collected the data by shadowing participants. All were RNs with graduate education and extensive clinical experience. One observer followed one participant at a time for eight consecutive hours.

Electronic standardized measures on nursing work (e-SMNW) were developed for the purpose of this study [26]. Observers collected quantitative data on the: a) work of nurses, b) influencing factors, and, c) movements between locations within the unit. The computer automatically collected data on time through an inbuilt clock. Work was categorized as: a) care activities, and further subcategorized into: direct patient care, indirect patient care, medication preparation, medication administration, documentation; b) unitrelated work; and, c) other. Influencing factors were categorized as: a) communication and information issues, including measures on non-self-initiated communication of participants and unclear or missing information; b) materials lacking, referring to the availability of medications, nursing supplies, linen and

equipment; and, c) environmental changes, referring to changes in patient load and condition, and sudden changes in staffing. Whenever participants went from one location to another within the unit it was marked in the computer database by the observers.

Observers' also collected qualitative descriptive field notes as a supplement to the quantitative data to provide a word-picture of the physical setting, people involved, actions and conversations under study [25]. Observers were taught to collect field notes whenever they considered the quantitative measures incomplete to describe their observation. Following each shift, observers conducted short structured interviews with participants to capture their perceptions of the shift under study and their experience of being observed. Participants were asked how the shift had been, whether anything had been left undone or unfinished in the nursing of their patients, and whether anything had interrupted them during the shift. No data were collected on patients.

Ethical considerations

The study was approved by the hospital Institutional Review Board (10/2008) and the Data Protection Authorities of Iceland (S3838/2008). The participants gave their written informed consent prior to participation.

Data analysis

Data analysis of the quantitative data was carried out in Microsoft Office Excel, SQL, R, and Graphviz, including frequencies, proportions, time-series analysis, and pattern analysis in 2009-2010. The observers' field notes and interviews with participants were transcribed verbatim, content analysed, coded and categorized [27].

RESULTS

Data from the PDA

More than 5000 data points were collected onto the PDA on work, influencing factors and movements, besides time. The work of participants was characterized by frequent shifting of attention due to shifting from one work activity to another, going from one location to another, or when encountering influencing factors, which occurred an average of 41.7 times per hour (333.4 times per shift) for RNs and 37.7 times per hour (301.2 times per shift) for PNs. These revealed that shifting of work between work categories for RNs occurred 21.7 times per hour on average or 173.5 times per shift. For PNs, shifting of work between work categories occurred on average 17.9 times per hour or 143.1 times per shift.

On average, RNs and PNs encountered influencing factors 4.2 and 2.0 times per hour, respectively. For RNs the mean duration of influencing factors was 49 seconds and for PNs 1.32 minutes. The most common influencing factor for both RNs and PNs was face-toface communication initiated by a co-worker. 2.7% of an RN's time was spent on this type of interruption during morning shifts; during evening shifts took less time, or 1.7%. The second most frequent influencing factor for RNs was having to assist a co-worker, which took 2.7% of their time during morning shifts and 2.6% during evening shifts (this assistance was due to the need for specific knowledge or skills, or due to lack of material resources). Face-to-face communication initiated by a co-worker took 2.1% of PNs' time during morning shifts and 1.1% during evening shifts. The second most common influencing factor for PNs was having to look for a co-worker, taking 3.3% of their time during evening shifts, but less time during morning shifts, or 0.7%. Table 1 shows the most frequently occurring factors influencing the work of RNs and PNs.

 Table 1. The mean frequency per shift of the most frequently occurring factors influencing the work of RNs and PNs.

