# Does size matter in aged care facilities? A descriptive literature review of the relationship between the number of facility beds and quality

# Abstract

**Background;** The evidence of the impact on the size of aged care facilities and quality is not easily accessible to guide investment decisions. **Purpose**: This study aims to review the relationships reported in the literature between the size of residential aged care facilities and quality for residents. **Methods**: A systematic review identified 42 studies that reported finding a relationship between size and quality. **Findings**: Twenty six studies reported a statistical significant relationship between size and quality with the majority finding that smaller facilities yielded the most favourable results. Studies using multiple indicators of quality produced more consistent results. **Practice implications:** The findings suggest that, when making investments, decision makers should keep in mind that smaller facilities are more likely to result in higher quality than larger facilities.

### Keywords

Aged care facilities; nursing homes; number of beds; quality; outcomes; regulatory compliance

# Introduction

Over the next decade the demand for residential aged care (nursing homes, care homes, skilled nursing facilities, assisted living facilities) will increase substantially in member countries of the Organisation for Economic Cooperation and Development ([OECD, 2011](#_ENREF_33)). For example, in Australia, to meet the predicated need for 74,000 additional beds by 2023 providers will need to introduce 140 new beds each week for the next ten years, which is twice the growth rate of the past ten years ([Aged Care Financing Authority, 2013](#_ENREF_1)). Although Australia has one of the highest predicted percentage growth in demand other OECD countries face similar challenges ([OECD, 2011](#_ENREF_33)). This demand will drive substantial investment in new aged care facilities and many decision-makers will seek to be guided by evidence as to the size of new facilities that are most likely to result in good outcomes for residents.

Decision makers who wish to be guided by the research evidence on the relationship between size and quality will discover a number of difficulties in using the available evidence. One difficulty is that no systematic review of the international literature on the impact of the size of an aged care facility (number of beds) on quality has been published since 1991 ([Davis, 1991](#_ENREF_14)). Should a decision maker seek to access the literature themselves they will find that there is considerable variation in the descriptions researchers use for size and how they define and measure quality. Finally confusion can arise when reading the literature as some papers report only negative associations and others only positive associations between facility size and results. Consequently there is a need for a review of the literature to summarise concisely the finding of recent studies and inform decision makers in an easy to read format on the relationship, if any, between the number of beds in a facility and the quality of life and care for resident in those facilities.

# Theory and conceptual framework

A robust conceptual framework linking structure, process and outcomes in health care was originally developed by Donabedian ([2005](#_ENREF_16)). This framework has been widely accepted internationally in research on quality issues in aged care ([Comondore et al., 2009](#_ENREF_13); [Charlene Harrington, 2013](#_ENREF_21); [Richardson & Bartlett, 2009](#_ENREF_38)). Donabedian’s framework, in short, is that structure impacts process, and process impacts outcomes. Based on this framework size as a structural factor should have an impact on quality. The size of a facility is important to decision makers because it may impact the financial viability of a facility. In addition, size may be harder to change, should the need arise, than other structural variables, such as staffing (skills and mix), management expertise or culture.

Building on Donabedian’s framework Harrington ([2005](#_ENREF_20)) argued that studies of quality (whether measured as resident outcomes, quality of care or regulatory compliance) in aged care facilities should take into consideration the structural features of staffing, ownership, chain affiliation, and size. There has been substantial research published on the relationship between staffing and quality ([Backhaus, Verbeek, van Rossum, Capezuti, & Hamers, 2014](#_ENREF_5); [Castle, 2012](#_ENREF_10); [Spilsbury, Hewitt, Stirk, & Bowman, 2011](#_ENREF_40)), between the type of ownership and quality ([Comondore et al., 2009](#_ENREF_13); [Ellis & Howe, 2010](#_ENREF_18); [Charlene Harrington, 2013](#_ENREF_21)) and on the impact of chain affiliation on quality (Harrington, 2011). However, the potential impact of the size of facilities (measured in the number of beds in a facility) on quality has received less attention although it often collected and analysed, as a secondary variable of interest, in studies of other structural variables.

There has also been recent interest in very small facilities, particularly for residents with dementia. This research, mainly from The Netherlands and the USA, ([de Rooij et al., 2012](#_ENREF_15); [R. A. Kane, Lum, Cutler, Degenholtz, & Yu, 2007](#_ENREF_26); [te Boekhorst, Depla, de Lange, Pot, & Eefsting, 2009](#_ENREF_41)) has focused largely on the quality of life of residents.

