

Medication management in municipality based health care: a time and motion study of nurses

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Introduction

Medication use is the most pervasive intervention in healthcare, thus ensuring medication safety is of paramount importance. Unfortunately medication errors, defined as an unintended failure in the medication management process, occur frequently and are the single most preventable cause of patient harm in hospitals (Kohn, 2000). Patients with chronic conditions spend most of their time outside hospital but as their health deteriorates, they may need municipality based health care services (home healthcare) in their private home or in a nursing home. Patients, together with their relatives, can choose if they want to live in a nursing home or remain at home and receive municipality based healthcare. The level of health care service should be the same, regardless of whether a patient chooses to remain at home or move to a nursing home. Nurses in home healthcare assist patients with care, including wound dressing, change of urinary catheters and prevention of malnutrition and falls. Medication management, which includes handling prescriptions, dispensing and administrating medications and monitoring efficacy of medications, is an important task that nurses in home healthcare also perform. Medication errors in home healthcare may occur due to poor communication about medications, delays in obtaining and delivering medication, and mistakes or errors in dispensing and administration (Ellenbecker, Frazier, & Verney, 2004; Mager, 2007). In nursing homes it has been estimated that 50% of the residents have an adverse drug event every year (Harrison et al., 2013; Pepper & Towsley, 2007). This can cause an increased risk of hospitalization and suffering for patients. Safety improvement regarding medication management for the elderly population is a priority area of patient safety in Sweden (The National Board of Health and Welfare in Sweden, 2016a).

This study was part of an evaluation of a yearlong quality improvement project, conducted in 13 municipalities in the southeast region of Sweden in 2015-2016 (Wulff S, Published June 2016). The project addressed the frustration among nurses regarding medication management in home healthcare. In particular, nurses and the operations manager were dissatisfied with the amount of time spent on dispensing medications for individual patients, the lack of communication regarding medication management between healthcare and/or patients, and the high prevalence of polypharmacy among the elderly in the county. The medication management process in home healthcare was perceived as unsafe.

Investigating home healthcare nurses' work patterns in nursing homes and private homes can identify safety hazards and inefficiencies. It can also assess whether health care services delivered to patients in private home and in nursing home is similar. Additionally, the time spent on medication related tasks compared to other tasks can be quantified and used to design interventions and strategies to ensure appropriate support for nurses to undertake medication management in a safe work environment and to meet the growing home healthcare demand due to older populations. It is important to facilitate care without eliminating tasks that are essential for high reliability of the process (Gorman, Lavelle, & Ash, 2003).

Purpose and Method

Purpose

The aim of this time and motion study was to increase our understanding of how nurses in home healthcare currently distribute their work time with a focus on the medication management process. We studied when interruptions, multi-tasking and errors occurred in their daily work, and looked at differences between distributions of time for home healthcare in nursing homes compared to private homes.

Study design

This was a direct observational time and motion study of nurses working in home healthcare in the southern part of Sweden. In accordance with Swedish law on ethical approval for research concerning humans, ethical approval was not deemed necessary since no sensitive personal information was collected (Department of Education, 2003). However, the study adhered to the Declaration of Helsinki and all participants were informed about the purpose of the project and provided written consent before any direct observations were conducted.

When the observed nurse engaged with patients, relatives or other health professionals, they were asked to briefly introduce the observer. If the observed nurse forgot to seek consent, the observer introduced themselves and sought consent to continue observations.

Study setting

The research was conducted with nurses in four municipalities in the southern part of Sweden. The municipalities were chosen to capture differences in area (metropolitan and rural areas), the number and mean age of citizens in each municipality as well as the medication profile for the elderly population in each municipality (Statistics Sweden; The National Board of Health and Welfare in Sweden, 2016c). Home healthcare was delivered in nursing homes where people have their own room in a large complex with staff on site, or in private homes where people live in their own residence and are visited by staff on a regular basis. Home healthcare by a nurse was provided 24 hours per day, often divided into three shifts (morning, afternoon and night shifts). All documentation in these settings was done electronically except signing for administration of medications, which was done on paper in both nursing homes and patients' private homes.

All nurses working in the four municipalities were informed about this study by their Head of Unit and invited to participate. In the four municipalities, 42 nurses were employed and nearly

970 patients registered for home healthcare. The workload during observations varied between 14-26 patients per nurse. A total of 27 nurses (2 male and 25 female) were asked and agreed to participate in the study.

Data collection

The observers used a portable touch screen tablet, running the Work Observation Method By Activity Timing (WOMBAT) software to record data.(Westbrook & Ampt, 2009) The data collection was structured to record all tasks according to predetermined categories (Table 1) defined by a reference group and refined during pilot testing. The reference group included nurses and pharmacists.

