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Outcomes of dementia: Systematic review and meta-analysis of hospital administrative database studies

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ABSTRACT

Introduction: Aim of the study was to compare various outcomes of dementia patients with elderly patients without dementia by conducting a systematic review of previous population-based studies.
Methods: The relevant studies were retrieved from search of electronic databases.
Results: The pooled data from included 11 studies consisted of outcomes of 1,044,131 dementia patients compared to 9,639,027 elderly patients without dementia. Meta-analysis showed that the mortality in dementia patients was 15.3% as compared to 8.7% in non-dementia cases (RR 1.70, CI 95%, 1.27-2.28, p 0.0004). However, there was significant heterogeneity between the studies ($p < 0.00001$). Dementia patients had significantly increased overall readmission rate (OR 1.18; 95% CI, 1.08-1.29, $p < 0.001$). They had higher complication rates for urinary tract infections (RR 2.88; 95% CI, 2.45-3.40, $p < 0.0001$), pressure ulcers (RR 184; 95% CI, 1.31-1.46, $p < 0.0001$), pneumonia (RR 1.66; 95% CI, 1.36-2.02, $p < 0.0001$), delirium (RR 3.10; 95% CI, 2.31-4.15, $p < 0.0001$), and, dehydration and electrolyte imbalance (RR 1.87; 95% CI, 1.55-2.25, $p < 0.0001$). Dementia patients had more acute cardiac events (HR 1.16; 95% CI, 1.06-1.28, p 0.002), while fewer revascularization procedures (HR 0.12; 95% CI, 0.08-0.20, $p < 0.001$). Patients with dementia had lesser use of ITU (reduction by 7.5%; 95% CI, 6.9-8.1), ventilation (reduction by 5.4%; 95% CI, 5.0-5.9), and dialysis (reduction by 0.5%; 95% CI, 0.4-0.8).
Discussion: Compared to older adult population, patients with dementia had poorer outcome. Despite higher mortality rate and readmission rate, they underwent fewer interventions and procedures.

1. Introduction

One of the leading causes of morbidity and mortality in the world is dementia (Pritchard, Baldwin, & Mayers, 2004; Pritchard, Mayers, & Baldwin, 2013). There were 46.8 million people worldwide living with dementia in 2015 and it is estimated that the number will double every 20 years (Prince et al., 2015). The incidence of dementia is 4.5 million every year worldwide and its on the rise (Prince et al., 2015). The global cost of dementia patients has risen from $604 million in 2010 to $818 million in 2015 (Prince et al., 2015). Nearly 40% of this cost is associated with social and informal care of these patients (Prince et al., 2015; Sampson, Leurent, Blanchard, Jones, & King, 2013). In 2011, dementia patients received 17.4 billion hours of care from 15 million informal carers in the US (Alzheimer's Society, 2014; Beerens, Sutcliffe, & Renom-Guiteras, 2014; Isaia, Bo, & Nobili, 2009). The World Health Organisation (WHO) reported a marked increase in mortality due to dementia in 5 countries including England (Pritchard et al., 2013; Sampson et al., 2013).

Dementia is a clinical syndrome, characterised by memory difficulties, language disturbances, psychiatric symptoms and impaired activities of daily living (Isaia et al., 2009). Patients with history of dementia are associated with increased risk of hospitalisation (Wins, 2005). Approximately 40% of the older patients admitted to general hospital have dementia (Mukadam & Sampson, 2011; Sampson, White, & Leurent, 2014; Wins, 2005). They occupy one-fifth of the general hospital beds (Wins, 2005). Patients with dementia have increased likelihood of recurrent hospitalisation, increased length of stay and poor outcome (Harvey, Mitchell, Brodaty, Draper, & Close, 2016). Similarly, they have poor quality of life and significant difference is found in the

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care service provided to these patients (Sampson, Gould, Lee, & Blanchard, 2006).

The management of dementia is complex and multi-faceted (Beerens et al., 2014). It requires psychological and pharmacological treatment as well as various means of social support. Moreover, regional variation exists in the quality of care provided to dementia patients due to a lack of evidence-based national protocols for management. In many countries, dementia patients are provided with home-based care and the proportion of patients treated in skilled nursing homes varies greatly (Beerens et al., 2014).

