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Title: Are Health Assets Associated with Improved Outcomes for Hospitalised Older Adults? A Systematic Review

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Title: Are Health Assets Associated with Improved Outcomes for Hospitalised Older Adults? A Systematic Review.

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Title: Are Health Assets Associated with Improved Outcomes for Hospitalised Older Adults? A Systematic Review.

Highlights

- Health assets are protective factors which support health and wellbeing, rather than risk factors that are associated with disease.
- Many risk factors for adverse outcomes have been identified for hospitalised older adults.
- Health assets are associated with improved outcomes for hospitalised older adults.
- This review highlights the need for further research on the effect of health assets in hospitalised older adults.

Key terms: Hospitalisation, Health Status, Aged, Health Assets, Frailty, Healthy Aging.
Abstract

Objective: Health assets are protective factors that support health and wellbeing, rather than risk factors that are associated with disease. This concept was developed in the community setting. In hospitalised older adults, the dominant approach has been to identify risk factors, with little examination of health assets.

The purpose of this systematic review was to determine whether, in hospitalised older people, individual health assets decrease the risk of post hospital mortality, functional decline, new need for residential care, readmission or longer length of stay.

Methods: MEDLINE, EMBASE, CINAHL and PsycINFO were searched to identify studies examining outcomes for hospitalised older adults. Included studies examined at least one potential individual health asset, which was a psychosocial characteristic or health characteristic. Study quality was assessed, and findings are narratively described.

Results: Nine prospective cohort and two retrospective cohort studies were identified. Subjective, functional and biological health assets were identified. Health assets were associated with decreased risk of post-hospital mortality, functional decline, new need for residential care and readmission.

Conclusion: The complex interplay between health status and psychological and social factors is incompletely understood. Health assets are associated with
improved outcomes for hospitalised older adults. The small number of studies suitable for inclusion indicates the need for further research in this area.

**Background**

Hospitalisation is a sentinel life event for many older adults. In addition to the risk of death, around 30-40% of older adults will leave hospital with a new, often persistent, disability leaving them reliant on family or needing formal care.(Boyd et al., 2008; Covinsky, Pierluissi, & Johnston, 2011) Although disability can occur insidiously in community dwelling older people, the incidence of onset increases markedly with hospitalisation.(Gill, Allore, Holford, & Guo, 2004) Older adults are also at increased risk for longer lengths of stay and readmission(Evans, M, A, & Rockwood, 2014).

Pre-existing dependence in activities of daily living, malnutrition, depression and impaired cognition(Vaccarino, Kasl, Abramson, & Krumholz, 2001) are well established as risk factors for poor recovery from unplanned hospitalisation.(Thomas, Cooney, & Fried, 2013) A higher level of frailty is predictive of increased risk of mortality, functional decline and increased length of stay for hospitalised older adults. (Evans et al., 2014; Gill, Allore, Gahbauer, & Murphy, 2010; Gill et al., 2004)

Only including factors with negative associations does not explain why some frail older adults recover well following hospitalisation. An individuals’ health status is also determined by resources they have at their disposal, which protect against negative health outcomes and promote wellness. ‘Salutogenesis’ describes an approach focusing on factors that support well-being and health rather than factors
that cause disease. (Lindstrom & Eriksson, 2005) Inclusion of health assets in a model of illness and health allows operationalisation of the concept of salutogenesis. Health assets are determining factors that predict health and illness over and above conventional risk factors ("Asset based approaches for health improvement: redressing the balance," 2011). They can be biological, subjective or functional. (Seligman et al., 2013) A biological asset is an objectively measured health characteristic, such as a favourable blood lipid profile. Subjective health assets include psychological state and positive emotions. A functional health asset relates to the ability to undertake community and social participation and includes physical function and adequate finances. (Seligman et al., 2013) Health assets have primarily been examined in the community setting. Potential assets in this setting are cardiorespiratory fitness, a stable marriage, positive emotions and social participation. (Seligman et al., 2013).

Community studies have demonstrated that positive health factors can mitigate the consequences of frailty i.e. individuals with comparable frailty status have reduced mortality if they have a higher number of assets (Wang et al., 2014) An asset model is more empowering to individuals, as it encourages resilience and empowers people to be active participants in their own wellbeing.

