The changes in caregivers’ perceptions about the quality of information and benefits of nursing documentation associated with the introduction of an electronic documentation system in a nursing home

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ABSTRACT

Purpose: To date few studies have compared nursing home caregivers’ perceptions about the quality of information and benefits of nursing documentation in paper and electronic formats. With the increased interest in the use of information technology in nursing homes, it is important to obtain information on the benefits of newer approaches to nursing documentation so as to inform investment, organisational and care service decisions in the aged care sector. This study aims to investigate caregivers’ perceptions about the quality of information and benefits of nursing documentation before and after the introduction of an electronic documentation system in a nursing home.

Methods: A self-administered questionnaire survey was conducted three months before, and then six, 18 and 31 months after the introduction of an electronic documentation system. Further evidence was obtained through informal discussions with caregivers.

Results: Scores for questionnaire responses showed that the benefits of the electronic documentation system were perceived by caregivers as provision of more accurate, legible and complete information, and reduction of repetition in data entry, with consequential managerial benefits. However, caregivers’ perceptions of relevance and reliability of information, and of their communication and decision-making abilities were perceived to be similar either using an electronic or a paper-based documentation system. Improvement in some perceptions about the quality of information and benefits of nursing documentation was evident in the measurement conducted six months after the introduction of the electronic system, but were not maintained 18 or 31 months later.

Conclusions: The electronic documentation system was perceived to perform better than the paper-based system in some aspects, with subsequent benefits to management of aged care services. In other areas, perceptions of additional benefits from the electronic documentation system were not maintained. In a number of attributes, there were similar perceptions on the two types of systems.

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1. Introduction

Nursing documentation is an integral component of nursing and a pre-requisite for quality nursing care. It is an important communication tool amongst caregivers in nursing homes and between aged care providers and other healthcare professionals [1–3]. Documented evidence enables nursing managers to assess whether care provided by individual caregivers was professional, safe and competent [2,4]. It also increases the visibility of nursing care activities [5,6]. Reimbursement for the provision of care services also benefits substantially from having thorough and accurate nursing records [3]. Moreover, nursing records can serve as legal evidence in the event of a lawsuit [3]. They also facilitate research activities and standards setting in nursing education and clinical practice [3]. For these reasons, nursing documentation has to be systematically implemented and continuously maintained.

Paper-based nursing documentation practice is time-consuming. Records are often illegible, missing or incorrect, which may lead to medical errors [5,7]. Also, the manual documentation process is often repetitive and data may not be easy to retrieve or update [1,5,7]. The paper record is thus incomplete and inadequate for supporting caregivers in the provision of quality nursing care [5,6].

Since the introduction of information technology (IT) into nursing practice, various applications have been developed and used by nurses with the hope of reducing paperwork [8,9], improving the quality of nursing data [10,11] and saving caregivers’ time [12,13]. However, most studies evaluating nursing information systems have concentrated on the process of introducing technology into nursing care [9,14-17]. A few studies that have explored the changes that might occur after the introduction of an electronic documentation system were mainly focused on efficiency gains [10,18–20].

Most evaluation efforts have been confined to hospital settings and results have varied due to the differences in study designs, context and applications under study. To our knowledge, few studies have investigated caregivers’ perceptions about the quality of information and the benefits of electronic documentation in a nursing home setting. A gap therefore exists in knowledge about whether IT investment in a nursing home will bring in the benefits of improved information management. This knowledge is essential in informing decisions by aged-care managers on investment of scarce resources in health IT solutions. Therefore, the aim of this study was to investigate whether there were any changes in caregivers’ perceptions about the quality of information and benefits of nursing documentation before and after the introduction of an electronic nursing documentation system.

2. Methods

2.1. Setting

The study was conducted at Warrigal Care Warilla, a 101-bed nursing home in Shellharbour, New South Wales, Australia. There are two houses in the facility, a 56-bed dementia care special house and a 45-bed normal nursing home house. Warrigal Care is a not-for-profit aged care organisation that runs five nursing homes, besides community aged care services.

An electronic documentation system was implemented in Warrigal Care Warilla in June 2007. The functions of this system included progress notes, care plans, handover sheets, scheduled tasks and calculation of funding level.

Nine desktop computers were available for use by caregivers in the nursing home, four in the normal nursing home house and five in the dementia care house. The electronic documentation system was installed in each computer. The computers were connected through the Internet, so that nursing records could be accessed from each of them. In the dementia care house there were two computers at the nurse station, two in a spare room, and one in the residents’ common room. In the normal nursing home section, two computers were located at the nurse station, one in a spare room and one in the conference room. Each caregiver was assigned a user name and password, and they could enter text using the keyboard.

2.2. The process of introducing the electronic documentation system

A staged, train the trainer strategy was used to introduce the electronic documentation system into Warrigal Care Warilla. Ten staff members showed better basic computer skills as indicated by the higher scores they acquired in the vendor conducted computer basic skill test. They were chosen as super users to receive a one-week electronic nursing documentation training provided by a trainer from the software vendor. They trained the rest of the care staff members in the nursing home how to use the electronic documentation system. Their training strategy was hands-on, one-by-one training on needs basis, until the trainee was fully comfortable in using the electronic documentation system.

