Papers reporting on more than one outcome are repeated as necessary in results tables below.

**Table 1 Clinical and patient-centred outcomes during hospitalisation**

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| --- | --- | --- | --- | --- |
| **Authors, year** | **Country** | **Population** | **Study design** | **Main results** |
| ***Patients’ experience of hospital admission*** | | | | |
| Digby 2016 | various | Patients with dementia and their carers’ in the acute setting. | Integrative review | People with dementia stigmatised in hospitals; acute care needs and tasks prioritised over personalised care; relatives/carers are not as involved in the patient’s care or decisions regarding their relative as they could be. |
| Royal College of Psychiatrists 2017 | United Kingdom | Patients with dementia in the acute setting. | National audit | 17% of comments about patient care collected via a carer questionnaire described care as generally poor, or alternative negative comment. 9% of comments expressed that the patient did not receive care appropriate to their needs. |
| Alzheimer’s UK 2016 | United Kingdom | Carers of patients with dementia in the acute setting. | Survey and Freedom of Information requests | Almost 60% of respondents felt the person with dementia they know wasn’t treated with dignity or understanding while in hospital, 92% said hospital environments are frightening for the person with dementia. |
| Jurgens 2012 | England | 35 family carers of confused older patients. | Qualitative interviews | Development of ‘cycle of discontent’ model: poor communication and relationship building between staff and patients/carers led to expectations from the patient/carer not being met, and subsequent cycles of identification of poor care by carers, challenge to staff, further deterioration in the relationship and reporting of poor experience occurring |
| Clisset 2013 | United Kingdom | 34 patients with dementia admitted to acute general medical, health care for older people, and orthopaedic wards, family carers and co-patients | Non-participant observations, qualitative interviews | Person-centred care was observed, but there were more opportunities to sustain personhood, according to Kitwood’s five domains of person-centred care - identity, inclusion, attachment, comfort and occupation. |
| ***Behavioural and psychological symptoms of dementia (BPSD)*** | | | | |
| Sampson 2014 | UK | 230 patients aged 70+ with dementia admitted to hospital for acute medical illness | Prospective cohort | The prevalence of BPSD symptoms in people with dementia in hospital rose from 62% at baseline, to 75% during the admission, with 43% being moderately/severely troubling to staff. The overall BEHAVE-AD score was in turn associated with an increase in mortality: aOR 1.11 [1.01-1.20], p=0.022 |
| Soto 2012 | France | 6,299 patients with dementia admitted to an Alzheimer Special Acute Care inpatient Unit | Observational study | BPSD was the most frequent cause of complications, with agitation/aggressiveness representing 60% of BPSD events |
| Porock 2016 | UK | 34 patients admitted to acute hospital care, and 32 carers | Qualitative study - interviews | Disruption in routine, for example admission to hospital, has a negative impact on a person with dementia, and can trigger changes in behaviour as the patient attempts to gain control over their unfamiliar environment. |
| ***Malnutrition or dehydration*** | | | | |
| Kagansky 2005 | Israel | 414 patients aged 75+ admitted to geriatric ward, including 107 patients with dementia. | Prospective cohort | People with dementia were more likely to have a low MNA at admission: OR 3.85 [1.55 - 9.59], as well as laboratory indices of malnutrition such as albumin, transferrin and the urea:creatinine ratio. The MNA score and the sub-score related to dietary habits (MNA-3) were significant predictors of death in hospital, with scores <7.5 increasing the risk of death 2.05-fold. |
| Miller 2006 | Australia | 68 patients aged 70+ admitted to orthopaedic ward for lower limb fracture, 50% with cognitive impairment (as per SPMSQ) | Prospective cohort | Cognitively impaired participants and those without cognitive impairment consumed, mean (95% CI) respectively, 3661 kJ/day (3201, 4121) versus 4208 kJ/day (3798, 4619) and 38 g (33, 44) versus 47 g (41, 52) protein/day. Cognitively impaired participants consumed mean (95% CI) 48% (43, 53) of estimated total energy expenditure and 78% (69, 87) of estimated protein requirements. |
| Royal College of Psychiatrists, 2017 | UK | Patients with dementia in the acute setting. | National audit | 24% of staff did not think that people with dementia had their nutritional needs met always or most of the time, and less than 75% of staff said that they could obtain finger foods or snacks between meals for patients with dementia. |
| Johnson 2015 | Sweden | 256 patients admitted to acute hospital care | Prospective cohort | Concentrated urine present in 16% of the patients, and more common in patients with confusion and/or dementia. 30-day mortality was higher in patients with fluid retention compared to those who were euhydrated: 21% vs 8% p<0.03. |
| ***Functional or cognitive decline*** | | | | |
| Hartley 2017 | Various | Adults 65+ with acute admission to hospital and have information on dementia/cognitive scores on admission, with 54,637 patients available for quantitative synthesis | Systematic review and meta-analysis | Functional decline in hospitalised adults aged 65 and above is associated with cognitive impairment (RR 1.64 [1.45-1.86]), and a diagnosis of dementia (RR 1.36 [1.05-1.76]) |
| Pedone 2005 | Italy | 9,061 older patients admitted to hospital. | Prospective cohort | During admission, 4% of patients with CI at admission and 1.3% of those without CI experienced functional decline: OR 2.4 [1.7-3.5], p<.001. Cognitive decline was strongly associated with an increased risk of functional decline: OR 16.0 [10.8-23.6], p<.001. |
| ***Incident delirium during hospitalisation*** | | | | |
