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# Behavioural and Psychiatric Symptoms in People with Dementia Admitted to the Acute Hospital: Prospective Cohort Study

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## Abstract

**Background—**Dementia is common in older people admitted to the acute hospital. There are increasing concerns about the quality of care they receive.

**Aims—**To define the prevalence of BPSD and explore their clinical associations in this setting.

**Methods—**Longitudinal cohort study of 230 people with dementia, aged over 70, hospitalised for acute medical illness, assessed with the Behave-AD scale at admission and every 4±1 days until discharge. Other measures included length of stay, care quality indicators (ACOVE), adverse events and mortality.

**Results—**Participants were very impaired; 57% at FAST stage 6d or above (doubly incontinent), 75% had BPSD, of these 43% were moderately/severely troubling to staff. Commonest were aggression (57%), activity disturbance (44%), sleep disturbance (42%) and anxiety (35%). Adverse events and mortality may be associated with severity of BPSD.

**Conclusions—**BPSD are very common in the acute hospital, suggesting patients and staff would benefit from more specialist psychiatric support.

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## Introduction

People with dementia are frequently admitted to the acute hospital. In the United Kingdom (UK), at any given time, around 6% of people with dementia are inpatients in general hospitals, compared with approximately 0.6% of over-65s without dementia (1). People with dementia are hospitalised two to three times more often than people of the same age without dementia (2). In the United States (USA) admissions to hospital for people over the age of 85 years with dementia increased from 700,000 in 2000 to 1.2 million in 2008. Dementia is particularly common in patients in acute medical wards, with prevalences in this setting ranging between 40-43% in the UK, Italy and Switzerland (3-5). Studies from a range of countries have demonstrated how people with dementia in the acute hospital are at increased risk of mortality and adverse events, functional decline during the admission, higher risk of being discharged into care homes and longer length of stay (6). In the UK there have been increasing concerns about the care that frail older people receive when they are admitted to acute hospitals (7).

The term “behavioural and psychological symptoms of dementia” (BPSD) encompasses a range of symptoms including agitation, aggression, delusions, hallucinations, depression and apathy. These symptoms are common, multifactorial in origin and likely secondary to complex interactions between the severity of dementia, the environment and other illness. They are distressing for people with dementia and those who care for them. Family caregivers have given rich reports on how BPSD may worsen during hospital admission and how acute hospital staff struggle to adequately manage these (8), however, we have little information on how common behavioural and psychiatric symptoms are in this setting. This is essential if we are to develop and evaluate management strategies for BPSD in the acute hospital, in particular effective non-pharmacological interventions, and to better justify the necessity of liaison psychiatry services within this setting.

## Aims

Our principle aim was to examine the prevalence of behavioural and psychiatric symptoms of dementia in older people with unplanned medical admission to hospital. Our specific objectives were to:

1. Describe the prevalence and subtypes of BPSD in this population.
2. Examine the clinical characteristics associated with BPSD.

Our secondary aim was to explore associations between BPSD (including subtypes) and quality of care, length of stay, adverse events, discharge destination, mortality and costs of the hospital admission.

## Methods

### Setting

For this longitudinal cohort study we recruited from two acute hospitals in London, UK. Both cover a large area encompassing socioeconomic and ethnic diversity, serving a population of two million people from six primary care trusts (healthcare commissioning

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bodies) and four mental health trusts. The hospitals have differing strengths and weaknesses in terms of their Care Quality Commission ratings and are at different stages of implementing the English National Dementia Strategy with varying provision of liaison psychiatry.

## Participants

In both hospitals, all patients are admitted via accident and emergency services to the medical acute admissions unit (MAAU), before transfer to care of the elderly or medical wards (total of 20 wards). Two research assistants spent five months at each site, assessing within 72 hours of admission all patients admitted to each MAAU under the care of the geriatricians, (recruitment period 4/4/2011-6/3/2012). Clinical staff identified patients who met the following inclusion criteria:

- aged 70 years or above with an unplanned acute medical admission
- able to give written informed consent or with an informal carer or "professional consultee" available to give assent
- sufficient English language to complete the study ratings
- Abbreviated Mental Test Score (AMTS (9)) of ≤ 7/10 (routinely measured on admission)

We excluded patients who indicated verbally or non-verbally that they did not wish to participate, those who were moribund, non-English speaking or where there were clinical concerns regarding them being approached.

**Screening—**All potential participants were screened for delirium using the Confusion Assessment Method (CAM) (10). This has a sensitivity of over 94% and a specificity over 90% for detecting delirium and distinguishes accurately between delirium and dementia (10). Those who were not delirious were consented to the study and assessed using the Mini Mental State Examination (MMSE) (11). If their score was ≤ 24 they were entered into the study. Patients with delirium were screened again 48 hours later, if this had resolved they underwent testing with the MMSE. If they remained persistently delirious they were not eligible to participate as we could not establish whether or not they had an underlying dementia. Patients with delirium who had a previous diagnosis of dementia from a specialist service (neurology, geriatrics, old age psychiatry) documented in their hospital notes were eligible.