The purpose of this systematic review was to determine whether individual health assets also improve outcomes in the acute hospital setting. The outcomes examined were post-hospital mortality, functional decline in activities of daily living, new need for residential care, readmission and length of stay.
Methods

Search Strategy

A search of MEDLINE, EMBASE, CINAHL and PsycINFO was conducted in February 2015. The MEDLINE search used a combination of Medical Subject Heading (MeSH) terms and keywords. Modified forms of the same terms were used for PsycINFO, EMBASE and CINAHL. Results were limited to articles published from 1990 onwards; English language, aged 65 and older and human subjects. Search terms were used to identify hospital inpatients, outcomes of interest, and studies looking at health determinants. These searches were then combined with the Boolean operator AND. A PubMed search was also conducted using keywords to identify any articles that had been published in the preceding two months and had not yet been assigned MeSH terms (see Appendix 1 for search strategies). The reference lists of included articles were also examined. The study protocol was registered with Prospero (http://www.crd.york.ac.uk/PROSPERO/, registration number: CRD42015019818)

Study selection

Inclusion criteria

Studies were included if the study population included adults aged 65 and older who had an unplanned hospitalisation. Health assets were only considered if they were examined independently. Studies where the health asset was identified in the community prior to admission were included. The domains included were biological,
subjective and functional health assets. The outcomes examined were post hospital mortality, functional decline, new need for residential care, length of stay and readmission. Only articles which examined quantitatively an association between factor(s) of interest and adverse outcomes were included.

Studies were excluded if they looked at a specific patient population such as transplant recipients, patients undergoing a particular intervention, or stroke patients. Studies were excluded if the association was found with an established risk factor defined as poor baseline function, co-morbidity, depression, malnutrition and cognitive impairment. Environmental and hospitalisation care processes were not examined.

Study quality was evaluated using an adapted version of the epidemiological appraisal instrument by Genaidy et al (Genaidy et al., 2007) (see appendix 2) (KG reviewed all, KL and RM reviewed half each). The studies were characterised as low, medium or high methodological quality.

**Data extraction**

Each study was interrogated for general information, population characteristics, outcome of interest, method and timing of data collection. A list of health assets was generated from the included studies.

**Data synthesis and analysis**
The studies were grouped by type of health asset examined. Although two studies included the same cohort, both were included as they examined the outcome of different health related characteristics.

**Results**

*Overview of included studies*

Initial search, title and abstract review were performed by KG. Initial searches identified 3566 original articles. After review of the title, 3303 were rejected. The abstracts of the remaining 231 were reviewed, following which 41 articles were retrieved for full text review. Of these, 10 articles met the final inclusion criteria (see table 1). One additional article was identified after reviewing the references of articles that met the inclusion criteria, resulting in a total of 11 articles (figure 1). A narrative approach was taken to the data analysis, as, due to the heterogeneity of study methods and populations, a meta-analysis was not possible.

Articles were identified which found health assets that decreased post hospital mortality, functional decline, new need for residential care and readmission (see table 1). No health assets were found to be associated with a shorter length of stay. The included studies were predominantly from English speaking countries. Two studies used data from the same cohort of patients based in New Haven, Connecticut (Berkman, Leo-Summers, & Horwitz, 1992; Wilcox, Kasl, & Berkman, 1994) (see table 1).

**Discussion**
This review indicates that individual health assets are associated with improved outcomes of functional decline, mortality, new need for residential care and readmission in hospitalised older adults. Older adults are more likely to have positive outcomes after an inpatient episode if they have adequate social, psychological and financial resources. The small number of studies suitable for inclusion indicates the need for further research in this area. Many health assets included in this review were presented with the negative associations of their absence, which is reflective of the traditional focus on risk factors and ill health, rather than seeking factors that can lead to better health.

Although many of the studies were classified as being high quality, as the studies were all cohorts, definitive causation cannot be demonstrated. Many of the findings, such as the protective effect of a carer, education and social engagement were repeated in multiple studies, which adds further weight. For many health assets, randomised controlled trials are not possible. This highlights the need to perform further cohort studies to look for factors that confer protection while adequately controlling for risk factors.