| Ryan 2013 | Ireland | 311 general hospital inpatients | Point prevalence study | Prevalence of delirium was higher in patients with pre-existing dementia: 50.9% of delirious patients, OR 15.33, p<0.001 |
| Ahmed 2014 | various | 2338 older medical inpatients | Systematic review and meta-analysis | Dementia increased risk of delirium: OR 6.62 [4.3-10.19] |
| Sa Esteves 2016 | Portugal | 270 male patients aged 65+ admitted to a medical ward | Prospective cohort study | The rate of delirium was increased with people with dementia compared to those without: 29.5% vs 7.1% , p<0.001 |
| Travers 2014 | Australia | 493 patients aged 70+, with (n=102) and without (n=391) dementia | Prospective cohort study | Dementia increased the risk of developing delirium during hospitalisation, from 4.8% to 14.7%: OR 4.8, p<0.001 |
| Pendlebury 2015 | UK | 503 patients with acute admission to hospital (308 patients 65+ with covariate information) | Prospective cohort study | The risk of delirium on admission or during hospitalisation was increased by dementia OR 2.08 [1.10-3.93], p=0.024 and low cognitive score (MMSE and AMTS) OR 5.00 [2.50 to 9.99], p<0.0001. |
| Franco 2010 | Colombia | 291 geriatric patients in medical wards | Nested case-control in prospective cohort | Median mini-Mental State Examination (MMSE) score 24.23 in patients who didn’t develop delirium during admission, vs 20.65 in those who did (p=0.0001) |
| Bo 2009 | Italy | 252 patients 70+ with emergency admissions to hospital. | Prospective cohort | Greater cognitive impairment associated with incident delirium (p<0.001) |
| Wilson 2005 | UK | 100 patients aged 75+ admitted to an acute medical ward | Prospective cohort | Lower Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) was related to an increased incidence of delirium: OR 3.26 [1.18-9.04] p=0.023 |
| Voyer 2006 | Canada | 104 patients aged 65+ admitted to acute care | Prospective cohort | Prevalence of delirium increased with decreasing cognitive ability: mild CI: 50% , moderate CI: 82%, severe CI: 86% |
| Muangpaisan 2012 | Thailand | 80 patients with fall-related hip fracture | Prospective cohort | Modified IQCODE score significantly different between delirium and non-delirium groups: median 3.5 vs 3.2, OR 4.5 [1.2-16.9] p=0.024 |
| Marcantonio 2000 | U.S.A. | 126 patients aged 65+ admitted emergently for hip fracture repair | Prospective cohort | Pre-fracture cognitive impairment was related to occurrence of delirium following surgery: RR 2.5 [1.6-3.9] |
| Wu 2015 | China | 130 patients aged 65+ attending hospital for hip fracture repair | Prospective cohort | Preoperative MMSE scores were negatively associated with higher incidences and greater severity of postoperative delirium: median MMSE of 18.1 (delirium) vs 24.3, p<0.001 |
| Tanaka 2016 | Japan | 152 patients aged 70+ for proximal femoral fracture surgery | Prospective cohort | Dementia predictive of perioperative delirium: OR 3.55 [1.35-9.30] |
| Jackson 2016 | various | 27 studies examining predictors of delirium | Systematic review | Hospital outcomes including mortality, institutionalisation and length of stay for patients with delirium are also worse if there is pre-existing psychiatric morbidity such as dementia. |
| Fong 2012 | U.S.A. | 771 persons with Alzheimer’s disease in the community, of whom 367 were hospitalised | Prospective cohort | Incidence of delirium in hospital was 25% (n=194). Patients with delirium had a higher risk of death within 1 year (15.5% (30/194 ) vs 9.2% (16/173)) |
| Torpilliesi 2010 | Italy | 2,340 patients admitted to a Rehabilitation and Aged Care Unit | Prospective cohort | DSD and poor functional status are stronger predictors than dementia alone of adverse clinical outcomes (length of stay, institutionalisation). |
| Avelino-Silva 2017 | Brazil | 1,409 acute hospital admissions of patients aged 60+ | Prospective cohort | Of the 549 patients with dementia, 66.8% (n=367) had DSD.  DSD was independently associated with in-hospital mortality, HR 2.14 [1.33-3.45] p = 0.002, whereas dementia alone was not. |
| Hsieh 2015 | U.S.A | 260 patients aged 65+ with an acute admission to hospital | Prospective cohort | Dementia was associated with an increased risk of occurrence of least 1 episode of delirium during the first 3 days of admission in adults aged 65 and above, and subsequently increased the odds of unanticipated ICU admission or in-hospital death: aOR 8.07 [1.91-34.14]. |
| ***Adverse events and complications occurring in hospital*** | | | | |
| Mecocci 2005 | Italy | 13,729 patients aged 65+ admitted to medical or geriatric wards | Prospective cohort | Cognitive impairment was found to be the most significant risk factor for: (i) pressure ulcers: OR 4.9 [2.4–9.9], (ii) development of new faecal incontinence: OR 6.3 [3.0-13.0], (iii) urinary incontinence: OR 5.3 [2.3-12.0], (iv) falls: OR 1.6 [1.2–2.3]. |
| Harlein 2011 | Germany | 9,246 patients aged 65+ admitted to 37 hospitals, with 1,276 (13.8%) rated as cognitively impaired | Secondary analysis of point prevalence studies | Cognitive impairment leads to an increased risk of falls in hospital: 12.9% with CI vs 4.2% without CI; aOR 2.1 [1.7-2.7] |
| Chen 2011 | Australia | 408 patients aged 70+ admitted to hospital | Retrospective case control. | Dementia was significantly associated with recurrent falls. Recurrent fallers had significantly lower MMSE scores than single fallers and non-fallers (17.3 ± 6.7, 20.2 ± 6.2, 24.0 ± 5.1, respectively, p < 0.01); and a larger proportion of recurrent fallers had MMSE <18 than in the other two groups (54.1%, 34.4% and 10.8%, respectively, p < 0.01). Patients with recurrent falls were more likely to have significantly lower scores in the ‘registration’, ‘attention and calculation’, ‘recall’ and ‘praxis’ domains of the MMSE than single fallers. |
| Ferrari 2012 | U.S.A. | 233 patients aged 65+ with a documented in-patient fall | Retrospective descriptive study | Falls related to impulsive behaviour are more common in patients with cognitive impairment. |