## Baseline study measures

Dementia diagnosis was confirmed using a structured clinical assessment based on operationalised DSM-IV criteria (12). This comprised cognitive testing from the Mini Mental State Examination (MMSE), structured review of the clinical notes and discussion with family and other carers. We only diagnosed new cases of dementia in the absence of delirium. Research staff did not give the diagnosis of dementia to the participant or their families. This was documented in their notes so the clinical team could manage this as per their usual procedures. Dementia severity was measured using the Functional Assessment

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Staging Scale (FAST) (13). Reason for admission, co-morbidities (Charlson Score) and demographics were obtained from medical notes.

### Assessment for BPSD

Participants were assessed for BPSD at baseline (during the first 72 hours of admission) using the Behave-AD (14), a scale designed for prospective studies of behavioural symptoms in dementia. In addition we included information from discussions with family carers, and ward staff and all available hospital notes. The scale covers seven domains of BPSD; paranoid and delusional ideation, hallucinations, activity disturbances, aggressiveness, diurnal rhythm disturbance, affective disturbance, anxieties and phobias. Scores can be generated for the presence or absence (0/1) or severity of symptoms (0=none, 1=mild, 2=moderate and 3 =severe), giving a maximum score of 75. The scale also includes a global rating of how troubling the BPSD are to family carers or staff (0=not troubling, 1= mildly troubling or dangerous, 2=moderately troubling or dangerous, 3=severely troubling or intolerable).

### Subsequent assessments

Patients were reviewed every 4 (± 1) with the Behave-AD, until discharge or they were deemed medically fit and “awaiting placement” in a care home. Hospital notes were examined and discussions held with clinical staff to identify any BPSD which had occurred in the 4 (± 1) days since the previous assessment. Inter-rater reliability for the Behave-AD was checked for 35 random cases. Agreement ranged from 84.9%-97.1 % (kappa values 0.60-0.75).

It was possible that BPSD may have occurred secondary to incident delirium. To perform a sensitivity analysis for this we undertook regular delirium assessments using the CAM every 4 (± 1 days) at the same time as the BPSD assessment at the second hospital site (n=113).

### Other clinical measures

Data on length of admission, mortality, and change of residence (from own home to a care home) were collected from hospital notes.

**Adverse events:** these were recorded using validated pre-set criteria, defined as “an unintended injury caused by medical management rather than by the disease process and which is sufficiently serious to lead to prolongation of hospitalisation or to temporary or permanent impairment or disability to the patient at time of discharge” and included falls (15).

**Quality of care:** We used the ACOVE (Assessing Care of Vulnerable Elders) indicators; standardised quality indicators in general hospital care and “geriatric-prevalent” conditions (e.g., dementia and delirium). They are a set of IF/THEN statements for 17 conditions, for example, “IF patient has an indwelling catheter placed either on admission or during hospitalization THEN there should be documented indication of need for catheter”. We used a standard method to calculate percentage adherence for each study participant (16).

## Sample size

We assumed a point prevalence of BPSD of 31% from a community based sample of people with dementia (17). We aimed to recruit 250 patients (125 from each hospital) to ensure a 95% confidence interval for prevalence estimates of BPSD with an acceptable 6% precision.

## Data Analysis

We used simple descriptive statistics for the demographic features of the cohort. We calculated the prevalence (and 95% confidence intervals) of BPSD of any severity at the baseline assessment, and then cumulatively at any time during the admission. We calculated the prevalence of individual types of BPSD (and 95% confidence intervals), as described in the Behave-AD scale: paranoid and delusional ideation, hallucinations, activity disturbances, aggressiveness, diurnal rhythm disturbance, affective disturbance, anxieties and phobias. The continuous variable length of admission and ACOVE scores were dichotomised by cutting at the median score. We examined associations between participant characteristics, other clinical measures and the presence of BPSD using Fisher's exact test and with the severity of BPSD using analysis of variance (ANOVA).

We also explored the association between BPSD severity (mean BEHAVE-AD score over admission) and quality of care (ACOVE score), adverse events, length of stay, mortality during admission, and discharge to institutional care (for those living in their own home before admission). The association was modelled using linear or logistic regression, with BEHAVE-AD mean score (for each BPSD type and total) as independent variable. Thus for continuous measures this gives the mean difference for a one point increase in the Behave-AD. For binary measures (adverse events, mortality and change of residence to a care home) we calculated the odds ratio of the outcome for a one point increase in the Behave-AD. Length of stay had a skewed distribution and was log-transformed for this analysis

**Sensitivity analysis for the impact of delirium—**To examine whether BPSD prevalence estimates were altered by participants developing delirium, we conducted a sensitivity analysis, recalculating the prevalence of BPSD for participants at hospital site 2, excluding those who had delirium at any assessment during their admission.