Progress notes were the first component of nursing documentation to be introduced. All categories of caregivers, including registered nurses (RNs), endorsed enrolled nurses (EENs) and personal care workers (PCWs) were required to enter progress notes in computer. After six weeks, electronic assessment forms and charts were introduced. Only RNs and EENs were requested to lodge assessment forms and charts. In four to six months, care plan was introduced. Only RNs were involved in developing care plans. Therefore, by the first post-implementation survey conducted six months after implementation, the facility was in the process of introducing electronic care plans. At this period of time, although progress notes were all electronic, some care plans and assessment forms were still on paper.

2.3. The introduction of the aged care funding instrument

In March 2008, a new funding instrument, the ‘Aged Care Funding Instrument’ (ACFI) was introduced into aged care facilities in Australia to replace the old funding tool, the ‘Resident Classification Scale’. According to the requirements of ACFI, standardised forms have to be followed to enter assessment information about wandering, verbal behaviour,
physical behaviour, cognitive skills, depression, nutrition, mobility, personal hygiene, toileting, continence, medication and complex health care [21]. Although these forms were built into the electronic documentation system, in an effort to reduce error, the direct care staff members were requested to enter data for these assessment forms on paper. Then a senior staff member would transfer the data on paper into the computer. Therefore, the components of manual documentation were increased after the introduction of the ACFI funding tool.

By the time of the survey conducted 31 months into electronic documentation, the direct care staff members only need to enter data on paper for four nursing assessment forms: wandering, verbal behaviour, physical behaviour, faecal and urine continence charts. The rest of the information was directly entered into the electronic documentation system. Therefore, 31 months into electronic documentation, all of the nursing records were entered and stored in the electronic documentation system, either directly by the caregivers who captured the data, or later on to be transferred from paper to the electronic system.

2.4. Study participants

The study participants consisted of the available caregivers in the nursing home, including Registered Nurses (RNs), Endorsed Enrolled Nurses (EENs) and Personal Care Workers (PCWs).

2.5. Survey process

The staff members were surveyed using a questionnaire, developed from the previously validated instruments by one of the authors (PY) [7]. The questionnaire included items measuring care givers’ perceived quality of information and benefits of either paper or electronic documentation system. The face-value validity of the questionnaire was further verified by the Residential Service Manager (RSM), three RNs and two EENs in the facility.

The RSM, in collaboration with one RN and a clerk, distributed the questionnaires to the available caregivers. The caregivers were instructed to complete the questionnaires and return them in sealed envelopes to the administrative clerk to ensure anonymity and confidentiality of the information provided. All of the completed questionnaires were kept in a locked cabinet in the RSM’s office before being collected by the researcher. Following approaches taken by the previous researchers [22,23], a periodic evaluation was conducted in four stages. The first stage was three months prior to the introduction of electronic documentation. The second, third and fourth stages were 6 months, 18 months and 31 months after the introduction of the electronic system, respectively. The caregivers’ responses to the measurement items in the questionnaire were first coded and entered into Excel, and then exported to the Statistical Package for Social Sciences (SPSS) version 17.0.

The scores for overall information quality or benefits of the relevant documentation system were calculated by adding the scores of all of the items measuring information quality (5 items) or benefits (20 items), then divide the sum by the number of measurement items for the construct (divide by 5 for overall information quality and 20 for overall benefits), respectively.

Structured interviews were conducted with all levels of care staff members in the facility 20 months into electronic documentation (on 23rd to 25th February 2009). In total 17 care staff members were interviewed. All levels of managers with electronic documentation experiences in Warrigal Care also received the interview.

2.6. Measurement of variables

The caregivers’ demographics were measured in terms of their sex, age, job role, employment status, work shift, length of work in aged care facilities and length of work in the nursing home. The time taken for caregivers to use their electronic documentation system and their comfort with it were also measured.

Caregivers’ perceptions about the quality of information from their nursing documentation system were measured by a 7-point Likert scale using a previously validated instrument. Twenty items were used to measure the benefits of nursing documentation by a 6-point Likert scale. On these scales, one represents the most desirable, and 6 or 7 denote the least desirable response.

Descriptive statistics and non-parametric statistical methods (Kruskal–Wallis test and Mann–Whitney U test) were used for data analyses. Statistically significant differences were assumed when a p value was less than 0.05. For the overall benefits of the documentation system, 90% confidence level was assumed, with p value set to be 0.10. Structured interviews were conducted with some care staff members to gather further information about their experiences with paper based or electronic nursing documentation and to seek their perceptions about both types of documentation system.

3. Results

In the period prior to electronic documentation, 32 of 50 caregivers (64%) participated in the questionnaire survey. In each of the measurements conducted six months or 18 months into electronic documentation, 25 of 50 caregivers (50%) responded. In the survey conducted 31 months after electronic documentation, 15 of 30 caregivers (50%) responded.