Although some of the resources identified are not amenable to modification, such as education, presence of a carer and financial resources, a large number could lead to targeted interventions, such as social engagement, having a primary physician and improving psychological health. This informs theoretical knowledge of factors that have a positive influence on health and highlights new directions to improve outcomes for this vulnerable patient group. In the community setting, frail patients
who have a high degree of social vulnerability are protected from mortality if they live in countries with social models that provide a high level of formalised support (Wallace, Theou, Pena, Rockwood, & Andrew, 2015), further demonstrating practical applications.

A health asset is an enabling factor, empowering individuals to use their own resources and resources around them to improve their health outcomes ("Asset based approaches for health improvement: redressing the balance," 2011). In this context, it is easily apparent how some assets, such as a higher level of educational attainment or the ability to pay for basic health and personal expenses are protective. The mechanistic link between a higher level of social engagement and a lower chance of post hospital mortality or functional decline is less easily apparent. Psychosocial stress is associated with increased inflammation, which may be the conduit for this association (McDade, Hawkley, & Cacioppo, 2006). Dent et al found that psychosocial factors conferred protection against adverse outcomes for frail adults in a hospitalised cohort. In contrast, this was not found in a community cohort which also included frail older adults and examined mortality and functional decline (Hoogendijk et al., 2014). The study by Dent et al. had a higher mortality rate compared to Hoogendijk et al, with 23% vs 6.8%. The participants had a far higher rate of frailty in the study by Dent et al, at 57%, with only 16.8% of the patients in the study by Hoogendijk et al being classified as frail, despite using the same method of measurement which could contribute to the different result. If the community cohort were followed for a longer time period, as mortality rates increase, an effect may be seen.
Oral health was associated with better functional outcomes in an analysis that accounted for social supports, cognition, but not nutritional status. (Chen, Wang, & Huang, 2008) It is possible that oral health is a reflection of higher socio-economic status, but it may also indicate an ability and willingness of the individual to take care of their health. This is consistent with the finding that having a primary health care provider is a health asset. (Smith & Stevens, 2009)

Although some studies found associations with gender, the findings were not consistently positive for one gender in particular to include this as a health asset.

No biological health assets were identified in this review. Lower levels of interleukin-6 (IL-6) and insulin-like growth factor-1 (IGF-1) are associated with better functional outcomes in patients following unplanned hospitalisation when combined with another predictive model. (de Saint-Hubert et al., 2011) As IL-6 and IGF-1 were not examined independently of the risk prediction model, this study was not included, but this does suggest that neuroendocrine reserve and diminished inflammation could be health assets. It is possible that biological health assets are not predictive in the acute setting due to the overriding impact of the antecedent illness.

The theory of salutogenesis was developed in the community setting with a focus on maintaining and improving wellness. (Lindstrom & Eriksson, 2005) Health assets in the community may not provide benefit when someone is hospitalised. Conversely there may be factors, which only come into effect once someone is hospitalised. In
the community setting environmental factors and community resources also affect health outcomes. (Wang et al., 2014) It has been well described that in the hospital setting, admission to an Acute Care of the Elderly unit instead of a general medical unit improves the likelihood of a positive functional outcome, (Baztan, Suarez-Garcia, Lopez-Arieta, Rodriguez-Manas, & Rodriguez-Artalejo, 2009) so this could also be considered a health asset.

The quality of hospital processes, including in-hospital nutrition and mobility; also have positive impact on health status outcomes. Mobility in hospital is partly a result of the quality of hospital processes. (Zisberg, Shadmi, Gur-Yaish, Tonkikh, & Sinoff, 2015) It may also represent a health asset, as in studies where the statistical model has controlled for illness severity, functional status, co-morbidity and cognition, higher levels of mobility were associated with better long-term functional status and mortality. (Zisberg et al., 2015)

