The impact of an electronic nursing documentation system on efficiency of documentation by caregivers in a residential aged care facility

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Aims and objectives. To examine the effect of the introduction of an electronic nursing documentation system on the efficiency of documentation in a residential aged care facility.

Background. Modern technology has the potential to free caregivers in residential aged care facilities from their burden of paper documentation and allow them more time to care for residents. To date, there is inadequate evidence to verify this assumption.

Design. Longitudinal cohort study with work sampling method for data collection.

Methods. This study was conducted between 2009–2011; two months before and 3, 6, 12 and 23 months after implementation of an electronic documentation system. A work classification tool was used by an observer to record documentation activities being performed on paper or on a computer by the caregivers.

Results. When compared with the proportion of time caregivers spent on documentation in the preimplementation period, personal carers’ proportion reduced at three months after implementation. The proportion increased from six months and then dropped at 23 months. Recreational activity officers’ proportion increased at three months after implementation. It stabilised at six months and increased again at 12 months. At 23 months, the proportion returned to the preimplementation level. Less than half of the caregivers’ time on documentation after implementation was associated with computer-related tasks.

Conclusions. Introduction of an electronic documentation system may not necessarily lead to efficiency in documentation for the caregivers. Charting some information items on paper and others on a computer may hinder realization of documentation efficiency.

Relevance to clinical practice. To optimise the efficiency benefit of electronic documentation in a residential aged care facility, it is not only necessary to automate all nursing forms but also to ensure that the system is aligned with caregivers’ documentation practice. Continuous education and mentor support is essential to ensure caregivers’ effective usage of the electronic system.

Key words: documentation, efficiency, electronic health record, electronic nursing documentation, long term care, nurse, residential aged care facility

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Introduction

Nursing documentation is an important component of aged care service delivery. It facilitates continuity of care and is essential in the provision of high-quality care. In Australia, the regulatory system in aged care requires that caregivers provide comprehensive and accurate documentation of the care given to each resident. Such documentation is needed both to support care delivery and for acquisition of government funding (Department of Health and Ageing 2008). However, the documentation in residential aged care facilities (RACFs) is time consuming and may conflict with the caregivers’ primary duty of caring for older people. Documentation tasks may also affect caregivers’ job satisfaction (Boroughs 1999, Pelletier et al. 2002, Jeong & McMillan 2003). Compounding the situation is high staff turn-over rate and a shortage of caregivers (Hussein & Manthorpe 2005, Productivity Commission 2011).

The use of information and communication technology (ICT) offers the possibility of improving care delivery while reducing caregivers’ documentation load and increasing the time available for caring for the residents. In Australia, however, the use of computers in RACFs to support the management of residents’ records and delivery of care is still uncommon (Department of Health and Ageing 2007). Perhaps the overall aged care sector has not yet been convinced of the benefits of ICT, and there is uncertainty as to how this technology will impact on caregivers’ work including documentation. Understanding how an electronic system may affect caregivers’ documentation in terms of time spent on this activity is useful in encouraging acceptance of the system by the caregivers and in motivating the aged care sector to invest in ICT innovations.

Previous evaluations of electronic systems in RACFs have focused primarily on exploring caregivers’ perceptions of these systems and the factors affecting the use of the systems in nursing practice (Cherry et al. 2008, Yu et al. 2008, Munyisia et al. 2011). No studies have investigated whether using these systems will indeed save documentation time in these settings, despite saving documentation time being a selling point for the IT application. Studies providing such information have been conducted in hospitals and their findings have varied. Some studies have found a reduction in time (Pabs et al. 1996, Bosman et al. 2003, Fraenkel et al. 2003, Wong et al. 2003), others an increase (Ammenwerth et al. 2001, Saarinen & Aho 2005), while others have found no difference between documentation time using computerised systems and manual (paper-based) approaches (Menke et al. 2001, Hakes & Whittington 2008). In addition, none of the hospital-based studies have used a longitudinal approach to provide data on the impact of an electronic documentation system at various periods after implementation.