Six Registered Nurses (RNs), nine Endorsed Enrolled Nurses (EENs) and 17 Personal Care Workers (PCWs) participated in the study before the introduction of the electronic system. Four RNs, three EENs and 17 PCWs participated six months after the implementation. Three RNs, three EENs and 19 PCWs participated in the survey 18 months after the implementation. Two RNs, two EENs, seven PCWs and two other staff members (a recreational activity officer and a record officer) participated in the survey 31 months after the introduction of the electronic documentation system (see Table 1).

Interview data suggests that the care staff members were most happy with daily progress notes on computer, because in principle any changes in care needs for a resident should be updated timely on progress notes; therefore, it is highly useful for understanding a resident’s care needs. Each of the 17 care
Table 1 - The respondents’ demographic information.

<table>
<thead>
<tr>
<th>Respondent’s characteristics</th>
<th>3 months before (%)</th>
<th>6 months after (%)</th>
<th>18 months after (%)</th>
<th>31 months after (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>28 (100%)</td>
<td>23 (100%)</td>
<td>20 (90.9%)</td>
<td>13 (92.9%)</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>2 (9.1%)</td>
<td></td>
<td>1 (7.1%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 20</td>
<td>1 (4.0%)</td>
<td>1 (4.0%)</td>
<td>1 (4.0%)</td>
<td></td>
</tr>
<tr>
<td>20–29</td>
<td>3 (10.3%)</td>
<td>1 (4.0%)</td>
<td>3 (12.0%)</td>
<td>2 (13.3%)</td>
</tr>
<tr>
<td>30–39</td>
<td>2 (6.9%)</td>
<td>3 (12.0%)</td>
<td>4 (16.0%)</td>
<td>2 (13.3%)</td>
</tr>
<tr>
<td>40–49</td>
<td>12 (41.4%)</td>
<td>10 (40.0%)</td>
<td>6 (24.0%)</td>
<td>2 (13.3%)</td>
</tr>
<tr>
<td>50–59</td>
<td>10 (34.5%)</td>
<td>10 (40.0%)</td>
<td>11 (44.0%)</td>
<td>8 (53.3%)</td>
</tr>
<tr>
<td>60 and above</td>
<td>2 (6.9%)</td>
<td></td>
<td></td>
<td>1 (6.7%)</td>
</tr>
<tr>
<td><strong>Job role</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCW</td>
<td>16 (55.2%)</td>
<td>17 (68.0%)</td>
<td>17 (73.9%)</td>
<td>7 (50.0%)</td>
</tr>
<tr>
<td>EEN</td>
<td>7 (24.1%)</td>
<td>3 (12.0%)</td>
<td>3 (13.0%)</td>
<td>2 (14.3%)</td>
</tr>
<tr>
<td>RN</td>
<td>6 (20.7%)</td>
<td>4 (16.0%)</td>
<td>3 (13.0%)</td>
<td>2 (14.3%)</td>
</tr>
<tr>
<td>Manager</td>
<td>1 (4.0%)</td>
<td></td>
<td></td>
<td>1 (7.1%)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td>2 (14.3%)</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full time</td>
<td>10 (34.5%)</td>
<td>8 (32.0%)</td>
<td>5 (20.0%)</td>
<td>6 (40.0%)</td>
</tr>
<tr>
<td>Part time</td>
<td>13 (44.8%)</td>
<td>12 (56.0%)</td>
<td>16 (64.0%)</td>
<td>9 (60.0%)</td>
</tr>
<tr>
<td>Casual</td>
<td>6 (20.7%)</td>
<td>3 (12.0%)</td>
<td>4 (16.0%)</td>
<td></td>
</tr>
<tr>
<td><strong>Work shift on the day of answering the questions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morning</td>
<td>21 (72.4%)</td>
<td>14 (63.6%)</td>
<td>6 (27.3%)</td>
<td>12 (80.0%)</td>
</tr>
<tr>
<td>Afternoon</td>
<td>5 (17.2%)</td>
<td>2 (9.1%)</td>
<td>5 (22.7%)</td>
<td>2 (13.3%)</td>
</tr>
<tr>
<td>Night</td>
<td>3 (10.3%)</td>
<td></td>
<td>4 (18.2%)</td>
<td></td>
</tr>
<tr>
<td>Morning and afternoon</td>
<td>4 (18.2%)</td>
<td>6 (27.3%)</td>
<td></td>
<td>1 (6.7%)</td>
</tr>
<tr>
<td>Morning and night</td>
<td>2 (9.1%)</td>
<td>1 (4.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Length of work in aged care facilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 months to 1 year</td>
<td>2 (8.0%)</td>
<td>2 (8.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–3 years</td>
<td>11 (37.9%)</td>
<td>8 (32.0%)</td>
<td>6 (25.0%)</td>
<td>3 (20.0%)</td>
</tr>
<tr>
<td>4–6 years</td>
<td>5 (17.2%)</td>
<td>4 (16.0%)</td>
<td>4 (16.7%)</td>
<td>1 (6.7%)</td>
</tr>
<tr>
<td>7–10 years</td>
<td>4 (13.8%)</td>
<td>5 (20.0%)</td>
<td>4 (16.7%)</td>
<td>3 (20.0%)</td>
</tr>
<tr>
<td>More than 10 years</td>
<td>9 (31.0%)</td>
<td>6 (24.0%)</td>
<td>8 (33.3%)</td>
<td>8 (53.3%)</td>
</tr>
<tr>
<td><strong>Length of work in this aged care facility</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 3 months</td>
<td>1 (4.0%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 months to 1 year</td>
<td>4 (16.0%)</td>
<td>3 (12.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–3 years</td>
<td>16 (55.2%)</td>
<td>7 (28.0%)</td>
<td>7 (28.0%)</td>
<td>3 (20.0%)</td>
</tr>
<tr>
<td>4–6 years</td>
<td>6 (20.7%)</td>
<td>6 (24.0%)</td>
<td>8 (32.0%)</td>
<td>4 (26.7%)</td>
</tr>
<tr>
<td>7–10 years</td>
<td>2 (6.9%)</td>
<td>4 (16.0%)</td>
<td>3 (12.0%)</td>
<td>3 (20.0%)</td>
</tr>
<tr>
<td>More than 10 years</td>
<td>5 (17.2%)</td>
<td>3 (12.0%)</td>
<td>4 (16.0%)</td>
<td>5 (33.3%)</td>
</tr>
<tr>
<td><strong>Amount of months using your facility’s current documentation system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 1 month</td>
<td>1 (4.2%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–3 months</td>
<td>2 (8.0%)</td>
<td>1 (4.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4–5 months</td>
<td>4 (16.0%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>14 (56.0%)</td>
<td>1 (4.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 6 months</td>
<td>5 (20.0%)</td>
<td>21 (87.5%)</td>
<td>15 (100%)</td>
<td></td>
</tr>
<tr>
<td><strong>Your comfort in using your facility’s current documentation system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not comfortable at all</td>
<td>6 (20.7%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat comfortable</td>
<td>13 (44.8%)</td>
<td>5 (20.8%)</td>
<td>6 (24.0%)</td>
<td>2 (13.3%)</td>
</tr>
<tr>
<td>Comfortable</td>
<td>4 (13.8%)</td>
<td>11 (45.8%)</td>
<td>14 (56.0%)</td>
<td>8 (53.3%)</td>
</tr>
<tr>
<td>Very comfortable</td>
<td>6 (20.7%)</td>
<td>8 (33.3%)</td>
<td>5 (20.0%)</td>
<td>5 (33.3%)</td>
</tr>
</tbody>
</table>