Influencing factors	Mean frequency per shift	
	RNs ^a	PNs ^b
Non-self initiated communication of co-worker	9.9	5.2
Assists co-worker	5.4	1.3
Non-self initiated communication of patient's relative	2.5	1.0
Lack of nursing supplies in stock	2.4	1.1
Looks for co-worker	1.4	2.1
Lack of medication in stock	1.4	0.1
Lack of linen in stock	0.5	1.4
Needs assistance from an RN	0.3	1.6

^a8 RNs observed during a comparable number of complete eight-hour shifts

^b10 PNs observed during a comparable number of complete eight-hour shifts

Figures 1 and 2 show examples of a busy hour in the work of one RN and one PN, respectively, the influencing factors they encountered, and movements between locations. The figures display the work categories measured, locations and influencing factors in chronological order. For each measure of work category, work activities were also measured ranging from 1-21.The figures do not show the multiple work activities undertaken within each work category. The examples are from different shifts and different units.





Figure 1. An example of one hour of work of a RN, demonstrating the interplay between timing of: the category of the work undertaken, the location of the RN, and factors influencing the work.



Figure 2. An example of one hour of work of a PN, demonstrating the interplay between timing of: the category of the work undertaken, the location of the RN, and factors influencing the work.

The RNs moved from one location to another an average of 15.9 times per hour, most frequently entering patients' rooms, the nurses' station, and the medication room. PNs moved more frequently between locations than RNs, or 17.3 times per hour. The rooms PNs entered most frequently were patients' rooms, followed by the nurses' station, pantry, and soiled utility room. Figures 3 and 4 illustrate the movements of one RN and one PN, respectively, during an entire weekday morning shift. These examples are from different shifts and units.

Qualitative data

A total of 170 observer field notes provided further descriptions of the work, influencing factors and movements of participants under study, and the characteristics of their work. Through content analysis of the qualitative data from the field notes, three categories emerged, presenting the characteristics of RNs' and PNs' work. These are: a) often having to go to several places within the unit to get their work done; b) frequently encountering influencing factors affecting and disrupting their work; c) frequently multitasking in their work. All three categories are related and are useful for gaining a deeper understanding of the work of RNs and PNs. As demonstrated in figures 1-4, the RNs and PNs frequently moved from one location to another to provide necessary patient care, as well as encounter factors influencing their work.



Figure 3. Movements of an PN during one eight-hour morning shift. The thickest line between the nurses' station and patient room 4 indicates 18 moves between these locations. The thinnest lines indicate one move between locations.



Figure 4. Movements of a PN during one eight-hour morning shift. The thickest line between the soiled utility and patient room 18 indicates 18 moves between these locations. The thinnest lines indicate one move between locations.

An excerpt from a PN provides a fuller picture of the complex interplay of the patient care and influencing factors observed:

[The PN] is still delivering lunch [to patients] ... she came by in the soiled utility and threw a shirt in the dirty laundry basket - it was from the patient she had just delivered food to. Then she entered the pantry to wash her hands ... she had been helping the patient in bed ... she continues delivering lunch ... but there has been some mix-up with lunch trays – she is talking to another PN ... and a patient's blood sugar still needs to be tested ... she again comes by in the soiled utility ... she enters the patient room ... a urine bottle needs to be taken away ... she had entered the room with the lunch tray and a glucose meter. When she enters the room then there is this urine bottle which needs to be emptied. She empties it and again enters the patient's room and has now finished measuring the blood sugar ... she is documenting the patient's fluid intake ... she also provided the patient with oxygen.

The above excerpt is an example of the reality of nurses' work, where patient care activities and interruptions are interwoven in a complex way. This PN not only encounters one interruption at a time during the primary work activity, but additional activities are also interrupted in a sort of layers of interruptions.

When interviewed after their shifts, participants described their shifts as quiet and manageable, and nothing out of the ordinary. They did not perceive interruptions or delays in their work.

DISCUSSION

The findings of this study confirm the complexity of

RNs' and PNs' work in acute care settings and demonstrate how multifaceted nursing is, involving both cognitive and physical work [9, 14, 15, 28, 29]. These results add a deeper understanding of the phenomenon with rich real-time data, and strongly suggest the need for a detailed analysis of work-flow processes focusing on safety risk for both staff and patients, in relation to policy, structure, culture, communication and professional knowledge [30].

