Text data mining of aged care accreditation reports to identify risk factors in medication management in Australian residential aged care homes

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Keywords
identify, risk, factors, medication, management, australian, text, data, mining, aged, residential, care, homes, accreditation, reports

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Abstract

This study aimed to identify risk factors in medication management in Australian residential aged care (RAC) homes. Only 18 out of 3,607 RAC homes failed aged care accreditation standard in medication management between 7\textsuperscript{th} March 2011 and 25\textsuperscript{th} March 2015. Text data mining methods were used to analyse the reasons for failure. This led to the identification of 21 risk indicators for an RAC home to fail in medication management. These indicators were further grouped into ten themes. They are overall medication management, medication assessment, ordering, dispensing, storage, stock and disposal, administration, incident report, monitoring, staff and resident satisfaction. The top three risk factors are: “ineffective monitoring process” (18 homes), “noncompliance with professional standards and guidelines” (15 homes), and “resident dissatisfaction with overall medication management” (10 homes).

Keywords:
Risk, medication management, residential aged care

Introduction

With population aging, the demand for aged care services around the world is increasing. Associated with the aging process is an increased level of frailty and chronic diseases, which pose major challenges to RAC services [1]. Residential aged care homes in Australia provide accommodation, nursing care and personal care services for the frail older people [2]. Previous research suggests that people living in RAC homes have a higher exposure to various risk factors than their counterparts in the community [1]. Long-term and complex chronic conditions associated with the aging process are the main challenges for nursing staff to provide appropriate care to these people [2]. The high demands for appropriate care and regulatory compliance have led to high cost and burden for aged care services [3]. Formal aged care services in Australia are predominantly financed by taxpayers with some contributions from service users [4]. In order to protect residents’ safety and enhance the quality of the services, the Australian government has imposed stringent accreditation and safety standards through its aged care accreditation program administered by Australian government Aged Care Quality Agency (ACQA).

The aged care accreditation program in Australia focuses on continuous quality improvement strategies [5]. It includes an accreditation process and monitoring of ongoing performance against standards [5]. It is an effective approach to risk management and quality improvement of government-subsidized RAC homes [4]. In Australia, RAC homes are required to meet the accreditation standards at all times to ensure a high standard of care and services [6]. If a home fails in the accreditation, a timetable for improvement with a deadline will be developed by the ACQA [7]. Meanwhile, the agency monitors the home’s progress in making improvements. If the home does not meet all the requirements before the deadline, the agency may conduct a review audit which may result in the home’s accreditation certification being revoked and the home will lose legibility for receiving government subsidy.

Risk management process in Australian RAC homes

The aged care accreditation system is established to manage potential risks in RAC homes. The accreditation process starts with self-assessment, followed by a desk audit, a site audit, the decision whether or not to accredit the home and the publication of the accreditation report [4].

Self-assessment, desk audit and site audit can help the RAC homes to identify the risk areas and risk factors [7]. The accreditation teams’ findings, the decision of the accreditation agency about whether an RAC home has met the 44 expected outcomes is the official verdict about the home’s risk management system. Therefore, a risk management approach is essential for RAC homes to pass the accreditation [7].

The whole process of risk management includes identifying risks, assessing the risks, developing risk management plans, implementing risk management actions and re-evaluating risks which have occurred in the process of delivering aged care services [7]. A vulnerable area where risks for resident safety might occur in RAC homes is medication management.

Medication safety is an important risk area in RAC homes

Residential aged care homes must support and safely manage each resident’s medication need [8]. It is reported that residents take an average of seven to nine medications [9-12]. As medication management is a complex process involving prescription, ordering, delivery, administration, monitoring, evaluation and documentation [13], errors such as wrong drug that are detrimental to medication safety may occur in any stage [14]. The error rate is between 28\% and 40\% [15, 16]. The occurrence of these errors may be increased by nurses’ high physical and mental load [17] and large amount of medication to be administered under time pressures [18]. Therefore, this research aimed to identify the risk factors related to medication management in RAC homes.
Methods

We followed a three-step process to extract the data from the aged care accreditation reports in Australia: 1) report collection, 2) section/paragraph extraction, and 3) keywords/terminology identification (see Figure 1).