staff members who received the interview stated that progress notes were simple and easy to use. Therefore, the introduction of electronic progress notes was highly welcomed by the whole care team.

Entering information for assessment forms and care plans requires more in-depth professional nursing knowledge and literacy in both English and the electronic documentation, only EENs and RNs were involved in these complex documentation tasks.

There was no significant variation in most of the caregivers’ demographic characteristics amongst the four data points except the shift they worked at the time of the surveys and their experiences with the electronic documentation system (see Table 1).

The majority of respondents were female; three quarters were aged over forty years (see Table 1). This age profile is consistent with the general age profile of aged-care workforce in Australia [24].

The shifts the respondents worked at the pre-implementation survey, at 6 months and 31 months post-implementation surveys were similar. The shifts the respondents worked at 18 months post-implementation survey were significantly different from the ones conducted pre-implementation and 31-months post-implementation;
fewer staff members who only worked in the morning shift, and more staff members who worked in afternoon, night or both morning and afternoon shifts participated in this survey compared with the other surveys.

The caregivers’ amount of months using their facility’s documentation system had significantly increased in the survey conducted 18 months into electronic documentation compared with the one conducted 6 months post implementation. The value for this parameter remained similar for the two surveys conducted 18 months and 31 months into electronic documentation (see Table 1).

The caregivers’ comfort with nursing documentation was significantly improved after the introduction of electronic documentation system (see Table 1). None of the respondents reported “not comfortable at all” with nursing documentation; whereas 21% of the respondents (n = 6) felt so when documenting in paper-based system. Six months into electronic documentation, about 80% of the respondents felt “comfortable” or “very comfortable” with nursing documentation; and this high level of comfort with nursing documentation was sustained at 18 months, and then at 31 months into electronic documentation.

### 3.1. Caregivers’ perceptions about the quality of information from their documentation system

The scores for the averaged ‘overall information quality’, the measured scores of accuracy and completeness of information from the nursing documentation system were significantly more desirable six months after the introduction of the electronic system than they were three months before implementation (see Table 2). The high level of positive scores was maintained 18 and 31 months into electronic documentation.

Scores for caregivers’ perceptions about understandability of information were significantly better at six months after than at three months before implementation. However, the scores for this measurement 18 months into electronic documentation had returned to the same level as those for the paper-based system. Interestingly at the survey conducted 31 months into electronic documentation, this score had jumped back to the same high level as the one conducted at six months after implementation.