As medication management was the focus in this study, details of other tasks were not recorded. For example, medication management had several subcategories including ‘communication’ and ‘dispensing’, however care-giving did not have subcategories hence social communication with patients, wound-dressing and replacing a catheter for example were all recorded as ‘care-giving’.

Information recorded for each observed task included task type, with whom the nurse interacted, where the task took place and resources used. Any interruptions or multitasking that occurred was also recorded, as were errors, near misses and corrections of an error.

WOMBAT automatically time stamps entered tasks and thus captures the duration of tasks as well as the number and duration of interruptions to work and multi-tasking.

Data were collected from January to March 2016 by three experienced pharmacists. A document outlining different clinical scenarios and how to register them in the WOMBAT program was created and used for training purposes. Observers read the test scenarios and recorded the information accordingly using the WOMBAT tool. Once the observers felt confident with the definitions and the WOMBAT tool, pilot observations of nurses were

undertaken. One researcher (MH) observed nurses for half a day each with the other two observers to ensure high inter-observer reliability. We compared the sequence of task categories and task count from these pilot sessions to ensure consistency between observers in subsequent observations.

Nurses were shadowed for the first five hours of the morning shift (0730-1230) Monday to Friday, which is when most medication management tasks take place.

Data analysis

To describe nurses' work patterns, the proportion of time spent in each task, proportion of time spent multitasking and the rate of interruptions per hour was calculated. The 95% confidence interval (CI) for both proportions and rates were generated by bootstrapping. Comparison of proportions of time spent between home healthcare in nursing homes and private homes was assessed using a Monte Carlo test. As there is little methodology for comparing proportions of continuous variables (such as proportions of time), Monte Carlo testing offers a viable non-parametric method.

In one of four municipalities, nurses spent their time in both home healthcare in nursing homes and private homes during a shift. For analyses comparing work in nursing homes and private homes, this municipality had to be excluded since it was not possible to separate tasks done in different settings during a given observation session.

A small number of tasks had missing values for the task category field. These were analysed as a separate category. Data were analysed using SAS 9.4 and Microsoft Excel.

Results

Distribution of time and tasks during morning shifts

The 27 nurses were observed for a total of 196 hours. Of the total observed time, 20.4% was spent on medication management while 31.7% was spent on care, 14.6% in transit and 10.9% on social tasks (Table 2). The total number of observed tasks was 7307 and the majority of tasks were either medication management (26.5%), in transit (18.8%) or care giving (28.3%). Communication about medication and transits had a greater proportion of tasks compared to the proportion of time, indicating more frequent but shorter task episodes. Of the medication management tasks, the highest proportion of time was spent on communications (5.7%) and dispensing medications (4.1%).

Differences in work patterns between home healthcare in nursing homes and private homes

Nurses in nursing homes spent more time on medication management (23.0% versus 17.4%, $p=0.001$) than nurses in private homes. Nurses working in nursing homes spent more time documenting medication related information compared to nurses working in private homes (4.2% versus 1.8%, $p=0.002$).

Nurses in private homes spent significantly more time in transit compared to nurses working in nursing homes (11.8% versus 18.2% $p<0.001$) (Table 3).

Interactions with others

During the observations, nurses spent 47.9 % of their time completing tasks with someone else, 22.1% was interaction with another nurse. Nurses also spent 16.2 % of their time interacting with patients, however there was a difference between nurses working in private homes where 19.8% of their time was spent on interacting with patients compared to 13.3% for nurses working in nursing homes ($p<0.001$). 87.7% of the dispensing task sequences were performed in the patient's home, but of these only 7.5% together with the patient.

Nurses did not interact much with prescribers, 4.5% of time spent in nursing homes and 3.2% for private homes.

Interruptions and multi-tasking

We recorded a total of 236 interruptions, with an overall rate of 1.2 (95% CI 1.1-1.4) interruptions per hour for the whole study group. Thirty percent of all interruptions occurred during medication management tasks and the interruption rate during these tasks was 1.8 (95% CI 1.4-2.2) per hour. When performing medication management, nurses were most often interrupted whilst documenting medication related tasks (2.9, 95% CI 1.5-4.5) and dispensing medications (2.7, 95% CI 1.6-4.0) (Table 4). Care was the most frequent interrupting task, accounting for 52% of such tasks.

Ninety percent of the 236 interruptions were caused by one or more persons. Of these interruptions 44% were caused by a nurse (intern or extern) and 13% by a patient.