Limitations of the present study include the heterogeneity of measures used to identify similar variables, which precluded meta-analysis. Many of the studies also examined similar populations, with 3 studies looking at populations from the same small city in the USA. Berkman (Berkman et al., 1992) and Wilcox (Wilcox et al., 1994) examined different outcomes for a very similar characteristic in the same population. Both studies were included as the outcome of interest for the characteristic was different. Nevertheless, the number of studies from a limited population raises concerns about generalisability. Loss to follow up was not reported in some studies nor was completeness of follow-up. Only one study set in a subacute care unit
examined subjective health assets, so this finding may not be generalisable to all inpatients. The health assets identified by Smith (Smith & Stevens, 2009) and Goodwin (Goodwin, Howrey, Zhang, & Kuo, 2011) need to be interpreted in the context of being retrospective studies based on large computerised data sets. Examining these assets in a prospective cohort would strengthen these findings. It is possible that confounding accounts for some of the effects of the health assets identified. As an example it is possible that the effect of higher financial resources is accounted for by increased level of education. However, even if independence of factors can be demonstrated statistically, this is a convention that is not well grounded in biological reality, and it is likely that two associated factors would still have an additive effect. This is something that could be explored in further research.

Although a systematic search strategy was used, it is possible that relevant articles were not identified. The identification of an article on hand search of the references indicates that this strategy was not fully sensitive.

Some studies were lacking in details of measurement. Drame et al. (Drame et al., 2011) identified that having a large number of children was protective against the need for residential care, but the number of children was not specified.

Our findings must be interpreted with caution due to the low number of studies identified for inclusion and the lack of duplication of findings for most health assets. There are many candidate health assets, which have been examined in younger hospitalised populations, but not in older people. Being married and being resident in the country of birth have both been identified as health assets in younger
inpatient cohorts, (Dimengo, 1996; van Oeffelen, Agyemang, Stronks, Bots, & Vaartjes, 2014) but these factors have not been examined in older cohorts. There are perceived difficulties in including older adults in research studies, such as a perception of older people as ‘vulnerable’. As this group make up a high proportion of hospitalised older adults, it is imperative to design inclusive studies. (McMurdo et al., 2011) Studies in younger adults tend to focus predominantly on mortality, rather than functional decline, which could be considered an outcome of almost equal importance by many older adults, due to the adverse prognostic implications. (Boyd et al., 2008)

There is increasing need across many health systems to try and improve care for older people, not only for the outcome of mortality, but for the outcomes of functional decline and readmission. Greater understanding of the role of health assets in the hospital setting could help individuals to play a greater role in their own recovery. It could also lead to improvements in hospital systems to facilitate the role of the individual as the driver of their own return to wellbeing. This could also promote more granular risk stratification and resource allocation as patients with fewer health assets may require increased assistance to ensure recovery following hospitalisation.

**Conclusion**

The complex interplay between health status and psychological and social factors is incompletely understood. A health asset allows an individual to better understand the situation they are in and to use their own resources and resources around them
to improve their health outcomes. A hospital admission is a time of great risk to older people and so it is critical to identify health assets that can improve outcomes and promote patients as active agents of their wellbeing. Health assets in older adults are associated with a decrease in mortality, functional decline, readmission and new need for residential care. Some health assets identified in younger age groups have not been explored in older age groups. Identification of health assets will allow collection of this information in the clinical setting, which may facilitate better allocation of healthcare resources and better patient outcomes. This review has identified many targets for further research.

Conflict of interest statement: The authors have no conflicts of interest to declare.

Sources of funding

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References


Covinsky, K. E., Pierluissi, E., & Johnston, C. B. (2011). Hospitalization-associated disability: "She was probably able to ambulate, but I'm not sure". *Jama, 306*(16), 1782-1793.


Excluded (n=3326)

Risk factors = 11
Not outcome of interest = 3
Wrong population = 8
Not original research = 1
Not relevant = 6

Excluded (n=29)
Risk factors = 11
Not outcome of interest = 3
Wrong population = 8
Not original research = 1
Not relevant = 6

Excluded (n=199)
Risk factors = 52
Not outcome of interest = 76
Wrong population = 29
Not original research = 14
Not relevant = 28

Excluded due to low quality (n=2)

Total (n=11)

No additional results were identified from the PubMed search
Table 1: Characteristics of included studies