There was no significant difference in the before and after implementation scores for perceptions about the relevance and reliability of information from the documentation system.

### 3.2. Caregivers’ perceptions about the benefits of their nursing documentation system

Scores for caregivers’ perceptions of the benefits of the documentation system are given in Tables 3 and 4. For three of the measurement statements – not much repetition in data entry, the records are legible, has managerial benefits – the scores were significantly better than those for the paper-based system after using the electronic system for six months, and remained so after 18 and 31 months (see Table 3).

Interviews with managers at all levels of Warrigal Care, either the Corporate Office or residential facility Managers, have revealed the significant managerial benefit of accessing resident information at a finger click. When nursing records were on paper, a manager had to physically find and check nursing records if needs arose. It was difficult to identify patterns and trends in care needs and evaluate outcomes of care. Using the Web-based electronic documentation system, a manager with proper access rights could access a resident’s record at a finger click. This had significantly improved management’s understanding about an aged resident’s care needs. Some managers mentioned that the first thing they did in daily work was to check the electronic records to identify areas that needed management intervention. Some managers used the system’s usage information to identify care staff members’ training needs in nursing documentation. These managerial benefits of electronic documentation can never be matched by a paper-based system. Therefore, the man-
The significantly better scores acquired at six months into electronic documentation for the three statements – puts all the information in one place, easy for information retrieval, offers information when it is needed – were maintained 18 months later, but regressed to the similar level as paper-based system after 31 months (see Table 3).

Scores for the averaged overall benefits of nursing documentation; the availability of information when needed and reduction in documentation errors, the standardisation of forms and data and ease in developing care plans were significantly better at six months after implementation than those for the paper based system. However, at 18 months, scores for these measurement items had decreased to levels similar to those obtained for the paper-based system. Thirty-one months after the implementation of electronic documentation system, scores for the averaged overall benefits of nursing documentation, availability of information when needed and reduction in documentation errors had returned to a similar high level to those at six months after the implementation of electronic documentation system; however, the scores for the two measurement items – the standardisation of forms and data and ease in developing care plans – remained the similar level to those for the paper-based system, the same as those measured at 18 months into electronic documentation.

There were no significant differences between the before and the after implementation scores for the remaining survey items, which covered understanding of residents’ needs, changes to care plans, efficiency of use, decision making ability and communication between care workers (see Table 4).

### 3.3. The differences in perceptions about the benefits of electronic documentation amongst the different categories of caregivers

No significant differences in perceptions about the quality of information were identified amongst the three categories of caregivers: RNs, EENs and PCWs. Interestingly, PCWs gave significantly more positive responses to six statements measuring different benefits of electronic documentation than EENs. These statements include easiness in developing care plans, offering information at any time, easiness in editing/revising care plans, putting all the information in one place, having increased my decision making capability and improving communication between care workers. The only significant difference in perception between RNs and EENs was whether the documentation system had put all the information in one place. The RNs were more positive in response to this statement than the EENs.
Table 4 – Scores for the answers given by the caregivers about the benefits of their documentation system 3 months before, 6, 18 and 31 months after the introduction of the electronic documentation system, and the p-value of Kruskal–Wallis test on the measurement scores amongst the four data points, showing no significant differences.

<table>
<thead>
<tr>
<th>Measurement statement</th>
<th>3 months before Median (interquartile range)</th>
<th>6 months after Median (interquartile range)</th>
<th>18 months after Median (interquartile range)</th>
<th>31 months after Median (interquartile range)</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gives me clear understanding of residents’ needs and problems</td>
<td>3.00 (2.00)</td>
<td>3.00 (2.00)</td>
<td>3.00 (2.00)</td>
<td>2.00 (1.00)</td>
<td>0.738</td>
</tr>
<tr>
<td>Ease to edit/revise care plans</td>
<td>3.00 (2.00)</td>
<td>2.00 (1.00)</td>
<td>3.00 (2.00)</td>
<td>2.00 (1.00)</td>
<td>0.324</td>
</tr>
<tr>
<td>Is efficient to use</td>
<td>2.50 (1.00)</td>
<td>2.00 (1.00)</td>
<td>2.00 (1.00)</td>
<td>2.00 (0.00)</td>
<td>0.481</td>
</tr>
<tr>
<td>Has increased my decision-making capability</td>
<td>4.00 (2.00)</td>
<td>3.00 (2.00)</td>
<td>3.00 (3.00)</td>
<td>3.00 (2.00)</td>
<td>0.873</td>
</tr>
<tr>
<td>Allows me to explore care alternatives deeper and wider</td>
<td>3.00 (2.00)</td>
<td>3.00 (2.00)</td>
<td>3.00 (3.00)</td>
<td>2.00 (2.00)</td>
<td>0.508</td>
</tr>
<tr>
<td>Has facilitated me to identify the change of care needs for a resident in a timely manner</td>
<td>3.00 (3.00)</td>
<td>3.00 (2.00)</td>
<td>3.00 (2.00)</td>
<td>3.00 (1.00)</td>
<td>0.266</td>
</tr>
<tr>
<td>Improves communication between care workers</td>
<td>3.50 (3.00)</td>
<td>3.00 (3.00)</td>
<td>3.00 (2.00)</td>
<td>3.00 (3.00)</td>
<td>0.765</td>
</tr>
<tr>
<td>Facilitates the exchange of experiences by reading records entered by co-workers</td>
<td>3.00 (1.00)</td>
<td>2.50 (1.00)</td>
<td>2.00 (1.00)</td>
<td>2.00 (1.00)</td>
<td>0.447</td>
</tr>
<tr>
<td>Improves communication between different occupations</td>
<td>3.00 (1.00)</td>
<td>3.00 (2.00)</td>
<td>3.00 (2.00)</td>
<td>2.00 (2.00)</td>
<td>0.256</td>
</tr>
<tr>
<td>Reduces personal contact between co-workers</td>
<td>3.50 (2.00)</td>
<td>4.00 (2.00)</td>
<td>3.00 (2.00)</td>
<td>3.00 (3.00)</td>
<td>0.718</td>
</tr>
</tbody>
</table>