In the recent past, hospital administrative data (HAD) has been used to assess the effectiveness of diverse treatment plans and their impact on the outcomes of dementia (Chanti-Ketterl, Pathak, Andel, & Mortimer, 2014; Guijarro, San Roman, & Gomez-Huelgas, 2010). It has the advantage of providing a large longitudinal patient cohort and assessment of clinically relevant factors. Outcome measures based on hospital administrative data have evaluated various clinical factors that impact morbidity and mortality of patients with dementia. The outcomes are derived from administrative database of hospitals once patients are admitted to hospital as an inpatient. They have been widely used to compare quality of care, adverse events and cost effectiveness of treatment, for example, mortality rate, readmission rate, length of stay, etc. (Chanti-Ketterl et al., 2014). The aim of the study was to compare various HAD-based outcomes of dementia patients with elderly patients without dementia by conducting a systematic review of previous studies.

2. Methods

2.1. Search strategy

The literature search was conducted from 15th February to 7th March 2015. The following literature databases were used: Embase, Medline, Web of Science, CAB abstracts, Current Contents Connect, SciELO citation index. Various search terms were used to find studies that reported outcomes of dementia using hospital administrative data (Table 1).

2.2. Data extraction and analysis

The following inclusion criteria were used:

1. Adult patient population over the age of 18 diagnosed with any type of dementia.
2. Studies that used hospital administrative data, with or without the use of other administrative data, to assess outcomes of dementia.
3. Studies evaluating clinical outcome of dementia, which is derived from hospital administrative database following patient's admission to hospital as an inpatient.
4. Studies comparing the outcomes of dementia with elderly patients without dementia.

The following exclusion criteria were used:

1. Studies that used clinical data from controlled trials, observational studies, case series or clinical registries.
2. Studies that reported incidence of dementia as a complication or adverse event of another disease.
3. Studies only evaluating cost outcomes.

The search strategy for the selection of studies was based on the PRISMA protocol that is primarily used to conduct systematic reviews (Moher, Shamseer, & Clarke, 2015) (Fig. 1).

Further studies were identified through cross-referencing of initial studies reviewed. Two independent researchers, AS and AR, reviewed the selected studies separately. In case of a disagreement about the inclusion or exclusion of a study, a third reviewer PA was asked to review the study, and a consensus was reached after mutual discussion.

Basic demographics were obtained from each study included in the review. Year of study, place of data collection, administrative databases used, and aim and objectives of study were recorded. Information on methodology of each study was collected, such as, number of patients, use of control group, diagnosis of patients, types of quality metrics used, significant outcomes assessed, follow up period. Mortality was found to be a common outcome measure and meta-analysis for the risk of mortality was conducted on the pooled data. Authors of the relevant studies were contacted to obtain data to conduct meta-analysis.

2.3. Assessment of risk of publication bias

The Newcastle-Ottawa scale was used to assess bias in the studies (Higgins, Altman, & Gotzsche, 2011). The scale uses a star ranking system based on 3 major criteria: selection of participants, comparability and definition of outcome. A Maximum of 8 stars can be obtained by a study. The scale is validated and recommended by Cochrane review methodological guidelines for non-randomised cohort studies.

2.4. Statistical analysis

Statistical software Review Manager, version 5.3 (The Cochrane Collaboration, Software Update, Oxford, United Kingdom) was used to perform the analysis (Higgins et al., 2011). Although, there was significant heterogeneity in outcomes reported by the studies, however, results from studies reporting similar outcomes were pooled and analysed as risk ratio (RR) and 95% confidence intervals (CI) was reported for each derived statistic. An inverse-variance method with random-effect model of meta-analysis was used

Table 1
Search terms and their combinations used for search strategy. Singular and plural forms were searched for each term. All the terms were combined with option 'OR' to include all search titles. All the subheadings were included in the search. Once all the terms were searched for broad headings of dementia, outcomes and hospital administrative data, they were all combine with 'AND' to select studies assessing all three search topics.

1	exp Alzheimer's disease/
2	exp vascular dementia/
3	exp lewy body dementia/
4	Lewy Body Disease/ or dementia with lewy bodies.mp.
5	mixed dementia.mp.
6	exp frontotemporal dementia/
7	exp dementia/
8	parkinson's dementia.mp.
9	exp Creutzfeldt-Jakob Syndrome/
10	exp huntington's disease/
11	outcome.mp.
12	complications.mp.
13	exp mortality/
14	Patient Readmission/ or readmission.mp.
15	re-admission.mp. or exp Alcoholism/
16	Hospitalization/ or acute admission.mp.
17	Databases, Factual/ or administrative database.mp.
18	hospital data.mp.
19	population based data.mp.
20	population-based.mp.
21	hospital administrative data.mp.
22	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10
23	11 or 12 or 13 or 14 or 15 or 16
24	17 or 18 or 19 or 20 or 21
25	22 and 23 and 24