<table>
<thead>
<tr>
<th>Study and Sample size</th>
<th>Quality</th>
<th>Location and setting for recruitment</th>
<th>Duration of Follow-up</th>
<th>Health Asset</th>
<th>Functional decline</th>
<th>Post hospital mortality</th>
<th>Discharge to RACF</th>
<th>Readmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berkman (Berkman et al., 1992) 194 age 65 and older female 48%</td>
<td>high</td>
<td>USA Community</td>
<td>6 months</td>
<td>Emotional support</td>
<td>OR of 2.9 (1.2, 6.9) Low vs. high</td>
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<tr>
<td>Chaudhry (Chaudhry, Friedkin, Horwitz, &amp; Inouye, 2004) 862 age 70 and older female 60%</td>
<td>high</td>
<td>USA General medical ward of single hospital</td>
<td>6 months</td>
<td>Education</td>
<td>35% for high vs. 45% for low</td>
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<td></td>
<td></td>
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<tr>
<td>Chen (Chen et al., 2008) 241 age 65 and older female 45%</td>
<td>high</td>
<td>Taiwan Surgical and medical units from a single</td>
<td>6 months</td>
<td>Oral health</td>
<td>OR 1.17 (1.04, 1.31) Poor vs. good</td>
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<tr>
<td>Study</td>
<td>Hospital</td>
<td>Age</td>
<td>Gender</td>
<td>Setting</td>
<td>Length</td>
<td>Outcome</td>
<td>Effect Size</td>
<td>Confidence Interval</td>
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<tr>
<td>Dent (Dent &amp; Hoogendijk, 2014)</td>
<td>Australia subacute ward of single Hospital</td>
<td>75 and older</td>
<td>Female: 75%</td>
<td>Single hospital in Australia</td>
<td>12 months</td>
<td>Sense of control</td>
<td>OR 3.22 (1.54, 6.72)</td>
<td>Low vs. high</td>
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<td></td>
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<td></td>
<td></td>
<td>Sense of wellbeing</td>
<td>OR 2.26 (1.01, 5.04)</td>
<td>Low vs. high</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Social engagement</td>
<td>OR 3.36 (1.01, 11.22)</td>
<td>Low vs. high</td>
<td>Moderate</td>
</tr>
<tr>
<td>Drame (Drame et al., 2011)</td>
<td>France Multi-centre trial in acute hospitals</td>
<td>75 and older</td>
<td>Female: 60.5%</td>
<td>France</td>
<td>Moderate</td>
<td>Time of discharge</td>
<td>HR 0.8 (0.7, 0.9)</td>
<td>More vs. less</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Many children</td>
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</tr>
<tr>
<td>Goodwin (Goodwin et al., 2011)</td>
<td>USA Retrospective cohort</td>
<td>65 and older</td>
<td>Female 64%</td>
<td>USA</td>
<td>High</td>
<td>Primary care physician PPI</td>
<td>OR 0.75 (0.74, 0.77)</td>
<td>PPI vs. no PPI</td>
</tr>
<tr>
<td>Reference</td>
<td>Study Population</td>
<td>High/Low</td>
<td>Setting</td>
<td>Time</td>
<td>Outcomes</td>
<td>High vs. Low OR (95% CI)</td>
<td>Low vs. High OR (95% CI)</td>
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<tr>
<td>Li (et al., 2005)</td>
<td>2200 aged 70 and older females: 64%</td>
<td>High</td>
<td>USA General medical service of two hospitals</td>
<td>90 days for ADLs</td>
<td>12 months mortality</td>
<td>Financial resources</td>
<td>OR 1.59 (1.07, 2.37) Low vs. high</td>
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<tr>
<td></td>
<td>Low vs. high</td>
<td>OR 1.36 (1.00, 1.87)</td>
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<tr>
<td>Rodríguez-Artalejo (et al., 2006)</td>
<td>433 aged 65 and older females: 58.2%</td>
<td>High</td>
<td>Spain Acute hospital wards of four hospitals</td>
<td>Median 6.5 months</td>
<td>Social engagement</td>
<td></td>
<td>HR 1.98 (1.07, 3.68) Low vs. high</td>
<td></td>
</tr>
<tr>
<td>Smith &amp; Stevens, 2009</td>
<td>6006 aged 60 and older females: 50%</td>
<td>High</td>
<td>USA Single hospital</td>
<td>Retrospective cohort</td>
<td>High education</td>
<td></td>
<td>OR 0.74 (0.65, 0.97) More vs. less</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carer</td>
<td>OR 0.76 (0.65, 0.97) Carer vs. no carer</td>
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<tr>
<td>Wilcox (et al., 1994)</td>
<td>417 aged 65 and older females: 64%</td>
<td>High</td>
<td>USA Community</td>
<td>6 months</td>
<td>Social engagement</td>
<td>Positive association (no OR published)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study (Zureik et al., 1995)</td>
<td>Severity</td>
<td>Setting</td>
<td>Discharge</td>
<td>Carer</td>
<td>Odds Ratio</td>
<td></td>
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<tr>
<td>Zureik (Zureik et al., 1995)</td>
<td>Moderate</td>
<td>France Two hospitals</td>
<td>Time of discharge</td>
<td>Carer</td>
<td>OR 2.9 (1.9, 4.3) No carer vs. carer</td>
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</tbody>
</table>