**Economic data—**Data of sufficient quality were available from one hospital site on 98 consecutive patients enrolled into the study prior to December 31$^{st}$ 2011. These included charges accruing to the hospital for each participant's admission; staff contact time, prescription medication use, hospital overheads and other running costs. We compared the cost of admission for patients who had any BPSD at baseline against costs for patients with no BPSD at baseline using a non-parametric Mann-Whitney test. Costs are reported as 2011-2012 values. As is common with healthcare data, costs were highly skewed (Skewness=2.88) because a small number of patients consumed a disproportionately large level of resources. As a result, the assumptions required for standard statistical approaches based on normally distributed data do not hold. Therefore a Bayesian parametric approach to analysis of costs was followed. The relationship between cost and mean BPSD score was estimated, taking into account the skewness, by using linear regression and non-parametric

bootstrapping with 5000 resamples and reporting bias-corrected and accelerated 95% confidence intervals (18).

### Ethical Issues

Our participants were acutely ill, had dementia, delirium or both and were not able to give informed consent. Our consent procedure complied with capacity legislation governing England and Wales whilst balancing the need to recruit a representative cohort of people with dementia (Mental Capacity Act 2005). If a patient agreed to participate we conducted a structured assessment of their capacity to consent. If they had capacity, written informed consent was obtained. If they did not have capacity we attempted to identify their next of kin, carer or another close person to give proxy assent. This could be given verbally over the telephone and we sent this personal consultee the assent form in the post to sign and return. If these forms were not returned the participant's data were withdrawn and destroyed at the end of the study. If we could not contact a next of kin within 48 hours of initial screening we approached a professional consultee for assent (a senior member of the clinical care team who was not directly involved in the research or patient's care) (19). The researchers had regular clinical supervision and a protocol to follow if they witnessed sub-optimal care or distressing incidents.

### Role of the funding source

The study funder had no influence on the study design, collection, analysis or interpretation of data, the writing of the report or the decision to submit the paper for publication.

## Results

### Recruitment

A total of 1612 people were screened (figure 1). Of these 292 met inclusion criteria. The commonest reasons for exclusion were that the MMSE score was >24 or AMTS score > 7 (n=634) or patients were discharged before they could be assessed (n=145). Of the 292 recruited to the study, a further 62 were excluded because they did not fulfil study inclusion criteria at baseline assessment or because family carers who gave telephone assent did not post back signed assent forms. There were 230 participants in the cohort (117 from hospital 1 and 113 from hospital 2). Median length of admission was 12 days (range 2-72, IQR 16, first and third quartile 7,23) and median number of study assessments per participant was 3 (range 1-20, IQR 3, first and third quartile 2,5). No participants dropped out during the study.

### Study participants

There were no significant differences between the characteristics of participants from hospital sites 1 and 2 with respect to gender, proportion of those with a prior diagnosis of dementia, usual place of residence or co-morbidity on the Charlson score. Participants from hospital 1 were significantly older ($t=-2.26$, $p=0.025$) and more were of white British origin, 82% compared to 69% at hospital 2 ($\chi^2= 25.9$, $p=0.004$). Few participants had missing data; three (1.3%) had data missing on the CAM at baseline, four (1.7%) sets of notes were not available for review post-discharge and in one case ethnicity was unknown.

Participants were predominantly female (66%), mean age 87.2 years, standard deviation (SD) 5.9, and of white British ethnicity (76%) (table 1). A known diagnosis of dementia prior to the hospital admission was present in 70%. Most were admitted from their own home and 62% had moderate to severe functional impairment as a result of their dementia. During the admission 13% died. Of those who survived and were admitted from their own home 23.4% were subsequently discharged into a care home.

The commonest causes of admission were pneumonia/chest infection (26.5%), urinary tract infection (15.6%), fall or fracture (11.3%) and cardiac events (9.6%). At the initial study assessment (within 72 hours of admission) 11.4% had delirium.

## Behavioural and psychiatric symptoms of dementia

At the first study assessment, 62% (95% CI 55, 68) had BPSD. The commonest symptoms at baseline were aggression 43% (95% CI: 36, 49) and activity disturbance 25% (95% CI: 20, 31). Considering the whole admission, 75% (95% CI: 69, 80) of participants had BPSD at some point, with 57% having aggression (95% CI: 50, 63) and 44% activity disturbance (95% CI: 37,54) (table 2). The least common BPSD were paranoia and hallucinations. Forty-six per cent of the cohort experienced three or more BPSD symptoms during their admission. At the first assessment 29% of participants had experienced BPSD which were moderately or severely troubling to staff or other carers, this increased to 43% for the whole admission.