| Tangman 2010 | Sweden | 223 patients admitted to a ward in a psychogeriatric hospital ward | Prospective fall registration study and case-note review | 91 (41%) of patients fell, with a total of 298 falls. More than three quarters of falls had one of the following precipitating factors: being in hospital at night (between 9pm and 7am), having an acute disease or symptoms of disease and/or acute drug side-effects |
| Tamiya 2015 | Japan | 817 with in-hospital fracture, 3,158 controls | Matched case:control study (national inpatient database) | Increased risk of fractures in patients taking short-acting benzodiazepine hypnotics, OR 1.43 [1.19 – 1.73]; p<0.001, ultrashort-acting non-benzodiazepine hypnotics OR 1.66 [1.37 – 2.01]; p<0.001, hydroxyzine, OR 1.45 [1.15 – 1.82]; p=0.001, risperidone and perospirone, OR 1.37 [1.08–1.73]; p=0.010. |
| Bail 2013 | Australia | 426,276 overnight hospital episodes in patients aged 50+, matched 1 patient with dementia:4 patients without dementia | Retrospective cohort study | Hospitalised medical and surgical patients with dementia were at higher risk of four common complications than medical/surgical patients without dementia: (i) UTIs med: RR 1.79 [1.70-1.90], surg: RR 2.88 [2.45-3.40], (ii) pressure ulcers med: RR 1.61 [1.46-1.77] surg: RR 1.84 [1.46-1.31] (iii) pneumonia med: RR 1.37 [1.26-1.48] surg: RR 1.66 [1.36-2.02], (iv) delirium med: RR 2.83 [2.54-3.15] surg: RR 3.10 [2.31-4.15]. Medical patients were also at higher risk from sepsis RR 1.34 [1.15-1.57] and failure to rescue RR 1.24 [1.02-1.33]. |
| Pendlebury 2015 | UK | 503 patients with acute admission to hospital (308 patients 65+ with covariate information) | Prospective cohort study | Prior dementia and low cognitive score is associated with incident delirium in hospital, and delirium in turn increased the risk of falls, (OR 4.55 [ 1.47 - 14.05], p=0.008), incontinence of urine (OR 3.76 [2.15 - 6.58],  p<0.0001) incontinence of faeces (OR 3.49 [1.81 – 6.73], p=0.0002) and catheterisation (OR 5.08 [2.44 - 10.54], p<0.0001). |
| Furlanetto 2016 | Australia | 100 patients aged 65+ with dementia/CI, ambulant and continent pre-admission | Retrospective case-note review | 57% had either urinary or faecal incontinence (or both) at some point during admission, with 36% and 2% respectively had new incontinence at discharge |
| Kanagaratnam 2017 | France | 293 patients with dementia syndrome admitted to an acute geriatric care unit within a hospital | Prospective cohort | Polypharmacy (≥ 5 drugs/day) (OR: 4.0, 95% CI: 1.1–14.1) and dependence on at least 1 activity of daily living (ADL) (OR: 2.6, 95% CI: 1.1–6.5) were related with ADRs |
| Borenstein 2013 | USA | 214 adult Medicare beneficiaries admitted to hospital, mean age 75 years | Prospective cohort | Cognitive impairment is associated with an increase in hospital acquired infection, ADRs and length of stay >7 days) OR 2.32 [1.24 - 4.37] |
| Onder 2002 | Italy | 16,296 patients admitted to 81 hospitals (GIFA study) | Prospective surveys | An ADR was recorded in 232/4,883 (4.8%) patients with cognitive impairment (AMT score<7) and in 744/12,043 (6.2%) patients cognitively intact: aOR 0.70 [0.60-0.83]. However, neuropsychiatric complications were significantly increased in patients with CI (aOR 2.23 [1.40-3.54]). |
| Onder 2003 | Italy | 5,734 patients aged 65+ admitted to 81 hospitals (GIFA study) | Prospective surveys | Patients with cognitive impairment had a lower risk of using inappropriate medication, as defined by the Beers criteria: OR 0.77 [0.64–0.94] |
| Marengoni 2011 | Italy | 1,332 patients aged 65+ admitted to general medicine or geriatric wards | Prospective cohort | Dementia on its own was associated with an increase in hospital mortality (OR 2.1 [1.0-4.5]). The addition of at least one adverse clinical event (defined as any acute clinical problem that newly occurred during hospitalisation e.g. delirium, urinary tract infection, fever, anaemia, pneumonia, electrolyte disorders, atrial fibrillation, heart failure or acute renal failure) had an additive effect on mortality, increasing the OR to 20.7 [6.9-61.9]. |
| Watkin 2012 | U.K. | 710 patients aged 70+ with emergency medical admission | Prospective cohort | AEs were associated with mild/moderate CI (OR 3.61 [1.72-7.61], p=0.01) and dementia (OR 2.18 [1.10-4.32], p=0.03). AEs were not subsequently associated with mortality: hazard ratio (HR) 1.01 [0.53–1.93], p=0.596. |
| Shen 2012 | Taiwan | 41,672 patients 65+ with inpatient claim in health insurance database, including 3,487 with dementia | Retrospective cohort | Patients with dementia have a higher risk of acute organ dysfunction (aOR 1.32 [1.19-1.46]) and severe sepsis (aOR 1.5 [1.32-1.69]). |
| Liao 2015 | Taiwan | 15,539 hospitalised patients with COPD, including 1,406 with dementia | Retrospective matched cohort | Patients with chronic obstructive pulmonary disease (COPD) with dementia had increased mortality (aOR 1.38 [1.10-1.72]). This may partly be explained by the increased odds of severe sepsis (aOR 1.38 [1.10-1.72]) and acute respiratory dysfunction (aOR 1.39 [1.09-1.77]). |
| Frohnhofen 2011 | Germany | 1,424 patients with COPD admitted to a geriatric ward, including 740 patients with dementia | Prospective cohort | Whereas 42% (287/684) of patients with no dementia were receiving no treatment for their COPD, 64% (195/307) of patients with moderate/severe dementia had no treatment (p<0.01). Patients with dementia were also less likely to have lung function tests completed successfully: OR: 2.80 [1.18–6.60] for mild and OR 4.92 [2.03–11.91] for moderate to severe dementia. |

**Table 2 Outcomes reflecting differentials in care during hospitalisation**

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| --- | --- | --- | --- | --- | --- |
| **Authors, year** | **Country** | **Population** | **Study design** | | **Main results** |
| ***‘Outlying’ and bed moves*** | | | | | |