Nurses frequently shift their attention as they go from one work activity to another, often multitasking, frequently encountering influencing factors, and often having to move from one location to another during their work. These findings provide further insight into nurses' work and support the results of former studies on influencing factors, such as interruptions and operational failures in nurses' work in inpatient units in other countries [9-11, 14, 15, 29], indicating a global issue of concern in health care.

The factors most frequently influencing participants' work relate to communication with co-workers and lack of information. Nursing cannot be carried out in an appropriate manner without collaboration between health care providers, including communication and use of needed information. However, the results raise questions about the situational awareness of nurses influenced by environmental factors, work flow, interpersonal dynamics, and professional knowledge and competence [31]. Nurses need to critically reflect on and revise their routine practices regarding communication and information seeking habits, focusing on patient and staff safety [32].

A comparison of the results of this study to the fact that participants did not identify their shifts as out of the ordinary and even denied they had been interrupted during their work raises questions as to whether interruptions, operational failures and frequent movements between places to carry out work is actually the norm for nurses. Nurses are extremely accessible at all times, most often attending to interruptions immediately, as they and their co-workers seem to consider interruptions as "normal" at any time and under any circumstances [13, 16, 33].

Clinical nurses and managers may not identify interruptions and operational failures as actual failures, but consider them part of their daily work [17]. This may go unnoticed by nurses themselves and their colleagues, creating safety risks for staff and patients. A growing number of procedural failures and medication administration errors has been identified with more frequent interruptions [13], raising questions as to whether the same may be true for other patient care activities. The causes and consequences of frequent attention shifting of nurses during clinical

work require further study $[\underline{19}]$. The present findings point to an urgent need for the nursing community to critically discuss these issues from the point of view of professionalism, efficiency, and the safety. Theories and models used to study and explain interruptions during work are mostly linear, where only one interruption during one work activity is expected [20, 22]. However, the results of this study show that this is not true for the clinical work of nurses. Participants here were interrupted within an interruption during their work, leading to layers of interruptions within one work activity, adding to the complexity of the situation, and, presumably, also adding to the risk of error. One way to react to this situation would be to view employees - carrying out the most sensitive and risky work activities - as critical resources [5]. This could be demonstrated in a symbolic way, as to emphasise that these critical resources are not to be disturbed. This would reduce interruptions and hence reduce the risk of errors. Symbolic interventions to reduce interruptions and errors during medication work such as drug round tabards and red-taped "no interruption zone" have shown to be effective [34, 35]. Comparable symbolic interventions may be used for other work activities.

Study limitations

This study was conducted in one hospital in Iceland on four quality units with experienced participants who described their shifts as quiet and manageable. Therefore these results may not be typical for the average shift on an average unit, in neither this nor other hospitals. Another limitation may be the Hawthorn effect caused by the constant observation of participants.

CONCLUSION

The findings of this study can be used to enable better self-management and efficient communication among nurses. Action needs to be taken to minimize the risks and the financial costs of unnecessary shifting of attention, due to influencing factors such as interruptions, and operational failures related to communication, availability of resources and professional competence. Inpatient units should be designed to support efficient and safe patient care and a healthy work environment for nurses.

This study has implications for clinicians, managers, policy makers and architects as participants in the creation and development of the work environment of nurses. The findings of this study demonstrate the importance of approaching and measuring nursing work as a complex phenomenon. At the organizational level, both RNs and PNs encounter numerous different factors pertaining to the physical structure of the workplace and collaboration and work culture that influence their work. The most important message from this study is that theories and models used to study and explain factors influencing the work of nurses do not reflect the real world of nurses' work in acute care, nor do nurses themselves realize how frequently their work is interrupted. The full picture of nurses' work needs to be acknowledged so that appropriate and effective patient safety interventions can be carried out.

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