Associations between clinical characteristics and BPSD are reported in table 1. BPSD were commoner in men, those admitted from residential or nursing homes, those with a prior diagnosis of dementia and the presence of delirium on admission. Adverse events and mortality were also associated with the total severity of BPSD. Exploring this further in regression analyses (table 3) we found that paranoia and activity disturbance were associated with adverse events. We did not find an association between the length of admission and mean severity of BPSD during the hospital stay.

**Costs—**The mean cost of admission per patient was £14,464 (SD=15,795) and median cost per patient £9,579 (inter-quartile range £5,322-£17,682). The mean total cost of admission for participants without BPSD at baseline was £12,150 (observed sample skewness 0.69) and the median cost £10,904 (IQR £5,028-£14,261). For those with BPSD the mean cost was £15,639 (observed sample skewness 2.69), and the median cost £9,755 (IQR £5,399-£19,031). The Mann-Whitney test of differences in costs between those with and without BPSD at baseline was 0.842 (Chi-squared, 1df = 0.40). The association between total cost of the hospitalisation and mean BPSD score was not significant (average increase in cost for each one point increase of mean BPSD =£215.45, bootstrap 95% CI = [−348.09, 1020.37], p=0.542).

**Sensitivity analyses for the impact of delirium—**Recalculating the prevalence of BPSD in participants from hospital 2, excluding those with delirium at any study assessment point had a small effect, decreasing the prevalence estimates for hallucinations (from 14.8% to 10.1%), activity disturbance (from 43.9% to 36.4%), sleep disturbance (from 42.2% to

35.4%), affective disturbance (from 33.0% to 28.3%) and overall prevalence of BPSD of any type from 75.0% to 68.7% (see online table appendix 1).

## Discussion

BPSD were common in people with dementia in the acute hospital, affecting 75% of participants at some point during their admission. Moderately or severely troubling BPSD occurred in 43% of participants and aggression (57%) and activity disturbance (44%) were the most common symptoms. Over a third of participants had symptoms of sleep disturbance, depression, phobia or anxiety at some time during their admission.

Systematic reviews of the prevalence of BPSD in community dwelling older people with dementia give widely ranging results, depending on which tools are used and the length of the observation period (20). However, in our sample aggression and activity disturbance were more common than in people with dementia living in the community (21), or those living in residential or care homes (22) and higher than in large UK population samples of people with dementia (23).

The acute hospital is a challenging environment for people with dementia and BPSD are multifactorial in origin. The combination of an unfamiliar, disorientating and often noisy environment with physical illness and the need for staff to undertake physical care tasks increases the likelihood that BPSD will occur (24). Studies undertaken in care homes have demonstrated that agitation is often preceded by verbal and physical interactions with staff (25) and physical aggression is more likely to occur when providing personal care (26).

We found an association between BPSD (activity disturbance and paranoia) and the risk of adverse events. These symptoms may be more common in the “ambulatory” cognitively impaired who are at higher risk of adverse events, such as falls (28). More severe BPSD (activity disturbance, aggression and sleep disturbance) were associated with mortality. This may be mediated by delirium, and its associated behavioural disturbances. Alternatively, “terminal restlessness” is a common phenomenon in people who are dying and our behavioural rating scale may have detected these symptoms. In clinical practice it may be difficult to distinguish between delirium and terminal restlessness (29).

Dementia is known to increase the length of hospital admission in a range of countries and types of acute care services (6). However our analysis did not indicate an association between BPSD at admission and length of stay. It may be that length of stay for people with dementia is more strongly influenced by external factors such as the speed at which discharge care packages can be arranged and the availability of social care at home (30).

The mean cost of hospital stay was higher for people with BPSD at baseline (£15, 639 compared to £ 12,150 in those without BPSD). However, data were highly skewed and median costs were not different between the two groups nor was there a significant association between the severity of BPSD and cost for the admission. These figures reflect the actual costs to the hospital of providing inpatient care and are charges accrued to the hospital for staff contact time, prescription medication use, hospital overheads and other running costs. Because of variation in clinical practice and different local cost structures




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these data are less suitable for drawing wider conclusions about the cost of providing care at a national level. Length of admission has the strongest influence on costs per stay and this may be determined by factors outside the control of the hospital. These costs may be useful in developing future economic evaluations of service improvements for people with dementia in the acute hospital.