| Ranasinghe 2017 | Australia | 300 patients under Older Person Evaluation Review and Assessment (OPERA) team, age and sex matched with 300 patients under general physician care | Retrospective matched cohort | Outlying patients and those with 3+ bed moves were more likely to be OPERA patients than general medicine patients, (47.7% vs 31.3%, p<0.001 and 22.3% vs 8%, p<0.001 respectively). Of those with 3+ moves, OPERA patients were more likely to have prior cognitive impairment (OPERA 70.1% vs general medicine 36.4%, p=0.005). OPERA patients were also more likely to be discharged to residential care or to die than those under general medicine (38.8% vs 9.1%, p=0.009) | |
| Perimal-Lewis 2016 | Australia | 6,367 inpatients with dementia and/or delirium | Retrospective descriptive study | ‘Outlier’ patients had higher mortality within 48 hours of admission: OR 1.973 [1.158-3.359], p=0.012 | |
| Royal College of Psychiatrists, 2017 | United Kingdom | Patients with dementia in the acute setting. | National audit | Night-time bed moves were reported as being avoidable in half of staff surveyed. | |
| ***Pain and end-of-life or palliative care*** | | | | | |
| Sampson 2015 | UK | 230 patients with an unplanned hospital admission with AMTS <8/10. | Prospective cohort | Pain was reported in 38.5% of patients during hospitalisation. Pain at movement and at rest was associated with an increase in the Behavioural Pathology in Alzheimer Disease Scale (BEHAVE-AD) score (adjusted coefficient 0.20 [0.07-0.32], p=0.002 and 0.41 [0.14-0.69] p=0.003 respectively), aggression (adjusted coefficient 0.16 [0.09-0.23], p<0.001 and 0.16 [0.02-0.30] p=0.023 respectively) and phobia/anxiety (adjusted coefficient 0.04 [0.01-0.07], p=0.021 and 0.11 [0.04-0.17] p=0.001 respectively). | |
| Kelley 2008 | U.S. | 4 patients aged 70+ with dementia and pain | Prospective case series | Patients with dementia may be unable to describe the characteristics and associated features of their pain; less able to alert staff to the presence of side effects from pain medicines; and unable to discern variations in the level of pain or compare their current pain to their experience of the day or hours before. | |
| Sampson 2006 | UK | 100 hospital inpatients aged 70+ who died in hospital, 35% with a diagnosis of dementia recorded | Retrospective case-note review | Patients with dementia had significantly fewer referrals to palliative care, (9% vs 25%, p=0.042) and less frequent prescription of palliative medicines, (28% vs 51%, p=0.026), than those without. Patients with dementia were more likely to have arterial blood gases checked and to be catheterised, but less likely to have a central line placed. Families were involved in discussing limiting procedures to the same extent (60% vs 53%, p=0.353). | |
| Afzal 2010 | Ireland | 75 patients aged 65+ who died in hospital, 24% with dementia | Retrospective case-note review | Patients with dementia had significantly fewer referrals to palliative care, (22.2% vs 62.5%, p=0.007) less frequent prescription of palliative medicines, (33.3% vs 68.8%, p=0.017) and carers were less involved in decision making (50.0% vs 87.5%, p=0.006). There was no difference in the receipt of invasive interventions according to cognitive status. | |
| Formiga 2007 | Spain | 102 patients aged 65+ who died from dementia (36%) or heart failure in hospital | Case-note review and carer interviews | No differences between provision of palliative care and withdrawal of drug therapy. In the opinion of the caregiver, adequate symptom control was only present in 46% of patients with dementia, and patients experienced uncontrolled pain and dyspnoea in 13.5% and 51.5% respectively | |
| Formiga 2006 | Spain | 293 patients aged 65+ who died from dementia (46%), heart failure or COPD in hospital | Retrospective case-note review | Rates of drug withdrawal in end-of-life patients with dementia in hospital was higher than those with COPD (p<0.01) or heart failure (p<0.002) | |
| Aminoff 2005 | U.S. | 71 patients with end-stage dementia, admitted to a geriatric ward in a general hospital | Prospective cohort | The Mini Suffering State Examination scale (MSSE) increased during hospitalisation from 5.62 +/- 2.31 to 6.89 +/- 1.95 (p < 0.001). 63.4% and 29.6% of patients died with a high and intermediate level of suffering, respectively with only 7% dying with a low level of suffering. | |
| ***Inappropriate catheterisation*** | | | | | |
| Hu 2015 | Taiwan | 321 patients aged 65+ with a urinary catheter placed during first 24 hours of hospital admission | Prospective cohort with propensity matched analysis | Inappropriate catheterisation was defined as NOT meeting one of the six criteria: neurogenic bladder dysfunction (where intermittent catheterisation is not possible), urinary retention or bladder outlet obstruction, medication instillation or bladder irrigation, conditions warranting accurate measurement of urinary output, perioperative management, open sacral or perineal wounds with a need for urinary diversion in incontinent patients. Patients with CI (measured by SPMSQ) were more likely to be inappropriately catheterised than those with no CI (65.3% vs. 52.6%; p = 0.02). , with the rationale of ‘convenience of care’ being reported in almost 50% of cases and leading to a greater decline in ADLs during admission. | |

**Table 3 Mortality in hospital**

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| **Authors, year** | **Country** | **Population** | **Study design** | **Main results** |
| Barba 2012 | Spain | 45,757 patients admitted from nursing homes to acute hospitals | Retrospective cohort | 17.3% of patients died during hospitalization, 2442 (30.91%) of them in the first 48 hours. Dementia was an independent predictor of mortality: adjusted Odds Ratio (aOR) 1.09 [1.03-1.16] |
| Marengoni 2011 | Italy | 1,332 patients aged 65 and above admitted to general medicine or geriatric wards | Prospective cohort | 9.4% of patients with dementia died in hospital, versus 4.9% of patients without dementia. Dementia was associated with in-hospital death adjusted Odds Ratio (aOR) 2.1 [1.0-4.5]. Having dementia and at least one adverse clinical event during hospitalization increased mortality; aOR 20.7 [6.9-61.9]. |