Note: Scores range from 1 = Strongly Agree to 6 = Strongly Disagree.

4. Discussion

To our knowledge, this is the first study to compare caregivers’ perceptions about quality of information and benefits of nursing documentation using a questionnaire survey before and after the introduction of an electronic documentation system in a nursing home. All of the caregivers participated in our study entered data into computers themselves. It is important that all health care workers who provide information record it themselves [25]; therefore, this is a significant achievement for the organisation that implemented the system.

Compared with the paper-based system, the electronic system was perceived to have provided the caregivers with legible, more accurate and complete information at all data points. Repetition in data entry had been significantly reduced. As completeness and accuracy are the two major criteria to measure information quality in information systems [25], the quality of information from the electronic documentation system is perceived by the caregivers to be high.

The success of electronic health records depends on the quality of information available to health care workers in making decisions about patient care and in the communication between health care professionals during patient care [25]. The positive feedback about quality of information from the electronic documentation system indicates that the system had benefited aged care services for the aged residents.

The above benefits were validated by the results of the post-implementation surveys at three data points, indicating that these benefits may be consistent and exclusive to the electronic documentation compared with the previous paper-based practice. These results are consistent with the findings from the previous studies evaluating clinical information systems in nursing practice [9–11,26].

Caregivers’ perceptions towards documentation at six months into electronic documentation were more positive than those measured later on. Although during this period of time, the facility was in the process of moving paper-based care plan into the computer, therefore, information was entered on both electronic and paper systems. It appears that the caregivers were fully familiarised with the new electronic documentation systems, whilst they could still recall the difficulties with paper-based documentation. Therefore, they were very enthusiastic about the new electronic documentation practice and had highly positive perceptions. This data may also suggest that six months is the time frame taken for an electronic documentation system to be completely integrated into aged care services in residential aged care facilities.

The scores for the items measuring other benefits of documentation fluctuated at the data points of 18 months and 31 months into electronic documentation. Sometimes the
improved perceptions were maintained 18 months later, then dropped to a similar level to that for the paper-based system 31 months later, or vice versa. This suggests that further realisation of other major benefits of electronic documentation, such as putting all the information in one place, improvement in information retrieval, offering information when it is needed, reducing documentation errors, standardisation of forms and data and easiness in developing care plans, may involve more managerial interventions than simply introducing an electronic documentation system. It may also suggest that merely moving the paper-based nursing records on computer was not sufficient enough to realise all of the potential benefits of electronic documentation. Decision support functions may be needed to realise quality improvement from electronic system, as found by Zhou et al. [27].

The introduction of the new funding model nine months into electronic documentation had led to increased amount of paper work; this might be the reason for the perceived reduction of benefits in some aspects 18 months into electronic documentation. Obviously documenting in both electronic and paper-based systems had led to increased complexity of documentation, a practice that makes coordination of data difficult, using a system that has the drawbacks of both paper and electronic records [28].

However, 31 months into electronic documentation, although the scores for some measurement items bounced back to the similar high levels to those at six months, scores for some items did not improve. For other items, although the scores were high at 18 months, they regressed to levels similar to those for the paper-based system. A possible explanation might be that there were caregivers leaving the nursing home either on retirement or resignation and new ones taking up the positions all the time. Such movement of care staff members is common in Australian nursing homes, as indicated by the similar length of work for the respondents from the aged care facility at each of the four survey data points (see Table 1). If the new caregivers were not adequately trained to use the electronic system, it could negatively affect their perceptions towards its benefits [29]. These results may suggest that continuous education and training on documentation are essential for maintaining the quality of electronic nursing documentation.

The caregivers’ perceptions about other documentation features were similar for both the electronic and the paper systems. There could be several reasons to explain this: first, these results reflect the reality; second, the caregivers usually acquire residents’ information verbally during shift handover. Previous studies have also found that nursing staff prefer oral to any other media to communicate their nursing care details [1,30,31]. In the study facility, personal care workers seldom referred to the written records unless necessary, such as when returning from annual leave. Therefore, the relevance of nursing records to their care practice may not be obvious. As most of the frontline caregivers did not often actively use information stored in the nursing records to guide their aged care service delivery, this has significantly undermined the value of electronic documentation.