## Strengths and limitations

It is possible that participants may not be representative of the wider population of people with dementia in acute hospitals. However, we believe it is very likely that our results could be generalised; we recruited from two large acute hospital trusts which cover a population of over two million people, previous research conducted in this location found a dementia prevalence of 42 % which is similar to that found in other acute hospital populations (4;5). In addition our prevalence estimates for behavioural problems at admission are similar to those of Goldberg et al. (32) who used the Neuropsychiatric Inventory (NPI) in older people admitted to hospital. Finally the principle causes of admission in our cohort reflect other UK statistics (33). We attempted to reduce selection bias by screening all people who met our inclusion criteria and carefully documenting reasons for exclusion. Using “Professional Consultees” (2005 Mental Capacity Act) enabled us to recruit participants who may otherwise have been excluded because they could not consent for themselves and did not have a carer or family member to give assent for their participation.

Diagnosing dementia in the acute setting is challenging because delirium is common in this population. However, it was important to attempt this as many people with dementia in the acute hospital have not received a prior diagnosis. To reduce the risk of misclassification of delirium as dementia we only diagnosed new cases of dementia in the absence of delirium, screening for delirium with the CAM version which gives maximum sensitivity. A recent systematic review showed the CAM to have high specificity (96–100%) and moderate sensitivity (77%) in distinguishing between these conditions (34). We conducted a sensitivity analysis, excluding participants with delirium as this may cause behavioural disturbance. This did not markedly alter our prevalence estimates for BPSD. It is however, possible that incident delirium occurred between study assessments.

Research in the acute hospital is challenging. We reviewed patients every four days, using clinical notes and interviewing families and ward staff in detail to ascertain whether BPSD had occurred, but recall bias may have led to over reporting of “troublesome” behaviours, for example aggression, and under reporting of tearfulness, depression or other forms of distress. Although less challenging for staff, these are important to people with dementia and their carers.

We conducted multiple analyses and some of our significant findings may be due to chance. With regards to analysing the association between BPSD and a range of outcomes, we found few significant associations between demographic and clinical factors that may influence this relationship, however, our study may have been underpowered to do this, particularly for less frequent events such as mortality. Factors such as admission diagnosis may also impact on the clinical outcomes we explored and it is likely that there are residual confounding factors which we did not consider. The direction of these associations is

complex; adverse events may be more common in longer hospital stays but this may be because there is more time at risk, therefore we controlled for length of admission where relevant.

### Clinical implications

The results of this study demonstrate a high prevalence of behavioural and psychiatric symptoms in people with dementia in the acute hospital, particularly aggression and activity disturbance. Despite this, many UK acute hospitals and their staff do not have access to specialist psychiatric advice and support or liaison services for older people. In addition the skill-mix of staff on acute general hospital wards may not be optimal to manage the range or severity of BPSD that occur. Our participants were very functionally impaired; 45% were at FAST stage 6d-e (doubly incontinent) and 13% at FAST stage 7a-f (unable to walk, smile or hold their head up). This finding supports recent concerns in the UK that there may be inadequate staff numbers to undertake basic care tasks in such dependent patients (35). These symptoms are still highly distressing for the person with dementia, other inpatients, their families, carers and acute hospital staff. They increase the risk of adverse events and appear to have a detrimental effect on the quality of medical care received.

The majority of acute hospital nurses feel they need more training and support in managing BPSD in people with dementia (8). Despite this there have been few evaluation studies or clinical trials on how we can best educate staff and implement changes to improve care (36). The severity of the behavioural and psychiatric problems found in this study, particularly that of aggression and activity disturbance, suggest more complex structured interventions for BPSD, similar to those that have been shown to be successful in care homes (37;38) may be required. Our results provide strong evidence for the necessity of specialist interventions for BPSD in the acute hospital setting, and for psychiatric liaison teams and specialists in dementia care, to support hospital staff in managing these.

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# Appendix

## Online appendix 1

**Prevalence of behavioural and psychiatric symptoms of dementia at any point during admission for older people with dementia in the acute hospital (subjects with delirium at any time excluded)**

| | Symptom present at any time during admission-(n=99*) | |
|---|---|---|
| **Behave-AD scale** | **n (%)** | **95% CI** |
| **Paranoia/Delusions** | 11 (11.1) | 5-17 |
| **Hallucination** | 10 (10.1) | 4-16 |
| **Activity disturbance** | 36 (36.4) | 27-46 |
| **Aggressive** | 55 (55.6) | 46-66 |
| **Sleep Disturbance** | 35 (35.4) | 26-45 |
| **Affect** | 28 (28.3) | 19-37 |
| **Phobia/Anxiety** | 34 (34.3) | 19-37 |
| **Any symptom** | 68 (68.7) | 59-77) |
| **Behave-AD Global Rating Scale** | | |
| **0-none** | 40 (40.4) | 31-50 |
| **1-mild** | 20 (20.2) | 12-28 |
| **2-moderate** | 19 (19.2) | 11-27 |
| **3-severe** | 20 (20.2) | 12-28 |