| Draper 2011 | Australia | 253,000 patients aged 50+ admitted to hospital, including 20,793 with dementia. | Retrospective cohort. | Mortality rates higher for people with dementia across all age groups, with a higher risk in the patients aged 50-64. Estimates range from aOR 50-64 years: 1.93 [1.55-2.41] to aOR 85+ years [1.09-1.16]. Overall aOR 1.25 [1.20-1.31]. |
| Hsiao 2015 | Taiwan | 32,649 elderly patients with dementia and 32,649 controls. | Retrospective propensity score-matched cohort study. | Higher in-hospital mortality rates for people with dementia at 90 days: aOR 1.97 [1.71-2.27] |
| Sampson 2009 | UK | 617 patients aged 70+ with an emergency medical admission | Prospective cohort study | Higher mortality rates for people with DSM IV diagnosis of dementia: aOR 2.09 [1.10-4.00]. Increasing mortality rates with reduction in Mini-mental state examination (MMSE) (increasing severity of cognitive impairment): MMSE 16-23 aOR 1.34 [0.60-3.15]; MMSE 0-15 aOR 2.62 [1.28-5.39] |
| Guijarro 2010 | Spain | >3 million hospital discharge records of patients aged 65+, including n=40,482 with dementia | Retrospective cohort study | Intra-hospital mortality rate was greater for patients with dementia compared to those without dementia (19.3% vs. 8.7%). Dementia was an independent predictor of mortality: aOR 1.77 [1.72-1.82] |
| Oreja-Guevara 2012 | Taiwan | 41,672 patients aged 65+, including 3,487 with dementia, with a hospital admission | Retrospective cohort study | Dementia was associated with an increased risk of hospital mortality: aOR 1.28 [1.10-1.48] |
| Farid 2013 | France | 331 acute patients with cardiovascular disease, age 70+ | Prospective cohort | Patients with cognitive impairment had increased mortality HR 2.04 [1.32-3.15] |
| Zuliani 2011 | Italy | 51,838 patients aged 60+ admitted to hospital, 4,466 with a diagnosis of dementia | Retrospective cohort study | Mortality rate 7.8% in patients with no dementia, versus 10.5% in patients with dementia, p=0.001. |
| Caspe Healthcare Knowledge Systems (CHKS) 2013 | UK | UK-wide hospital episode statistics of people aged 45+ | Retrospective analysis | In 2011, standardised excess mortality rate in patients with dementia estimated at 7.5%. |
| Liao 2015 | Taiwan | COPD inpatients with (n=1,406)/without dementia (n=5,334) | Retrospective cohort study | Increased risk of mortality for patients with (COPD) with dementia vs no dementia: 4.8% vs 2.3%, aOR 1.69 [1.18-2.43] |
| Bo 2003 | Italy | 659 inpatients aged 65+ with an ICU admission during hospitalisation | Prospective cohort | Moderate-to-severe CI (measured with the Short Portable Mental Status Questionnaire - SPMSQ) was associated with increased mortality (p<0.001) |
| Fogg 2017 | UK | 19,269 acute hospital admissions of 13,652 patients aged 75+ | Retrospective cohort study | Patients with cognitive impairment (no dementia diagnosis) and those with a dementia diagnosis have a higher risk of dying in hospital than patients with no cognitive impairment: 11.8% [10.5–13.3] and 10.8% [9.8–11.9] versus 6.6% [6.2–7.0]. |
| Reynish 2017 | UK | 10,014 emergency admissions of patients aged 65+, including 38.5% with a cognitive spectrum disorder (CSD) – delirium, dementia, or AMT<8 | Prospective cohort study | Higher mortality in patients with cognitive spectrum disorder (CSD) (delirium, known dementia or Abbreviated Mental Test (AMT) <8/10) than those with no CSD: 13.6% vs 9.0% |
| Marengoni 2013 | Italy | 1,201 inpatients in internal medicine and geriatric wards | Prospective cohort study | Cognitive impairment (measured by Short Blessed Test - SBT) was associated with increased mortality, and this association increased as severity of CI increased: overall OR 3.1 [1.1-8.6]; moderate impairment: OR 2.7 [1.00-7.96], severe impairment: OR 4.2 [1.29-13.78]. |
| Sa Esteves 2016 | Portugal | 270 male patients aged 65+ admitted to a medical ward | Prospective cohort study | Mortality rates of patients with/without dementia were similar: 12.1% vs 7.1%; P = 0.204 |
| Zekry 2011 | Switzerland | 444 hospitalised patients aged 75+ | Prospective cohort | No association between dementia (HR 0.65 [0.26-1.62]), or cognitive impairment (HR 1.08 [0.29-3.99]) and in-hospital mortality in univariate analyses. |
| Travers 2014 | Australia | 493 patients aged 70+, with (n=102) and without (n=391) dementia | Prospective cohort study | No difference between mortality rates of people with/without dementia: 5% vs 9%, p=0.58 |
| Avelino-Silva 2017 | Brazil | 1,409 patients aged 60+ with acute admission to a geriatric ward | Prospective cohort study | Mortality rates were 8% for patients without delirium or dementia, 12% for patients with dementia alone, 29% for patients with delirium alone, and 32% for patients with delirium superimposed on dementia (DSD) (Pearson Chi-square = 112, p < 0.001). DSD and delirium alone were independently associated with in-hospital mortality: hazard ratios ratios (HRs) of 2.14 [1.33-3.45], p = 0.002 and 2.72 ([1.77-4.18], p < 0.001, but o association between dementia and in-hospital mortality was found in patients who did not experience delirium during hospitalisation: HR 1.69 [0.72-2.30], p = 0.385. |
| Thomas 2013 | Various | Prospective studies consisting of persons aged 65 and older that evaluated the association between at least one health-related participant characteristic and mortality within a year in multivariable analysis. | Systematic review, including 28 studies in hospitals | Cognitive function associated with in-hospital mortality in 6 of 12 studies (50%). |
| Zekry 2009 | Switzerland | 435 hospital patients aged 80+ | Prospective cohort | There was no association between presence or severity of dementia or cognitive impairment and mortality in multivariate analysis: patients with dementia: 3.9% vs 6.3% with MCI and 5.8% with normal cognition, p=0.641. Clinical dementia rating (CDR) 0.5-1: OR 0.83 [0.07-9.59], CDR 2-3: OR 1.28 [1.12-13.52] |