*Berkman and Wilcox use data from the New Haven Connecticut cohort of the Established Populations for Epidemiologic Studies of the Ageing RACF: residential aged care facility
Appendix 1: Search strategies for MEDLINE, EMBASE, PsycINFO and CINAHL

**Literature Search Strategies for MEDLINE (web of science)**
1. MeSH heading: hospitalisation OR inpatients
2. MeSH Heading: survivors OR Activities of Daily Living OR Recovery of Function OR treatment outcome OR Health status OR Nursing Homes
3. MeSH heading: Social support OR Risk Factors OR Social Determinants of Health OR caregiver OR Topic: indicator* OR determinant* OR carer*
4. #1 AND #2 AND #3
   Limits: English language AND aged and human

**Literature Search Strategies for EMBASE (1437)**
1. Hospital patient OR hospitalisation
2. Daily life activity OR survival OR treatment outcome OR health status OR nursing home
3. determinant or indicator).mp. [mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword OR risk factor OR social support OR caregiver OR carer.mp
4. #1 and #2 and #3
   limits: 1990-to present, age 65+, English language

**Literature Search Strategies for PsycINFO 21**
1. hospitalisation OR hospitalised patient
2. Daily life activity OR survival OR treatment outcome OR ability level OR nursing home
3. Social support OR risk factor OR caregiver OR carer.mp (determinant or indicator).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures]
4. #1 AND #2 and #3 limit to Human, English, 1990-current and Aged 65 years +

**Literature Search Strategies for CINAHL (290)**
1. (MH inpatients) OR (MH Hospitalisation)
2. (MH "Activities of Daily Living") OR (MH "Geriatric Functional Assessment") OR (MH "Treatment Outcomes") OR (MH "Health Status") OR (MH “Nursing Home”)
3. (MH "Risk Factors") OR "indicator*" OR "determinant*" OR “carer”
4. #1 AND #2 AND #3 limit to English, human and aged 65 years +
Appendix 2: Study Evaluation Tool by Genaidy et al
Score <33 low quality, 33-35 moderate quality, >35 high quality

(scoring 0=absent 1=partial 2=present)

1. Is the hypothesis/aim/objective of study clearly defined?
2. Are all the exposure variables clearly described?
3. Are the main outcomes clearly described?
4. Is the study design clearly described?
5. Is the source of the subject population (including sampling frame) clearly described?
6. Are the eligibility criteria for subject selection clearly described?
7. Are the participation rates reported?
8. Are the characteristics of study participants described?
9. Have characteristics of subjects lost after entry or not participating from eligible population been described?
10. Are important covariates and confounders described?
11. Are statistical methods clearly described?
12. Are main findings clearly described?
13. Does the study provide estimates of random variability for outcomes or exposures?
14. Does the study provide estimates of statistical parameters?
15. Are the exposure variables reliable?
16. Are the exposure variables valid?
17. Are outcome measures reliable?
18. Are outcome measures valid?
19. Is there adequate adjustment for covariates and confounders in analysis?
20. Can study results be applied to the eligible population?