* data from hospital 2

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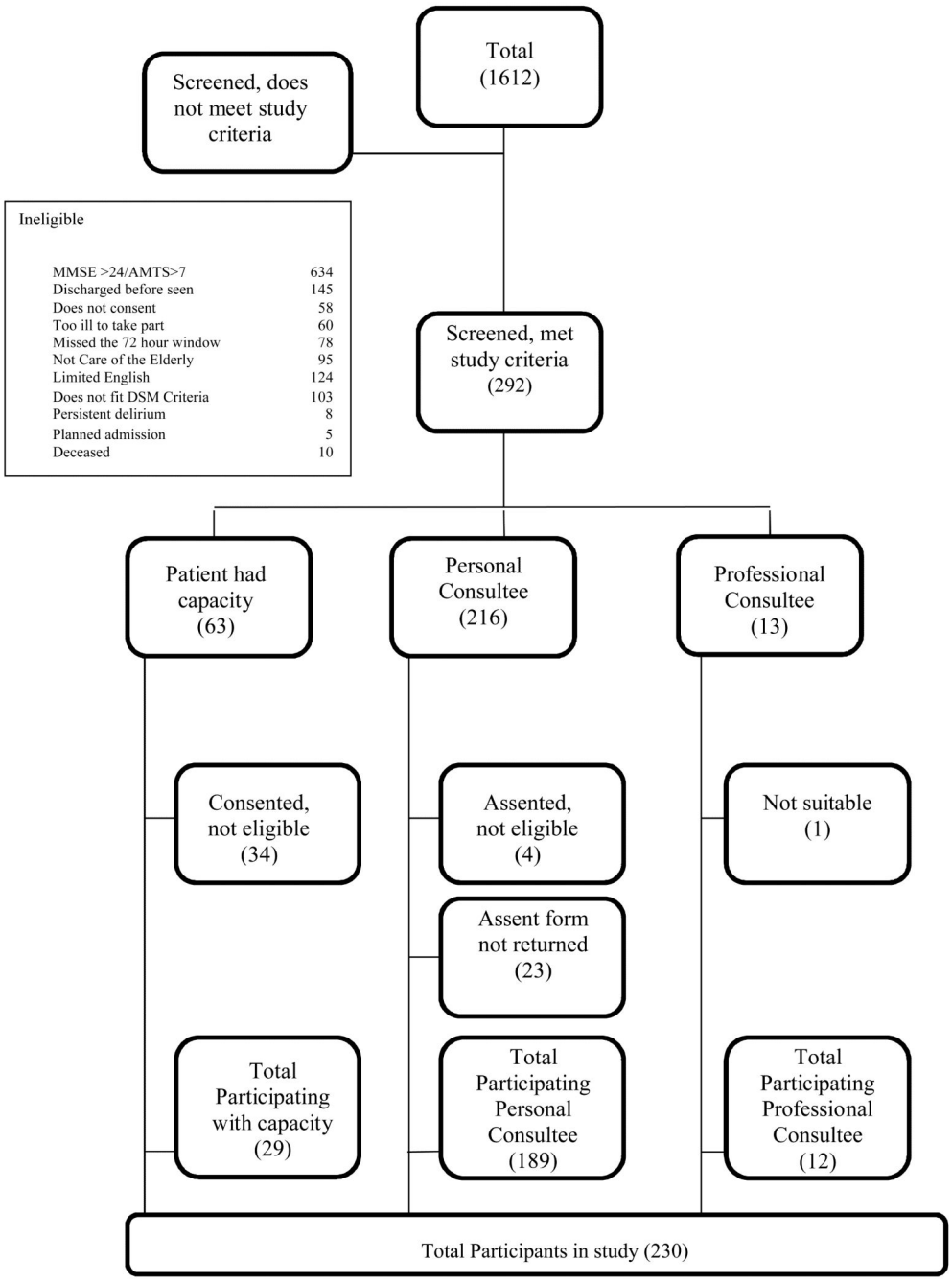


**Figure 1. Study flowchart**

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**Table 1**

**Cohort characteristics and associations with behavioural and psychiatric symptoms of dementia for 230 older people in the acute hospital**