This article presents the results of a 25-month longitudinal cohort study on the impact of the introduction of an electronic nursing documentation system on the efficiency of documentation by caregivers in low care section of an RACF. In the Australian aged care system, ‘low care’ suggests that the residents in this care setting only require limited personal care services and support for the activities of everyday living such as meals (Productivity Commission 2011).

Methods

Study environment

This study was conducted in a low care section of an RACF in Australia between 2009–2011. It is part of a larger investigation of changes in caregivers’ activities following the introduction of an electronic nursing documentation system. The study was approved by the Human Research Ethics Committee of the University of Wollongong, Australia.

The low care section has 64 beds. On a normal day shift, four personal carers (PCs) and one recreational activity officer (RAO) provide care to the residents.

The electronic documentation system is a web-based application which was implemented in May 2009. It supports residents’ demographic information, incident and accident reports, residents’ forms and charts, progress notes, continence information and assessments. It also supports the preparation of administrative and 24-hour shift handover reports, care plans and documents for funding. The electronic system was installed on a laptop and four desktop computers. All caregivers underwent a 30 minute one-on-one training session, and newly employed caregivers learned to use the system from their peers who had worked with the system. Ongoing training was provided on individual needs basis. This training was undertaken by either colleagues who were more experienced working with the system or the facility’s IT support officer.

After the introduction of the electronic system, some documentation activities at the RACF continued to use paper-based approaches. Caregivers were allowed to complete continence information either on paper or on a computer. Data on blood pressure, weight and blood sugar levels (BSL) were entered on a computer and written on paper from six months after implementation. Similarly, resident-related information from doctors and allied healthcare staff was recorded on both documentation systems from 12 months after implementation. Information on medication, recreational activities, summary
shift handover reports and scheduled tasks was available only on paper throughout the study.

Study sample and recruitment

The number of participants for each measurement period was the total number of caregivers working in the study area during that period of data collection (excluding part-time care staff members like doctors).

Prior to the first period of measurement, invitations to participate in the investigation were given to the caregivers working on a morning shift (6:45 a.m. to 3:15 p.m.) during their shift handover meetings. All caregivers accepted and signed consent forms. Caregivers working on afternoon or night shifts were excluded from the investigation. This decision was reached in a discussion with the residential service manager at the study facility. The discussion revealed that most activities at the facility were undertaken on a morning shift, and thus, this shift was deemed adequate in providing the needed sample size for this study. Another reason is that the study resources were insufficient to undertake such additional work. Others excluded from the study were doctors, allied healthcare staff such as podiatrists and registered nurses assigned to administrative tasks or supervision of the PCs. These staff members were excluded because they are not routinely involved in caring for the residents.

Study design and procedures

The study was conducted using an observational work sampling technique at five separate measurement periods. The first period was two months before the introduction of the electronic documentation system. The second, third, fourth and fifth periods were at 3, 6, 12 and 23 months after the implementation of the system, respectively (Table 1). These data points represent the different stages of implementation (Talmon et al. 1999): the learning stage (up to three months), early use (up to six months) and when the system is fully integrated into routine practice (after 12 and 23 months). Each study period lasted five days (Monday, Tuesday, Wednesday, Saturday and Sunday), and observations were made during the morning shift.

To minimise the Hawthorne effect, the observer talked to the caregivers in their shift handover meetings held two - weeks prior to the first period of data collection. The observer reassured the caregivers that the investigation was not meant to identify mistakes in their work but to understand any changes in the amount of time they spent on documentation after the introduction of the electronic system. This information may have helped the caregivers to become comfortable with the observer and, thus, reduced the Hawthorne effect, leading to accurate recordings of activities for the care staff members by the observer.

The caregivers’ documentation activities were identified and recorded using a predetermined set of documentation tasks (Table 2). These tasks were adapted from those specified in previously published instruments (Bosman et al. 2003, Korst et al. 2003, Pelletier & Duffield 2003). Their validation, including assessment of inter-rater reliability, is described elsewhere (Munyisia et al. 2010).