Discussion with caregivers identified that they normally documented resident’s information at the end of a shift based on memory, as reported by Crofton and Witney [6]. Thus it is likely that the recording of change of care needs for a resident may not be timely, leading to incomplete or irrelevant information that is unreliable. According to the nursing manager and staff members, lack of time attending to all their nursing chores in a shift is the major cause for this behaviour. This documentation behaviour was one of the reasons for the introduction of electronic documentation: documentation at the point of care timely. However, due to the limitation in time management and the inconvenience of multitasking when attending to a resident, this aim did not appear to have been achieved in the study facility.

Having said that, the PCWs were significantly more positive about some benefits of nursing documentation than either RNs or EENs (see Table 5). The PCWs’ perceptions that electronic documentation system had offered them information at any time and improved communication between care workers appear to be valid claims. This is because in paper-based documentation system, only one file recording a particular piece of information about a specific resident was available for the whole care team. Being the staff members with the lowest rank in the organisational hierarchy, it is likely that PCWs had the least chance of getting hold a specific piece of information for a resident if the information was simultaneously requested by a care staff member who was higher in the organisational hierarchy.

As electronic records were legible, the last five records could be immediately brought up on screen, and this had significantly increased PCWs’ access to resident information. As

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<table>
<thead>
<tr>
<th>Table 5 – The measurement statements for which differences in answers about the benefits of electronic documentation amongst the three categories of caregivers were identified, the medium and interquartile range of the answer scores.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Improves communication between care workers</strong></td>
</tr>
<tr>
<td>RN: 3.00 (3.00)a     EEN: 3.00 (3.00)b   PC: 2.00 (2.00)b</td>
</tr>
<tr>
<td><strong>Puts all the information in one place</strong></td>
</tr>
<tr>
<td>RN: 3.00 (2.00)a     EEN: 2.50 (3.00)b   PC: 2.00 (0)a</td>
</tr>
<tr>
<td><strong>Has increased my decision making capability</strong></td>
</tr>
<tr>
<td>RN: 3.00 (2.00)a     EEN: 4.00 (0)a     PC: 3.00 (1.00)a</td>
</tr>
<tr>
<td><strong>Has facilitated me to identify the change of care needs for a resident in a timely manner</strong></td>
</tr>
<tr>
<td>RN: 3.00 (2.00)ab    EEN: 3.00 (1.00)a   PC: 2.50 (1.00)a</td>
</tr>
<tr>
<td><strong>Easy to edit/revise care plans</strong></td>
</tr>
<tr>
<td>RN: 3.00 (2.00)a     EEN: 3.00 (2.00)a   PC: 2.00 (1.00)b</td>
</tr>
<tr>
<td><strong>Offers resident information at any time</strong></td>
</tr>
<tr>
<td>RN: 3.00 (2.00)a     EEN: 3.00 (2.00)a   PC: 2.00 (1.00)b</td>
</tr>
<tr>
<td><strong>Is easy to develop care plans</strong></td>
</tr>
<tr>
<td>RN: 3.00 (3.00)a     EEN: 3.50 (1.00)a   PC: 2.00 (1.00)b</td>
</tr>
<tr>
<td><strong>Offers resident information at any time</strong></td>
</tr>
<tr>
<td>RN: 3.00 (2.00)a     EEN: 3.00 (2.00)a   PC: 2.00 (1.00)b</td>
</tr>
<tr>
<td><strong>Is easy to develop care plans</strong></td>
</tr>
<tr>
<td>RN: 3.00 (3.00)a     EEN: 3.50 (1.00)a   PC: 2.00 (1.00)b</td>
</tr>
</tbody>
</table>

Note: Scores range from 1 = Strongly Agree to 6 = Strongly Disagree. The same superscript letter represents no significant difference in responses to a statement between two categories of caregivers (p > 0.05); whereas different superscript letters denote a significant difference in responses to a statement between two categories of caregivers (p < 0.05).
such, electronic documentation has the indirect benefit of
reducing the divide in access to information caused by care
staff members’ difference in positions in an aged care facil-
ity. As mentioned in Section 2, PCWs were only involved in
entering data into progress notes, the simplest function to use.
They did not need to bother how to use more sophisticated
functions such as assessment, care planning and reporting.
This may explain why the PCWs were more happy with
electronic documentation than the other two categories of
caregivers.

It appears that EENs were the less positive about the bene-
fits of electronic documentation than the other two categories
of caregivers. The reason for this difference is yet to be iden-
tified.

Another significant benefit of electronic documentation
compared with paper-based practice appears to be simplifying
documentation for all categories of the caregivers. This ben-
efit was evidenced by the significantly higher comfort level
the caregivers had with the electronic documentation system
at all three data points compared with that in the paper-
based system. Caregivers also expressed their satisfaction
with the easiness of following the documentation procedures
in the electronic documentation system, and the increased
convenience to learn their peers’ best documentation prac-
tice because of increased legibility and access to information
such as progress notes.