| Freedberg 2008 | U.S.A. | Hospitalised patients aged 85+ and above with/without cognitive impairment (100 in each group) | Matched cohort on age and date of admission. | Cognitive impairment was not associated with increased mortality in multivariate analysis: HR 3.99 [0.42-37.90] |
| Kimata 2008 | Japan | Older patients with (n=62) and without dementia (n=1,775) with acute myocardial infarction (AMI) | Prospective cohort | Dementia had no association with increased mortality: 17.7% vs 11.1%, p=0.101 |
| Tehrani 2013 | America | 631,734 Older patients with (n=15,335)/without dementia with AMI | Retrospective cohort. | Dementia was a significant predictor of in-hospital mortality for hospitalised individuals with AMI: OR 1.22 [1.15-1.29]. However, there was less likelihood of in-hospital mortality in participants with dementia who received diagnostic catheterization (OR 0.36 [0.16–0.78] p < .001), Percutaneous coronary infusion (PCI) (OR 0.57 [0.47–0.70] p < .001), or CABG (OR 0.22 [0.08–0.56] p < .001) than in those not receiving interventions. |
| Grosmaitre 2013 | France | 255 patients aged 75+ admitted to emergency departments with ST-segment elevation MI (STEMI), including 39 patients with dementia | Retrospective cohort | Of 39 patients with dementia, 34 (87.2%) had atypical symptoms at presentation, whilst 5 (4.8%) had chest pain. Atypical symptoms were significantly associated with treatment delays, reduced access to potentially lifesaving treatment, and consequently higher mortality rates at 1 month. |
| Saposnik 2012 | Canada | Patients admitted to hospital with stroke: 877 with dementia and 877 without dementia. | Retrospective propensity-score matched cohort study | No significant difference in mortality at discharge between patients with/without dementia: risk ratio (RR) 0.88 [0.74-1.05]. |
| Pisani 2005 | U.S.A. | 395 patients age 65+ with an ICU admission during hospitalisation (n=66 with dementia as per Modified Blessed Dementia Rating Scale - MBDRS) | Prospective cohort | No association between presence of moderate-severe dementia and mortality (21% for patients with dementia vs 25%, p=0.53), despite higher APACHE II scores for patients with dementia on admission to ICU (24.9 vs 22.7, p=0.02) and higher likelihood of having their code status changed to less aggressive (24% vs 14%, p=0.04). |

**Table 4 Resource utilisation and discharge destination**

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| --- | --- | --- | --- | --- | --- |
| **Authors, year** | **Country** | **Population** | **Study design** | | **Main results** |
| ***Length of stay*** | | | | | |
| Fogg 2017 | UK | 19,269 acute hospital admissions of 13,652 patients aged 75+ | Retrospective cohort study | | Length of stay (LOS) in days (median, IQR): patients with no CI: 6 (11); CI no diagnosis of dementia: 11 (16); diagnosis of dementia: 9 (17). |
| Reynish 2017 | UK | 10,014 emergency admissions of patients aged 65+, including 38.5% with a cognitive spectrum disorder (CSD) – delirium, dementia, or AMT<8 | Prospective cohort study | | Mean LOS longer in patients with CSD than those with no CI: 25.0 vs 11.8 days (difference 13.2 [11.2-15.3] p<0.001). Patients with DSD had significantly longer LOS than those with dementia alone (34.3 vs 20.1 days, p<0.001) or delirium alone (34.3 23.0 days, p<0.001). |
| Power 2017 | Ireland | 143 patients aged 65+ admitted to hospital, 39 dementia, 30 with mild cognitive impairment (MCI), 74 normal cognition | Prospective cohort study | | The mean hospital stay was 32.2 days for patients with dementia, 18.2 days with MCI and 17.0 days with normal cognition. After adjustment, patients with dementia remained in hospital 15.3 days [1.9-18.8] longer than patients with normal cognition (p=0.047). |
| Bo 2016 | Italy | 1,568 patients age 65+ admitted to acute geriatric or medical wards | Prospective cohort study | | For patients admitted from home (approx. 90% of the sample), delayed discharge occurred in 392 patients, and was independently associated with cognitive impairment: OR 1.12 [1.05-1.19] Among patients admitted from intermediate or long-term facilities, lower cognitive impairment was associated with prolonged stay: OR 0.59 [0.39-0.88]. |
| Tropea 2016 | Australia | 93,300 hospital admissions of patients aged 50+, including 6,459 (6.9%) with CI. | Retrospective cohort | | Patients with CI had a significantly longer adjusted median length of stay compared with the non-cognitively impaired group: 7.4 days (IQR 6.7–10.0) vs 6.6 days (IQR 5.7–8.3), p<0.001 |
| Guijarro 2010 | Spain | >3 million hospital discharge records of patients aged 65+, including n=40,482 with dementia | Retrospective cohort study | | Patients with dementia had a longer average duration of hospital stay than those with no dementia: 13.4 vs. 10.7 days |
| Connolly 2015 | Ireland | 591,619 adult hospital admissions, with 6,702 discharges with a dementia record | Retrospective cohort study | | The mean length of stay was higher for patients with dementia than those without across the age groups: 65-74: 24.4 vs 8.7 days; 75-84: 26.8 vs 11.0 days; 85+: 23.7 vs 12.8 days. |
| Wancata 2003 | Austria | 372 patients aged 60+ admitted to 4 general hospitals | Prospective cohort study | | The mean length of stay of patients with dementia with non-cognitive symptoms (e.g. depression or delusions) was 30.4 days, vs 23.0 days in patients without such symptoms, vs 16.9 days in patients with no cognitive impairment. |
| Li 2013 | China | 34,888 patients aged 60+ admitted to a tertiary hospital, including 918 with dementia | Retrospective case-control study | | Patients with dementia had a mean LOS of 13 days (Standard deviation (SD) 8-20) vs 15 days (SD 11-23) for those without, p<0.001. |
| Annear 2013 | Australia | 4,332 hospital admissions of patients aged 55+ | Retrospective cohort | | Patients with dementia had a median hospital stay of 5 days in both 2013 and 2014, whereas people without had a stay of 2 days in 2013 and 3 days in 2014. |