During data collection, observations were made every five minutes. Starting from a fixed location in the facility, an observer (ENM) followed the same route on each round of observation and recorded all activities being undertaken by each caregiver. Brief communication between the observer and a caregiver to clarify an activity being undertaken was allowed when necessary. The observed documentation activities were recorded on a tabular data collection tool using a unique code number allocated to each task. The tabular form contained information about the day and date of observation and whether the caregiver under observation was an RAO or a PC. When a caregiver was not found on a given round of observation, a dash (–) was recorded. A maximum of 136 rounds of observations were made per day during the

<p>| Table 1 The five periods of measurement |</p>
<table>
<thead>
<tr>
<th>Period</th>
<th>Measurement time</th>
<th>Month/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Two months before implementation of the electronic system</td>
<td>March 2009</td>
</tr>
<tr>
<td>Intervention</td>
<td>Implementation of the electronic system</td>
<td>May–June 2009</td>
</tr>
<tr>
<td>Second</td>
<td>Three months after implementation</td>
<td>August 2009</td>
</tr>
<tr>
<td>Third</td>
<td>Six months after implementation</td>
<td>November 2009</td>
</tr>
<tr>
<td>Fourth</td>
<td>12 months after implementation</td>
<td>May 2010</td>
</tr>
<tr>
<td>Fifth</td>
<td>23 months after implementation</td>
<td>April 2011</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2 Caregivers’ documentation activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taking records from the storage place</td>
</tr>
<tr>
<td>Flipping through to identify the correct page</td>
</tr>
<tr>
<td>Reviewing resident information</td>
</tr>
<tr>
<td>Writing progress notes/charts and forms</td>
</tr>
<tr>
<td>Putting records back in the filing area</td>
</tr>
<tr>
<td>Medication documentation</td>
</tr>
<tr>
<td>Admission documentation</td>
</tr>
<tr>
<td>Documentation to transport a resident to hospital</td>
</tr>
<tr>
<td>Locating the correct window</td>
</tr>
<tr>
<td>Inputting a username/password</td>
</tr>
<tr>
<td>Typing progress notes/charts and forms</td>
</tr>
<tr>
<td>Closing the electronic system</td>
</tr>
</tbody>
</table>
was conducted using Pearson’s chi-square test. A P-value was chosen because of the limitation of funds; a single observer collected data for this study, unlike in the previous work sampling studies with two or more observers on the floor (Bosman et al. 2003, Ampt et al. 2007). This situation might have negatively affected our sample size.

The proportion of time spent on documentation activities performed using paper and with a computer after implementation was also analysed using descriptive statistics. Pearson’s chi-square test was used to identify differences in the proportion of time for any two of the four measurement points.

Interview data analysis
Each interview was transcribed verbatim. The transcripts were analysed using an inductive content analysis method as described by Elo and Kyngas (2008). Transcripts were open-coded, line-by-line to identify terms or events that were similar and appeared to shed light on the caregivers’ experiences with the electronic documentation system. Categories emerged from these terms and events. The categories from different transcripts were then compared and grouped into broader higher order categories. The content of these categories was then used to abstract major themes from which to draw conclusions for this study.

Results
A total of 1594 documentation activities were recorded for the PCs and 130 for the RAOs. Over the five measurement periods there were 92 observations of PCs and 17 of RAOs (Table 3). There was no significant difference in the number of observations of PCs or of RAOs across the five periods of data collection.

Caregivers’ proportion of time on documentation
The proportion of time spent by caregivers on documentation in this period was not significantly different in the electronic system. The RAOs’ proportion of time in this period increased from 14% to 19% in the electronic system. The RAOs’ proportion of time on documentation in this period was not significantly different from that recorded when the paper-based system was used. Twelve months into electronic documentation, the PC and
PC, personal carers; RAO, recreational activity officers.