Step 1. Report collection

Data were sourced from the website of the Australian ACQA [19]. 3,607 copies of aged care accreditation reports published between 7th March 2011 and 25th March 2015 were downloaded, all in PDF format and each was about 24 pages in length.

The reports were converted from PDF to txt files. Errors generated during conversion, such as mis-spellings, broken lines and unnecessary symbols were fixed. The first author manually compared the converted text files with the original PDF documents, finding that the incorrect character encoding was concentrated on list characters like ‘*’ in PDF format. These characters were converted to ‘?’ or ‘????’ in the txt format. Otherwise, the errors did not influence reading the content.

Step 2. Section/paragraph extraction

Text data in the collected reports were classified and labelled with the representative key words. For example, the text in comments and recommendations about medication management was labelled with the keyword “medication management”. Text about whether the home met or not met the accreditation outcome of medication management was labelled with “met” or “not met”. Following this labelling rule, information labelled included state name, assessment date, the name of an RAC home, its location, and comments on each of the 44 expected outcomes.

Information about report name, name of an RAC home, location, and comments and recommendations on the outcomes was extracted and loaded into a designed PostgreSQL database for storage and further analysis. In total, 3,607 records were stored. Each record contained the text data extracted from the section about medication management in the original accreditation reports.

Step 3. Keywords/terminology identification

Records showing that a home failed in medication management were selected for qualitative analysis.

To help us to get a sense of the key issues discussed in the report, we used the application Apache OpenNLP to build a word cloud from the extracted accreditation reports about medication management to highlight the most frequently used words in the text (see Figure 2).

Figure 2-A word cloud for highlighting the most frequently used keywords comments for medication management an aged care accreditation report.

We used a manual process to classify and summarize all the risk factors from the section of the accreditation report for medication management. This process was concluded until no further risk factors were identified.

Then each sentence in the section of medication management was carefully read to understand the reason for failure, which was mapped to and labelled as a risk factor for medication management. This label was stored in the PostgreSQL database. Constant comparison was made with the labels among the records to classify or amalgamate them. This led to the generation of a classification table (see Table 1). The number of times that a risk factor was mentioned in the reports was also counted.

Results

Only 18 out of 3,607 RAC homes (0.5%) did not meet medication management outcome. Twenty-one risk factors for the RAC homes to fail in medication management were identified. These factors were grouped into 10 categories: overall medication management, medication assessment, ordering, dispensing, stocking, administration, monitoring, incident reporting, staff satisfaction and resident satisfaction (Table1).

There were three risk factors in the overall medication management. 15 (83% of the failed) RAC homes did not comply with professional standards and guidelines. Two (11%) RAC homes did not have consistent policies and procedures to guide staff, or did not adequately review these policies and procedures. In one RAC home, the medical officers and pharmacist did not regularly evaluate and review residents’ medication needs and preferences.

Four RAC homes did not assess residents who self-administered medications or received PRN medication. In one RAC home, the risk factor for the ordering process was not actioned upon residents’ medication orders in accordance with the medical officer’s directives. One RAC home did not have
a pre-packed medication system from a pharmacist in medication dispensing.

Table 1 - Risk factors for RAC homes to fail in accreditation standard of medication management

<table>
<thead>
<tr>
<th>Issue</th>
<th>Risk factors</th>
<th>No. of homes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall medication management</td>
<td>Non compliance</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Inconsistent policies</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Irregular medication review</td>
<td>1</td>
</tr>
<tr>
<td>Assessment not done</td>
<td>Medication are not assessed</td>
<td>4</td>
</tr>
<tr>
<td>Medication ordering</td>
<td>Non compliance with medical officer’s directives</td>
<td>1</td>
</tr>
<tr>
<td>Dispensing</td>
<td>No pre-packed medication system</td>
<td>1</td>
</tr>
<tr>
<td>Medication stocking</td>
<td>Insufficient or unavailable stock</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Insecure storage and disposal</td>
<td>5</td>
</tr>
<tr>
<td>Medication administration</td>
<td>Incomplete information</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Inconsistent timing and practice</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Use of controlled medication for other residents</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Use of unordered medication</td>
<td>2</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Ineffective process</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Staff practice not monitored</td>
<td>4</td>
</tr>
<tr>
<td>Incidents</td>
<td>Incident not identified and acted upon</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Inconsistent follow up</td>
<td>2</td>
</tr>
<tr>
<td>Staff satisfaction</td>
<td>Lack of competent assessment</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Insufficient staffing</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Lack of education</td>
<td>1</td>
</tr>
<tr>
<td>Resident satisfaction</td>
<td>Dissatisfied with medication management</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Dissatisfied with medication administration</td>
<td>2</td>
</tr>
</tbody>
</table>

There were two risk factors in medication stocking. Two RAC homes did not have adequate stock, or medications ran out. Five RAC homes did not store and dispose medications safely and securely.