| Draper 2011 | Australia | 409,000 hospitalisations in 253,000 patients aged 50+. | Retrospective cohort | | The mean length of stay for admissions for people with dementia was 16.5 days vs 8.9 days for those without dementia (p<0.0001) |
| Briggs 2016 | Ireland | 69,718 hospital admissions in patients 65+, including 1433 (2%) admissions with a diagnosis of dementia (929 patients) | Retrospective cohort | | The mean LOS was 31 days in patients with dementia, as compared to 14.1 days in patients without a diagnosis. |
| Lang 2006 | France | 908 patients aged 75+ with an acute admission to hospital | Propsective cohort | | Patients with CI were more likely to stay more than 30 days in hospital: OR 2.2 [1.2–4.0], including after adjustment by French Diagnosis Related Groups (f-DRGs): OR 7.1 [2.3-49.9] |
| Caspe Healthcare Knowledge Systems (CHKS) 2013 | UK | UK-wide hospital episode statistics of people aged 45+ | Retrospective analysis | In 2011, standardised excess length of stay in patients with dementia estimated at 22.1%. | |
| Holmes 2000 | UK | 731 patients aged 65+ with a hip fracture admitted to orthopaedic wards | Prospective cohort | | Concurrent dementia or delirium significantly decreased the likelihood of timely discharge as compared to patients with no psychiatric diagnosis: dementia – OR 0.47 [0.38-0.58]; delirium – OR 0.53 [0.41-0.68] |
| Murata 2015 | Japan | 14,569 patients aged 80+ treated by endoscopic hemostasis for haemorrhagic peptic ulcer disease, including 695 patients with dementia | Retrospective cohort | | Patients with dementia stayed an additional 3.12 [1.58-4.67] days in hospital as compared to those without (p<0.001). |
| Zuliani 2011 | Italy | 51,838 patients aged 60+ admitted to hospital, 4,466 with a diagnosis of dementia | Retrospective cohort study | Median length of stay 7 days (IQR 4-12) in patients with no dementia, versus 8 days (IQR 5-12) in patients with dementia, p=0.12. | |
| Zekry 2009 | Switzerland | 435 hospital patients aged 80+ | Prospective cohort | | The median length of stay varied from 41.5 days in patients with dementia: 31 days in patients with MCI, and 29 days in patients with normal cognition, p<0.001. In multivariate analysis, length of stay was not independently related to cognition : Clinical dementia rating (CDR) 0.5-1: OR 2.12 [0.79-5.69] p=0.134, CDR 2-3: OR 2.15 [0.75-6.22], p=0.156 |
| Timmons 2016 | Ireland | 660 inpatients with a diagnosis of dementia and LOS >5 days | National audit – retrospective chart review, interviews with senior management and ward managers | | 72% of people of dementia did not have discharge planning initiated within 24 hours of admission, and less than 40% had a plan for discharge recorded in the notes. The LOS was significantly greater for new discharges to residential care than to usual residence: median 35 vs 10 days, p<0.001. |
| Saravay 2004 | U.S. | 93 patients age 65+ admitted to hospital | Prospective cohort | | Emergence of mental signs and symptoms in patients with CI, dementia or delirium prior to behavioural disturbance increase LOS |
| Chen 2011 | Australia | 408 patients aged 70+ admitted to hospital | Retrospective case control. | | Cognitive impairment is related to an increased risk of recurrent falls, and patients with recurrent falls are more likely to have a LOS >5 weeks (50.7% of patients with recurrent falls vs 27.2% with a single fall, and 23.2% with no falls, p<0.001) |
| Bail 2015 | Australia | 426,276 overnight hospital episodes in patients aged 50+, matched 1 patient with dementia:4 patients without dementia | Retrospective cohort study | | People with dementia had increased LOS (10.9 vs 7.1 days). |
| Chang 2015 | Taiwan | 203 patients aged 65+ with Alzheimer’s, vascular dementia or Parkinsonism-related dementia admitted to hospital at least once over 4 year period (472 admissions) | Prospective cohort | | Of the dementia subtypes, patients with Alzheimer’s had the shortest hospital stays (mean 10.2 days), followed by vascular dementia (16.8 days), and then Parkinsonism related dementia (17.4 days), p=0.010. The following were independently associated with prolonged hospital stay (>14 days), specifically: diabetes mellitus: OR 2.7 [1.17-6.66], p=0.02; pneumonia: OR 11.21 [3.40-37.01], p<0.001; fall-related hip fracture: OR 4.76 [1.18-19.29], p=0.029. |
| ***Costs*** | | | | | |
| Caspe Healthcare Knowledge Systems (CHKS) 2013 | UK | UK-wide hospital episode statistics of people aged 45+ | Retrospective analysis | In 2011, additional costs attributed to excess length of stay in patients with dementia estimated at £83.8 million. | |
| Briggs 2016 | Ireland | 69,718 hospital admissions in patients 65+, including 1433 (2%) admissions with a diagnosis of dementia (929 patients) | Retrospective cohort | | The average cost for a patient with dementia was almost three times that of a patient with no dementia: £13,832 vs £5,404 |
| Tropea 2016 | Australia | 93,300 hospital admissions of patients aged 50+, including 6,459 (6.9%) with CI. | Retrospective cohort | | CI (defined as dementia or delirium coded during admission) increased costs of hospitalisation by 51%. |
| Annear 2016 | Australia | 4,332 hospital admissions of patients aged 55+ | Retrospective cohort | | Costs of a hospital stay for people with the dementia in the winter months of 2013 and 2014 exceeded the costs of patients without dementia by at least 39% |
| Connolly 2015 | Ireland | 591,619 adult hospital admissions, with 6,702 discharges with a dementia record | Retrospective cohort study | | Estimated that the extra length of stay in patients with dementia results in an additional 246,908 hospital days per annum, at a cost of 199 million Euros |
| Murata 2015 | Japan | 14,569 patients aged 80+ treated by endoscopic hemostasis for haemorrhagic peptic ulcer disease, including 695 patients with dementia | Retrospective cohort | | Average additional costs for patients with dementia were 1171 USD on average (95% CI 533.8-1,809.5) p<0.001. |