Nurses spent 7.2 hours multi-tasking, in which two or more tasks were performed simultaneously, corresponding to 3.7% of the total observation time. The two most common types of multitasking observed were dispensing in parallel with care (9.3% of multitasking instances) and in transit combined with care (10.2%). For medication management multi-tasking was most common when nurses administered (24.3%, 95%CI 10.4-39.6) or dispensed (19.7%, 95%CI 13.7-27.5) medications.

Recorded errors in relation to interruptions and multitask

Six errors and six near misses were recording during the observation period, which means that 0.2% of performed tasks were associated with an error or near miss. Four of the 12 recorded errors and near misses were observed during dispensing of pillboxes. No errors or near misses occurred during an interruption or multi-task. We observed 46 corrections and it took just

over one and a half hours to correct them. Due to the small number of observed errors or near misses no correlation between errors or near misses with interruptions or multi-tasking could be calculated.

Discussion

During our observations of nurses' morning shift, 20.4% of their time was spent on medication management, indicating that medication management is a large part of the nurses' workload. A similar medication management workload has been reported for nurses working in hospital settings in Australia (Westbrook, Duffield, Li, & Creswick, 2011). Nurses in nursing homes spent significantly more time on medication management compared to nurses working in private homes. Medication related subtasks with the largest difference between nursing homes and private homes were clarifying prescriptions and documenting medication related issues, with more time spent on this in nursing homes.

Our results may indicate a more complex medication management for patients in nursing homes as on a national level in Sweden, patients living in nursing homes have more medications on average than patients of the same age living at home with home care (The National Board of Health and Welfare in Sweden, 2016c). It may also indicate that patients and their relatives play a greater role in the medication management, for instance ordering medications from the pharmacy, storage and visits to physicians, when patients live in private home. Elderly patients have different needs for help in their medication management, both in nursing homes and private homes. Addressing what they are able to manage by themselves and what they might need assistance with is important (Westerbotn, Fahlstrom, Fastbom, Agüero-Torres, & Hilleras, 2008). Activities where nurses explore in which part of the medication management process a patient need support might prevent unnecessary drug related problems (Ellenbecker et al., 2004).

Our study shows how nurses spend their time on different medication related tasks, but it does not indicate which task is most important from a patient safety perspective. A critical analysis on how time is allocated between different tasks can give an objective view of how to prioritize time on different tasks. In the improvement project nurses expressed a frustration on time spent on dispensing pill-boxes since tablets and capsules also can be delivered pre-packed in multiple doses from the pharmacy. Dispensing was most often performed in the patient's home but not together with the patient. Reducing time for dispensing medications might free up time for the nurse to communicate with the patient about the drug therapy and monitor efficacy instead. This requires nurses to continue to visit patients even if the dispensing is outsourced to pharmacy.

Nurses spent approximately half their time completing tasks alone. Only seventeen percent of their time was spent interacting with patients, which is less than the time reported in hospital settings (Westbrook et al., 2011). The time nurses spent interacting with patients differed between nursing homes and private homes, with more patient interaction in the latter. In hospital settings there is a positive correlation between nurse surveillance and patient safety (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002). Nurses are more likely to recognize adverse drug events compared to home health workers (Carolien GM Sino, van Dooren, Haverkamp, & Schuurmans, 2013). For a safe medication management it is important that nurses have regular patient interactions to monitor clinical outcomes and to recognize drug-related problems.

The interaction with prescribers differed between nursing homes and private homes. In nursing homes prescribers had weekly visits for rounds, which was not mandatory in more than one of four private home settings. Regular visits by a prescriber might make it easier for nurses to communicate different medication related issues.

Documenting in this study was defined as any medication related documentation, including signing administered medications in the drug chart or to document medication related issues in the medical record. This study indicates that documentation takes up a large proportion of time spent on medication related tasks. The observed proportion of documentation may underestimate the total documentation time since nurses tended to plan patient visits in the morning, and do office work at the nurse station during the afternoon. Since mobile electronic devices with patient records were not available in the patients' home they did all electronic required documentation at the nursing station. Also previous studies have shown that documentation mostly occurs in the nurse station (Donoghue, Pelletier, & Duffield, 2005). Documentation is a central part in the exchange of information between healthcare professionals, but it is important from a patient safety perspective that it is effective and transparent between the healthcare professionals involved (Gaskin, Georgiou, Barton, & Westbrook, 2012; Georgiou, Marks, Braithwaite, & Westbrook, 2013).