| | Total cohort (%) | BPSD* (%) | | | BPSD severity‡ Behave-AD scale | |
|---|---|---|---|---|---|---|
| **DEMOGRAPHICS** | **(n-230)** | **Absent (n-58)** | **Present (n-172)** | **p-value** | **mean (SD)** | **p-value** |
| **Gender** | | | | | | |
| Female | 151 (65.7) | 29.1 | 70.9 | | 2.8 (3.7) | |
| Male | 79 (34.3) | 17.7 | 82.3 | 0.078 | 3.7 (3.7) | 0.075 |
| **Age**, years | | | | | | |
| 75-84 | 85 (36.9) | 32.8 | 38.4 | | 3.0 (3.6) | |
| 85-94 | 118 (51.3) | 50.0 | 51.7 | | 3.4 (4.0) | |
| 95+ | 27 (11.7) | 17.2 | 09.9 | 0.295 | 2.4 (3.2) | 0.448 |
| **Ethnicity** | | | | | | |
| White British | 175 (76.1) | 26.3 | 73.7 | | 2.9 (3.7) | |
| Black Caribbean | 15 (06.5) | 20.0 | 80.0 | | 2.9 (2.9) | |
| Other | 40 (17.4) | 22.5 | 77.5 | 0.823 | 4.2 (4.1) | 0.141 |
| **Place of Residence** | | | | | | |
| Home | 145 (66.2) | 26.9 | 73.1 | | 2.6 (3.5) | |
| Residential Home | 26 (11.9) | 15.4 | 84.6 | | 4.4 (3.9) | |
| Nursing Home | 39 (17.8) | 28.2 | 71.8 | | 3.5 (3.7) | |
| Other | 09 (04.1) | 22.2 | 77.8 | 0.656 | 6.8 (8.3) | 0.014 |
| **CLINICAL CHARACTERISTICS** | | | | | | |
| **FAST Score**, % | | | | | | |
| **3-5** (objective functional deficit, difficulties with activities of daily living) | 86 (37.4) | 31.4 | 68.6 | | 2.4 (3.5) | |
| **6a-6c** (help required putting on clothes, toileting or bathing) | 39 (16.9) | 17.9 | 82.1 | | 3.6 (4.2) | |
| **6d-6e** (urinary and faecal incontinence) | 74 (32.2) | 21.6 | 78.6 | | 3.4 (3.5) | |
| **7a-f** (less than 6 words, can no longer walk, sit up, smile, hold up head) | 31 (13.5) | 25.8 | 74.2 | 0.358 | 3.7 (4.3) | 0.153 |
| **Known diagnosis of dementia prior to index admission** | | | | | | |
| Yes | 161 (70.0) | 21.1 | 78.9 | | 3.7 (4.1) | |

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| | Total cohort (%) | BPSD* (%) | | | BPSD severity‡ Behave-AD scale | |
|---|---|---|---|---|---|---|
| **DEMOGRAPHICS** | **(n-230)** | **Absent (n-58)** | **Present (n-172)** | **p-value** | **mean (SD)** | **p-value** |
| No | 69 (30.0) | 34.8 | 65.2 | 0.032 | 1.6 (2.1) | <0.001 |
| **Delirium on admission (CAM)†** | | | | | | |
| Yes | 26 (11.4) | 7.7 | 92.3 | | 5.3 (4.6) | |
| No | 201 (88.6) | 27.4 | 72.6 | 0.030 | 2.8 (3.6) | 0.001 |
| **Charlson Co-morbidity Score** | | | | | | |
| 0-1 | 57 (24.8) | 22.8 | 77.2 | | 2.5 (3.4) | |
| 2-3 | 124 (53.9) | 27.4 | 72.6 | | 3.2 (3.9) | |
| 4+ | 49 (21.3) | 22.5 | 77.5 | 0.740 | 3.6 (3.7) | 0.298 |
| **ACOVE** | | | | | | |
| < 75 | 108 (47.0) | 20.4 | 79.6 | | 3.2 (3.5) | |
| ≥ 75 | 122 (53.0) | 29.5 | 70.5 | 0.129 | 3.1 (4.0) | 0.822 |
| **Number of adverse events** | | | | | | |
| 0 | 199 (88.0) | 27.1 | 72.9 | | 2.9 (3.6) | |
| 1-2 | 27 (12.0) | 14.8 | 85.2 | 0.240 | 4.4 (5.0) | 0.045 |
| **Mortality** | | | | | | |
| Yes | 30 (13.0) | 20.0 | 80.00 | | 4.6 (4.3) | |
| No | 200 (87.0) | 26.0 | 74.0 | 0.652 | 2.9 (3.6) | 0.017 |
| **Length of admission** | | | | | | |
| Low (<12 days) | 113 (49.1) | 31.9 | 68.1 | | 2.8 (3.6) | |
| High (≥ 12 days) | 117 (50.9) | 18.8 | 81.2 | 0.024 | 3.4 (3.9) | 0.224 |
| **Discharge to institutional care (n=128)** | | | | | | |
| Yes | 30 (23.4) | 5 | 67 | | 3.50 (4.6) | |
| No | 98 (76.6) | 31 | 25 | 0.163 | 2.15 (2.9) | 0.056 |

FAST=Functional Assessment staging Scale, ACOVE= Assessing Care of Vulnerable Elders Indicators

*BPSD at any assessment during hospital admission.

†BPSD at baseline

‡Mean score over admission.