Table 3 Numbers of documentation activities and participants observed during the study

<table>
<thead>
<tr>
<th>Number</th>
<th>2 months before</th>
<th>3 months after</th>
<th>6 months after</th>
<th>12 months after</th>
<th>23 months after</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentation activities for PCs</td>
<td>370</td>
<td>255</td>
<td>460</td>
<td>279</td>
<td>230</td>
</tr>
<tr>
<td>Documentation activities for RAOs</td>
<td>18</td>
<td>57</td>
<td>5</td>
<td>36</td>
<td>14</td>
</tr>
<tr>
<td>Observations of PCs</td>
<td>16</td>
<td>19</td>
<td>17</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td>Observations of RAOs</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

The same superscript letter between measurement periods represents no significant difference in the proportion of time spent on documentation.

Table 4 The proportion of time spent by caregivers on documentation activities performed using paper and with a computer after the introduction of the electronic system

<table>
<thead>
<tr>
<th>Caregivers</th>
<th>Percentage of time in documentation activity (90% confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 months after</td>
</tr>
<tr>
<td>PCs</td>
<td>14.5%** (13.4–15.7)</td>
</tr>
<tr>
<td>Recreational activity officers</td>
<td>4.5%*a (2.8–6.2)</td>
</tr>
</tbody>
</table>

*The same superscript letter between measurement periods represents no significant difference in the proportion of time spent on documentation. Different superscript letters between measurement periods denote a significant difference in the proportion of time on documentation.

Table 5 The proportion of time spent by caregivers on documentation activities performed using paper and with a computer after the introduction of the electronic system

<table>
<thead>
<tr>
<th>Caregivers</th>
<th>Documentation activities</th>
<th>Percentage of time in documentation activity (90% confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 months after</td>
<td>6 months after</td>
</tr>
<tr>
<td>Personal carers</td>
<td>Performed using paper</td>
<td>69.8%** (65.1–74.5)</td>
</tr>
<tr>
<td></td>
<td>Performed with computer</td>
<td>30.2%a (25.5–34.9)</td>
</tr>
<tr>
<td>Recreational activity officers</td>
<td>Performed using paper</td>
<td>59.6%a (49.0–70.3)</td>
</tr>
<tr>
<td></td>
<td>Performed with computer</td>
<td>40.4%a (29.7–51.0)</td>
</tr>
</tbody>
</table>

*The same superscript letter between measurement periods represents no significant difference in the proportion of time spent on documentation. Different superscript letters between measurement periods denote a significant difference in proportion of time spent on documentation.

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the RAO proportion of time on documentation was significantly higher than the proportion recorded in the paper-based system (PCs, 17.2% vs. 14.5%, p = 0.02; RAOs, 9.2% vs. 4.5%, p = 0.01). Twenty-three months after implementation, the PCs’ proportion of time on documentation reduced significantly compared with the proportion in the period prior to the implementation of the electronic system (11.1% vs. 14.5%, p < 0.01). The RAOs’ proportion of time returned to the preimplementation level in this period.

Table 5 presents the proportion of time spent by caregivers on documentation activities performed using paper and with a computer after the introduction of the electronic system. The PCs as well as the RAOs spent over half of their time on documentation on paper-based tasks at all measurement periods after the introduction of the electronic system.

Interview results

To gain an understanding of issues that may affect the efficiency of the electronic documentation system at the RACF, we present relevant interview results below. The positive feedback is presented first followed by the problems reported by the interviewees.

The PCs were happy with the computerised documentation system in general

The PCs were happy with the electronic documentation system because access to the residents’ notes had been improved. It was much quicker for them to obtain a resident’s records and update or review his or her care needs. A PC explained her experience by stating:
I get a resident’s notes on a computer at a finger click. Unlike using the manual system that required me to go over there (points to a filing cabinet), search for a folder, come back, find the right page, and when the page was missing, go and get a photocopy. Therefore, access to one resident’s notes would probably take me 20 minutes before I sit down and start writing.