Communication was the subcategory of medication management that nurses spend most time on, regardless of being in of nursing home and private home. Most of the communication occurred with other nurses. Only a small proportion of communication was with prescribers and these interactions were shorter and fewer for nurses working in private homes. This suggests that the communication was not so much about clarifying medication prescriptions or discussing medication efficacy with physicians but more "communication with peers" to inform or double check medication related problems. Communication with colleagues is important in home healthcare since nurses often work alone with the patient, without being able to consult a prescriber in a new situation (Lindblad, Flink, & Ekstedt, 2017). However a qualitative study about general prescribers' views on collaboration with nurses in home

healthcare highlighted the importance of communication regarding feed-back on treatment and patients' conditions (Modin, Törnkvist, Furhoff, & Hylander, 2010). A safety concern might be that nurses in home care are not particularly informed about the medication treatment and do not have enough knowledge to evaluate it (C. G. Sino, Munnik, & Schuurmans, 2013). Nurses in these municipalities were able to access the medical record by a safe link but documentation about the medication treatment in the record varies. In the quality improvement project pharmacists performed small medication management reviews together with nurses to discuss medications, times for administration of medications and proper medications for elderly. Medications reviews in a multi-professional team was not performed in these municipalities but can be one way to increase the knowledge used to evaluate medication treatment and at the same time improve the medical treatment (Chen, 2016; Milos et al., 2013).

We found that interruptions occurred most frequently when nurses were documenting and preparing medications, compared to other tasks. However, the overall rate of interruptions in this setting is far less frequent compared to nurses working in hospitals (Ballermann, Shaw, Mayes, Gibney, & Westbrook, 2011; Westbrook et al., 2011). Nurses were more likely to be interrupted by another nurse than by a patient. Some interruptions are necessary, for instance asking questions related to the performed task, whereas interruptions during medication dispensing have been reported as a barrier for patient safety in nursing homes (Dilles, Elseviers, Van Rompaey, Van Bortel, & Vander Stichele, 2011) and hospital settings (Westbrook, Woods, Rob, Dunsmuir, & Day, 2010). By identifying where interruptions tend to occur in the medication management process, it is possible to alert them and find useful interventions to minimize the risk of errors (Cook, Render, & Woods, 2000; Freeman, McKee, Lee-Lehner, & Pesenecker, 2013). The number of recorded near misses and errors in

this study was too small for formal analysis, but seemed to occur more frequently during medication management compared non-medication related tasks. This is important to address in future patient safety work.

Multi-tasking is an important component of health care professionals work. In our study only 3.7 % of nurses time was spent multi-tasking, which is comparable to a direct observation study of nurses in a hospital were 5.8% of nurses time was spent multi-tasking (Westbrook et al., 2011). Individuals might have different abilities to multi-task and different situations are more or less suitable for multi-tasking (Walter, Li, Dunsmuir, & Westbrook, 2014). The cognitive impacts, and hence safety implications of multitasking vary considerably with factors such as task complexity, task modality or working memory capacity (Douglas, Raban, Walter, & Westbrook, 2017; Konig, Buhner, & Murling, 2005). For the two most common types of multitasking (dispensing in parallel with care, and in transit with care), arguably the first combination carries risk of dispensing error, while the error risk for the second combination is not so apparent. Hence changes in practice aimed at multitasking may make sense for certain high risk multitasking scenarios, but will not necessarily be appropriate for all multitasking.

Limitations

The results of this study reflect work patterns of nurses for the first five hours of morning shifts on weekdays in four municipalities in Sweden and may not be generalizable to other times or to other areas of the country. The percentage of time spent on medication management would likely been lower if we had observed nurses during all day since more medication related tasks takes place in the morning.

The observed differences between settings may not be entirely due to different work practices, as there may also be variation in case mix. For example one of the major reasons why people receive home healthcare in Sweden is cognitive impairment (The National Board of Health and Welfare in Sweden, 2016b). Even if we excluded nursing home wards for patients with diagnosed dementia the morbidity may have differed between our two settings.

It is possible that participants modified their performance during the observation period, referred as the “Hawthorne effect” (McCambridge, Witton, & Elbourne, 2014). However, this study did not involve any form of performance scrutiny of participants and that was made clear to participants from the outset. Also observers made efforts not to interact with participants unless absolutely necessary and participants were observed over a sufficiently long time to become accustomed to the observer’s presence.

Observer fatigue can also be a potential issue in observational studies. The main focus of this study was on medication management which meant that during other tasks, such as transfer between patients’ home, observers had mental breaks.

Conclusion

This study highlights that nurses spend a considerable amount of time on medication management in home healthcare. Interruptions while performing medication related tasks in municipality based home healthcare were common, as well as multi-tasking, but is not as common as in hospital settings. Nurses in nursing homes spend more time on medication management compared with private homes. Spending more time on communication about medications with prescribers may increase nurses’ competence and pharmacovigilance in monitoring and evaluating medication effects. This study provides a unique insight into homecare nursing work, and the results may contribute to the development of strategies for safer medication management in home healthcare.

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