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## Table 2

**Prevalence of behavioural and psychiatric symptoms of dementia at any point during admission for 230 people in the acute hospital**

| | Symptom present on admission (n=230) | | Symptom present at anytime during admission (n=230) | |
|---|---|---|---|---|
| **Behave-AD scale** | **n (%)** | **95% CI** | **n (%)** | **95% CI** |
| **Paranoia/Delusions** | 11 (4.9) | 2-8 | 25 (10.9) | 7-15 |
| **Hallucination** | 17 (7.4) | 4-11 | 34 (14.8) | 10-19 |
| **Activity disturbance** | 58 (25.2) | 20-31 | 101 (43.9) | 37-54 |
| **Aggressive** | 98 (42.6) | 36-49 | 130 (56.5) | 50-63 |
| **Sleep Disturbance** | 39 (17.0) | 12-22 | 97 (42.2) | 36-49 |
| **Affect** | 37 (16.1) | 11-21 | 76 (33.0) | 27-39 |
| **Phobia/Anxiety** | 47 (20.4) | 15-26 | 81 (35.2) | 29-41 |
| **Any symptom** | 142 (61.7) | 55-68 | 172 (75.0) | 69-80 |
| **Behave-AD Global Rating Scale** | | | | |
| **0-none** | 119 (51.7) | 45-58 | 85 (36.9) | 31-43 |
| **1-mild** | 45 (19.6) | 14-25 | 46 (20.0)† | 15-25 |
| **2-moderate** | 41 (17.8) | 13-23 | 46 (20.0) † | 15-25 |
| **3-severe** | 25 (10.9) | 07-15 | 53 (23.0) † | 18-29 |

† Maximum level reached by participant during admission

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**Table 3**

**Clinical associations with severity of behavioural and psychiatric symptoms of dementia for 230 older people in the acute hospital**

| | ACOVE (n=226) | | Adverse Events (n=226) | | Mortality (n=230) | | Length of stay (log) (n=230) | | Discharged to institutional care (n=128) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Behave-AD (possible range)** | **MD (95%CI)** | ***p*** | **OR (95%CI)** | ***p*** | **OR (95%CI)** | ***p*** | **MD (95%CI)** | ***p*** | **OR (95%CI)** | ***p*** |
| **Paranoia (0-21)** | −0.22 [−2.90,2.45] | 0.870 | 2 24 [1.14,4.41] | 0.019 | 0.90 [0.37,2.15] | 0.805 | 0.04 [−0.17,0.26] | 0.684 | 1.72 [0.77,3.82] | 0.186 |
| **Hallucinations (0-15)** | −0.94 [−3.27,1.39] | 0.427 | 1 23 [0.69,2.18] | 0.489 | 0.64 [0.21,1.95] | 0.433 | 0.08 [−0.11,0.27] | 0.396 | 1.92 [1.06,3.50] | 0.032 |
| **Activity (0-9)** | −0.85 [−2.41,0.70] | 0.282 | 1.58 [1.09,2.28] | 0.015 | 1.56 [1.09,2.23] | 0.015 | −0.05 [−0.18,0.07] | 0.394 | 1.19 [0.74,1.91] | 0.468 |
| **Aggression (0-9)** | −0.33 [−0.98,0.31] | 0.306 | 1.13 [0.96,1.34] | 0.148 | 1.23 [1.06,1.44] | 0.008 | 0.04 [−0.01,0.09] | 0.152 | 1.22 [0.97,1.52] | 0.084 |
| **Sleep (0-3)** | 0.99 [−1.68,3.66] | 0.467 | 1.39 [0.69,2.78] | 0.357 | 1.95 [1.04,3.63] | 0.036 | 0.10 [−0.12,0.31] | 0.380 | 1.00 [0.41,2.46] | 0.996 |
| **Affect (0-6)** | −0.49 [−2.33,1.36] | 0.604 | 0.58 [0.22,1.50] | 0.261 | 1.11 [0.69,1.80] | 0.670 | −001 [−0.16,0.14] | 0.862 | 0.78 [0.36,1.70] | 0.531 |
| **Anxiety/Phobia (0-12)** | −0.72 [−2.77,1.33] | 0.489 | 1.24 [0.75,2.06] | 0.405 | 1.07 [0.62,1.85] | 0.807 | −0 05 [−0.22,0.11] | 0.536 | 1.55 [0.77,3.10] | 0.218 |
| **Total score (0-75)** | −0.20 [−0.55,0.16] | 0.279 | 1.09 [1.00,1.19] | 0.052 | 1.11 [1.01,1.20] | 0.022 | 0.01 [−0.02,0.04] | 0.447 | 1.11 [0.99,1.24] | 0.072 |

MD = Mean Difference in dependent variable for each one point increase on the BEHAVE-AD, from linear regression. OR = Odds Ratio of outcome for each one point increase on the BEHAVE-AD, from logistic regression.

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