There were four risk factors in medication administration process: (1) medication charts did not contain complete and sufficient information in three RAC homes; (2) in eight RAC homes, medications were not administered, consistently safely and correctly, e.g. at appropriate intervals, not following prescribed orders, or inconsistent administration process; (3) in one RAC home, controlled medications prescribed for individual residents were used for other residents; and (4) in two RAC homes, medications being administered were not ordered by a medical officer.

The two risk factors for monitoring included (1) monitoring processes were not in place or were not effective; which happened in all failed RAC homes; and (2) four RAC homes did not monitor staff practice.

There were two risk factors for incident reporting: (1) medication incidents were not identified, analysed and acted upon (2 RAC homes); (2) medication incidents were not consistently followed up with the relevant parties (2 RAC homes).

There were three factors for staff satisfaction. These included (1) not conducting competency assessment (3 RAC homes); (2) insufficient staffing (1 RAC home); and (3) not providing education to staff in relation to medications (1 RAC home).

There were two risk factors for resident dissatisfaction. Residents were either not satisfied with medication management (10 RAC homes) or not satisfied with the way medications were given (2 RAC home).

The top risk factor was “ineffective monitoring process”, which occurred in all 18 failed RAC homes. The second frequently stated risk factor was “noncompliance with professional standards and guidelines”, occurring in 15 failed homes (83%). Resident’s dissatisfaction about overall medication management was the number three risk factor, happened in 10 failed RAC homes (56%). Risk factors about staff practice were also quite often mentioned in the reports. These included inconsistency in staff practice to administer medication (8 homes, 44%) and unmonitored staff practice (4 homes, 22%).

Discussion

This study identified 21 risk factors for the RAC homes to fail in medication management in accreditation. It contributes in the knowledge area of aged care risk management.

A medication management process includes prescription, ordering, dispensing, administration, recording and review, storage and disposal [20]. For resident safety, the whole medication management process requires monitoring. We found that “ineffective monitoring process” is the biggest risk factor for the RAC homes to fail in medication management. Our finding is in line with that of another study which found that 70% of adverse drug events in RAC homes were caused by inadequate monitoring of the medication management process [21].

The second major risk factor in medication management is “noncompliance” with professional standards and guidelines. Another notable finding is that staff practice at each stage of medication management is important for medication safety. For example, checking the package of medication will ensure the expired medication would not be administered to a resident. Therefore, developing an effective monitoring system is of critical importance for safe medication management in the RAC homes.

The limitation of this study was the nature of any secondary study, with all the findings drawn from analysis of the accreditation reports. As only 18 out of 3,607 ACAR reports reported failure in medication management for an RAC home, evidence collected from this information source might be limited. In addition, these publicly available reports only summarised high level information. There was inadequate details about what exactly leaded to failure in medication management. Therefore, we cannot infer how risks happened and what can be done to prevent and control these risks.

The strength of the study is, for the first time, providing a nationwide overview of the reasons for the Australian RAC homes to fail the accreditation outcome in medication management. It gives some insight into aspects of safety-related issues in RAC homes, which may be helpful for future studies.
Conclusion

Using text data mining method, this study identified 21 risk factors for the RAC homes in Australia to fail in medication management accreditation standards. These risk factors fell into 10 categories: overall medication management, medication assessment, ordering, dispensing, stock, administration, monitoring, incident report, staff satisfaction and resident satisfaction. It provides accurate information about which aspects of medication management that the RAC homes in Australia failed in the four year period from 2011 to 2015. This information is useful for the RAC home managers and aged care quality improvement agency to use to improve medication management in this care setting. The future research can be focused on how to best implement monitoring mechanism to improve medication safety and resident satisfaction with the medication management process.

References


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