| Bail 2015 | Australia | 426,276 overnight hospital episodes in patients aged 50+, matched 1 patient with dementia:4 patients without dementia | Retrospective cohort study | | Patients with dementia who had complications during hospitalisation accounted for 10.4% of hospital episodes, but comprised 22% of the extra costs. |
| Lane 1998 | U.S. | 3,109 patients with Alzheimer’s disease at end-of-life | Retrospective cohort | | 51% died in hospital, where the costs for end-of-life care are estimated to be six times higher than hospice or home care. |
| Araw 2003 | U.S. | 60 hospitalised patients with end-stage dementia | Retrospective cohort | | Patients with dementia who had received a palliative care consultation reduced the average daily pharmacy cost from 31.16 USD to 20.83 USD (p<0.003), even though there was an increase in the prescribing (and therefore costs) of analgesics and anti-emetics. |
| ***Discharge to a nursing or residential care home*** | | | | | |
| Fogg 2017 | UK | 19,269 acute hospital admissions of 13,652 patients aged 75+ | Retrospective cohort study | Patients with cognitive impairment (no dementia diagnosis) and those with a dementia diagnosis have higher rates of being discharged to a nursing or residential home than patients with no CI: 11.3% and 16.3% versus 3.5%, p<0.001. | |
| Harrison 2017 | Scotland | 100 adult patients (18+) with an emergency hospital admission from home and discharged to a care home | Retrospective cohort | | 75% of new discharges to care homes were in people with with cognitive impairment – 55% with dementia, and 20% with CI (no dementia diagnosis). Interdisciplinary standards should be set to support assessment and appropriate care for these patients. |
| Power 2017 | Ireland | 143 patients aged 65+ admitted to hospital, 39 dementia, 30 with mild cognitive impairment (MCI), 74 normal cognition | Prospective cohort study | | Patients with dementia were less likely to be discharged home (70.5%), as compared to those with normal cognition (88.8%) or mild cognitive impairment (MCI) (90%) |
| Zekry 2009 | Switzerland | 435 hospital patients aged 80+ | Prospective cohort | | Dementia is an independent predictor of institutionalisation, i.e. a new admission to a nursing home or other long-term care facility, with patients with severe dementia being four times more likely to be institutionalised. Rates of institutionalisation were: patients with dementia: 20.1%, patients with MCI: 8.3%, normal cognition: 8.2%, p=0.001 Clinical dementia rating (CDR) 0.5-1: OR 1.69 [0.45-6.42] p=0.438, CDR 2-3: OR 4.17 [1.07-16.26], p=0.040 |
| Caspe Healthcare Knowledge Systems (CHKS) 2013 | UK | UK-wide hospital episode statistics of people aged 45+ | Retrospective analysis | In 2011, deficit in the number of people with dementia with non-elective admissions returning to their usual place of residence estimated at 7.1%. | |
| Draper 2011 | Australia | 253,000 patients aged 50+ admitted to hospital, including 20,793 with dementia. | Retrospective cohort. | | Patients with dementia were more likely to be discharged to a nursing home across the age groups, increasing from 8.2% in 50-64 years to 22.4% in 85+ years. |
| Harrison 2017 | Various | Observational studies of patients admitted directly to long-term institutional care following acute hospitalisation, where factors associated with institutionalisation were reported. 23 studies (354,985 participants) | Systematic review and meta-analysis | | For the 11 studies included in the quantitative synthesis, patients with dementia had an increased odds of institutionalisation: pooled OR 2.14 [1.24-3.70]. |
| Kasteridis 2016 | England | 31,120 patients with a primary diagnosis of dementia admitted to hospital and 139,267 patients with dementia admitted for ambulatory care sensitive conditions | Retrospective cohort study | | 19% of patients with dementia were discharged to a care home, falling to 14% in patients with an ambulatory care sensitive condition |
| Saposnik 2012 | Canada | Patients admitted to hospital with stroke: 877 with dementia and 877 without dementia. | Retrospective propensity-score matched cohort study | | There was no difference in the proportion of patients going home at discharge: 19.6% with dementia, 19.4% without dementia, RR 1.01 [0.84-1.22] |
| Leung 2010 | UK | N/A | Review | | Poor, uncoordinated hospital care may contribute to increased rates of nursing home admissions in people with dementia |
| Wancata 2003 | Austria | 372 patients aged 60+ admitted to 4 general hospitals | Prospective cohort study | | Both cognitive and non-cognitive symptoms of dementia, including depression, agitation and delusions, were significant independent predictors of nursing home placement. Dementia without non-cognitive symptoms: aOR 2.28 [1.37-3.79], p=0.001; dementia with non-cognitive symptoms: aOR 3.61 [1.76-7.38], p<0.001. In patients with dementia, more severe CI and an increased number of non-cognitive symptoms increased likelihood of institutionalisation: aOR 2.82[1.10-7.19], p=0.030 and aOR 1.38 [1.01-1.88] respectively. |
| Tochimoto 2015 | Japan | 391 patients with dementia hospitalised for treatment of BPSD | Prospective cohort study (chart review) | | Aggressiveness in BPSD at admission was independently associated with not being discharged home: aOR 0.56 [0.36-0.87], p=0.010 |
| Brindle 2005 | UK | n/a | Discussion paper | | Whether the wishes of the individual concerned have been met should be considered in discharge planning, as they may differ markedly from those of health care professionals, carers or relatives, thus promoting choice and person-centred care. |
| Royal College of Psychiatrists, 2017 | United Kingdom | Patients with dementia in the acute setting. | National audit | | Over one third of patients did not have their consent to a change in residence after discharge, or evidence that a best interests decision making process had taken place, in the case that they lacked capacity. 54% of carer’s comments regarding discharge/care transfer said that discharge was unsafe and poorly planned, which may lead to readmissions to hospital due to lack of readiness of support in the discharge location. |