In addition, ease of access to the records had encouraged visiting doctors to directly enter residents’ data into the computer. This had relieved caregivers from the burden of writing doctors’ notes into the residents’ files, as they used to do with paper records. One PC expressed her experience as follows:

When there was a clinic here (at the facility) yesterday, the doctor wrote everything on the computer. Therefore I did not have to write progress notes because the doctor has already done it.

**Certain information items were double charted**

The PCs charted certain information items on both paper and on a computer for various reasons. For instance, PCs wrote and kept a resident’s blood sugar level data on paper at the bedside and later entered the data into a computer at the nursing station because computerised documentation was not feasible at the bedside; data entry devices available to the caregivers were only desktop and laptop computers. The PCs found the paper-based record useful in helping them make real-time care decisions at the point of care as data were organised in a longitudinal format making it easy to compare trends. One PC interviewed noted that:

With the blood sugar level data on paper at the bedside, we are able to compare trends and make care decisions unlike with the electronic system that has deficiencies with the user interface. Eventually, we ensure this data is entered into the computer.

Data on blood pressure were also recorded and maintained on paper and on a computer. According to the PCs, data in a paper-based record was organised in a longitudinal format and, thus, easier to monitor trends and make care decisions. However, data in the computerised record was located in various sections of the electronic system and, thus, difficult for the PCs and even the doctors to track the trends. One PC stated that:

We (PCs) record blood pressure data on paper because we get very frustrated looking for a resident’s data from various sections of the electronic system. We want a chronological view of this data to make care decisions. One doctor for example comes monthly to see 18–20 residents, and being able to view this data in a way that supports his workflow helps him to get a clear picture of each resident.

**It took longer to complete some documentation tasks using a computer than writing on paper**

Caregivers were unhappy with the amount of time they spent to enter certain data into a computer. For example, to complete a resident’s continence chart, a PC needed to go through three drop-down menus selecting the correct continence information from a list. To access and complete another resident’s chart, the caregiver had to enter a username and password to close the screen with the previous resident’s chart. According to the caregivers, the many clicks and switches among screens make this process far more time consuming than the previous procedures in the paper-based system. For instance, entering continence data in the paper-based system only required a tick in a continence chart and a flip-over to complete another chart. One PC said:

The only real problem I have is with the continence charts, it takes so long to enter everyone’s information in the electronic system. It can take up to one hour to enter continence data and when using the paper system, it is just a 5 minute job. I am able to go from one resident to the next using the electronic system, but when I have 35 residents, that is a lot of clicking and switching screens.

Given that the caregivers had the option to either write on paper or enter data into a computer, some of them chose to only write on paper. As stated by a PC:

It does get slow to enter data into the computer that you eventually give up. When data entry is slow and you really want to complete your documentation, you get trapped in the paper system.

**Continuous training is needed for some caregivers to effectively use the electronic system**

The procedures followed to complete certain forms on a computer such as continence and leisure charts required more computer skills and this seemed challenging for some caregivers to remember and apply. When confronted with such forms, some caregivers chose to chart the information on paper. One caregiver stated that:

Although they have been trained, some girls do not know how to give up. When data entry is slow and you really want to complete your documentation, you get trapped in the paper system.

**Discussion**

The aim of this study was to determine the impact of the introduction of an electronic documentation system on care
staff members’ documentation efficiency in an RACF. The PCs’ proportion of time spent on documentation reduced only at 3 and at 23 months after the implementation of the electronic system. There was no reduction, however, in the RAOs’ proportion of time on documentation at all measurement periods after the introduction of the electronic system. A lack of time-saving after moving to an electronic system has been reported in some studies in nursing (Ammenwerth et al. 2001, Menke et al. 2001, Saarinen & Aho 2005, Hakes & Whittington 2008). For example, Saarinen and Aho (2005) found that caregivers took longer to document care using an automated system than using a paper-based system after the implementation of an electronic system in a hospital’s intensive care unit (ICU). In an observation of caregivers using either manual or electronic documentation systems in the ICU of a paediatric ward, Menke et al. (2001) found no difference in documentation time after the introduction of the electronic system. These studies, however, were conducted in hospital settings. Our study is the first to report a lack of time-saving using an electronic documentation system in a residential aged care setting.