4.1. Limitations

The study was confined to a single nursing home and thus
the results may not be generalisable to all nursing homes.
The findings from our study are based on self-reported
opinions from aged care workers. Although self-reported
measures have been viewed as a relevant indicator for
understanding work force acceptance of IT innovation [32],
data acquired was subjective. We need to be aware that
even though care givers perceived that there was improve-
ment in quality of information and felt that the electronic
documentation system was beneficial, this does not neces-
sarily mean that there is actual improvement in terms of
quality of information and actual benefits of the electronic
documentation system compared to the paper-based sys-
tem.

The care staff members completed the questionnaire
at their own chosen time and place, thus there were
possibilities for them to share answers with their peers.
To eliminate their hesitation in providing personal opin-
ions, we provided the caregivers with an information
sheet before getting their consent to complete the ques-
tionnaire. The information sheet clearly outlined the
importance of the participants providing their independent
responses.

The questionnaire survey was designed for research pur-
puses, completing it or not was completely voluntary as clearly
stated in the information sheet; therefore, we did not acquire
information about the characteristics of the caregivers who
completed the survey and those who did not.

The questionnaire contained pre-coded answers. This
might have limited caregivers’ responses. However, the ques-
tionnaire used in this study was a slight modification of a
validated instrument by one of the authors (PY) [7], which
has been shown to be capable of providing valid and reliable
results. The sensitivity of the questionnaire was also vali-
dated by its capacity to indicate the differences in responses
between different data points. The sample size for each of
the four data collection points was relatively small, but sta-
tistically they were considered adequate for providing valid
results. Although the response rate was somewhat limited, it
was, in fact, similar to that of previous studies on IT accep-
tance in healthcare professionals [33].

We were unable to find conclusive evidence based on this
longitudinal questionnaire survey that the introduction of
electronic documentation to a nursing home resulted in effi-
ciency gain. A possible reason for this could be that both
manual and electronic systems were used concurrently, par-
ticularly in the period leading up to the third measurement,
when ACFI was introduced, as mentioned in Section 2. This
practice might have increased the time spent by caregivers on
nursing documentation tasks.

Further study using other methods, such as measuring
work activity and time, and quantitative measurement of the
quality of nursing documentation system, would have pro-
vided further insights about the similarities and differences
between electronic and paper-based documentation practice.
The research team is currently using these measurements
to acquire objective evidence about efficiency and quality of
nursing documentation.

5. Conclusions

The care staff members felt significantly more comfortable
with electronic nursing documentation than writing on paper
after using the electronic system for six months. The benefits
of the electronic documentation system were perceived by the
caregivers as providing more legible, accurate and complete
information. There were also perceptions of reduced repeti-
tion in data entry and more managerial benefits. However,
caregivers’ perceptions of their communication and decision-
making ability remained the same no matter whether they
used an electronic or a paper-based documentation sys-
tem.

Improvement in some aspects of caregivers’ perceptions
about the quality of information and benefits of nursing
documentation was most obvious in the measurement con-
ducted six months into electronic documentation, indicating
that the practice change associated with the introduction of
electronic documentation system was relatively mature six
months later. However, some of the perceived improvements
were not maintained 18 months or 31 months later. Con-
current use of both manual and electronic systems during
the study period may have contributed to the limited per-
ceived benefits from the electronic documentation system
18 months into electronic documentation. The regression in
perceptions about some benefits of electronic documentation
31 months later suggests that realisation of most benefits of
electronic documentation involves more managerial interven-
tions, such as education and training care staff members,
than merely introducing the new electronic documentation
system.
Summary points

What was known before the study?

- Paper-based nursing documentation is time-consuming, illegible, inaccurate and thus incomplete in supporting caregivers in providing quality nursing care.
- Electronic documentation has potential to improve the quality of nursing records in terms of legibility, completeness and comprehensiveness of data.
- An electronic documentation system has potential of reducing caregivers’ charting time.

What this study has added to the body of knowledge?

- An electronic documentation system performs better than a paper-based system in some aspects of nursing documentation. In other areas, additional benefits from the electronic documentation system may not be sustained. Whilst in some areas, there may be no difference between using either of the systems.
- Concurrent use of both manual and electronic nursing documentation could limit the benefits of using an electronic documentation system.
- The role of nursing documentation in facilitating communication and care decision-making is yet to be realised.

Ethical considerations

All procedures used in this study were approved by the Human Research Ethics Committee, University of Wollongong, Australia, and complied with the National Health and Medical Research Council National Statement on Ethical Conduct in Research Involving Humans, 1999.

Author contributions

EM: Survey instrument validation, data collection, interpretation and manuscript preparation. PY: study conceptualization and design, survey instrument development, statistical data analysis, data interpretation and manuscript preparation. DH: manuscript preparation, data interpretation.

Conflict of interest statement

The authors have no financial interest to this work.

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