Caregivers’ proportion of time spent on paper-based documentation activities remained high at all measurement periods after the introduction of the electronic system (Table 5). In addition to the continued practice of charting some information items on paper, some caregivers decided to return to their manual way of documenting care after the introduction of the electronic system. For instance, while some caregivers documented continence information on a computer, others chose to chart the same information on paper, probably, because computerised forms took longer time to complete as mentioned in the interviews.

The qualitative findings suggest that the extent to which an electronic documentation system is aligned with caregivers’ documentation practice may influence the efficiency of the system. In this study, interviews with caregivers revealed that the process involved in completing a resident’s continence chart on a computer was much longer than that required by the manual system. The interview results further revealed that caregivers’ practice of double charting was partly caused by the way nursing data was organised in the electronic system, making the data inconvenient to review. Blood pressure data was located in various sections of the electronic system, unlike in the manual system where the data are organised in a longitudinal format and, hence, easier to view trends and make care decisions. Such poor alignment of the electronic system with caregivers’ documentation practice may be a barrier to the achievement of efficiency in documentation. Indeed, Bates et al. (2003), in their report analysing the requirements for an effective clinical decision support system, emphasised the importance of aligning an electronic system with the users’ work practices for achievement of the expected outcomes. Nevertheless, our findings provide useful information that can be used to improve the electronic system.

Computer skills of the caregivers can also be a determinant of efficiency in documentation. In a study conducted in an RACF in the USA, findings showed that caregivers with inadequate computer skills spent longer time documenting care on a computer (Cherry et al. 2011). In the current study, some caregivers with inadequate computer skills decided to complete some of their documentation using the less optimal and inefficient paper-based system (Martin et al. 1999). A number of the caregivers working in RACFs are older and their computer skills are poor (Yu & Comensoli 2004, Munyisia et al. 2011). Possibly, these caregivers missed the opportunity to learn how to use computers in their school education. This situation calls for a strategy that allows the caregivers to continuously learn how to use the electronic system in their work.

This study has some limitations. First, our study was confined to day shift. It is unknown whether findings from this shift correctly reflect caregivers’ documentation time in the afternoon and night shifts. In addition, the work sampling technique provides an estimate and not the exact time on an activity.

The major strength of this study is the long-term follow-up on caregivers’ proportion of time on documentation, which makes it possible to detect the long-term effect of electronic documentation in the RACF. This has also enhanced the reliability of the findings. Most previous studies conducted in other healthcare settings have had only a single point of data collection after implementation. For example, some studies were conducted at six months after implementation (Wong et al. 2003, Banet et al. 2006), others at seven months (Bosman et al. 2003, Pizziferri et al. 2005), and others at 24 months after implementation (Overhage et al. 2001, Saarinen & Aho 2005).

In addition, the application of a work sampling technique enabled a single researcher to observe a whole care team’s work in a shift. The caregivers worked in a particular section of the facility, and thus it was easy to locate them at a specific moment and record their activities without disrupting their workflow.

Conclusions

The introduction of an electronic documentation system did not lead to improved efficiency in documentation for the caregivers in an RACF at most measurement periods. This
may partly be due to the practice of documenting some information items on paper and others on a computer.

Relevance to clinical practice

To optimise the efficiency of an electronic documentation system in an RACF, it is not only important to automate all nursing forms but also to ensure the electronic system is aligned with the caregivers’ documentation practice. Continuous education and mentor support is essential to ensure caregivers’ effective usage of the electronic system.

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Contributions

Study design: ENM, PY; data collection and analysis: ENM, PY, DH and manuscript preparation: ENM, PY, DH.

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Conflict of interest

No conflict of interest.

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