# Methods

**Aim**

This paper aims to systematically and descriptively review the literature on the relationship between the numbers of beds in aged care facilities and indicators of quality and report the findings in a manner that is easy to understand. The purpose is to assist decision makers to make sense of the literature on the relationship between size and quality. It contributes to the literature in three ways; by comparing research findings around similar constructs, by converting the research findings into number of beds for comparison, and presenting these data in a format that enables visual comparison of results.

**Search**

The electronic search of the literature used the following limits; articles published in English, in peer reviewed journals, prior to 2014, that reported a relationship between structural factors and one or more indicators of quality, and that had a level of evidence of 2b (retrospective cross-sectional studies, cohort studies and systematic reviews of cross-sectional studies) or higher based on the grades of evidence published by the Oxford Centre for Evidence-based Medicine Levels of Evidence ([2009](#_ENREF_34)). The definition of quality was guided by the framework outlined by Castle and Ferguson ([2010](#_ENREF_12)).

Three databases were searched; CINAL, Medline and Pubmed. Database searches used the descriptive words ‘assisted living’, ‘care homes’, ‘homes for the aged’ ‘nursing homes’, ‘residential aged care’, and ‘skilled nursing facility’. Separate searches were completed for these terms coupled with each of the key words for structural variables; ‘size’, ‘ownership’ and ‘chain’. This wider search was necessary as ‘size’ was not always included as a keyword even when results for size as an independent variable was reported in studies of other structural variables. The four tiers of the search are illustrated in Table 1.

In Table 1, tier 1 indicates the number of papers detected in the initial searches. Tier 2 removed duplicate articles. Tier 3 removed articles that did not meet the selection criteria. Tier 4 removed articles that did not report specific findings related to size and quality. Forty two articles were retained that fell naturally into three groups. Tier 4a identified twelve studies that reported a relationship between size and quality but did not include sufficient statistical or sample details to enable comparison. Tier 4b found four articles that reported no statistically significant relationship between size and quality. Finally, Tier 4c identified 26 articles with sufficient statistical analysis and details of bed numbers to enable comparison. This paper is limited to the discussion of those studies identified in these last tier 4b and 4c. A list of all articles identified in tier 4 is available on request from the principal author.

**INSERT TABLE 1 HERE**

**Analysis**

There were two main challenges in reviewing this literature. The first is the combination of the range of variables used to measure quality across the studies. This challenge was addressed by organising the findings into three groups of studies based on the indicators used within the studies reviewed; outcome indicators (such as mortality, hospital admissions, infections and quality of life), care (process) indicators (such as medication management, restraint use and medical care), composite indicators (combining outcome and process indicators) and indicators of regulatory compliance (complaints, deficiencies against standards, citations, sanctions and penalties, and some studies also collected additional care indicators). Selection of this typology was guided by Castle and Ferguson ([2010](#_ENREF_12)) and the limitations with these categories reflect the inconsistency identified by these authors in the aged care literature.

The second challenge in reviewing this literature lies with the use the descriptive terms ‘small’, ‘smaller, ‘large’ and ‘larger’ used by researchers to describe their findings. The studies reported the mean number of beds within their samples but there is no consistency in the number of beds these terms defined. Due to the wide range of mean facility size across the studies reviewed, a facility that is ‘larger’ in one study would fall into the ‘smaller’ group in another study. Generally, researchers do not compare their findings in relation to size to other studies or compare their sample to whole populations of facilities making generalisation of findings in relation to size difficult. Some papers report only negative associations and others only positive associations between factors; for example, ‘larger facilities had poorer results’. To overcome these challenges the data for articles in tier 4c were converted to the number of beds that were found to be associated with the most favourable results and presented graphically in Figure 1.

# FINDINGS

The majority of studies identified in tier 4 were cross sectional analysis of secondary data, with one case control study ([Li, Birkhead, Strogatz, & Coles, 1996](#_ENREF_29)) and one retrospective cohort study ([McGregor et al., 2006](#_ENREF_31)). No randomised studies were found. The studies are summarised in Table 2 in the order they are displayed in Figure 1. A variety of statistical techniques ranging from simple t tests to complex regression analysis was used across the studies. Table 2 indicates which studies used statistical controls for potentially compounding variables.

**INSERT TABLE 2 HERE**

**Studies finding a relationship between size and outcomes**

Nine studies reported a statistical result, with six reporting a relationship between size and outcome indicators. In a robust study of all Medicare residents discharged to 13,619 nursing homes in the United States Studies over a twelve month period Unroe and colleagues ([2012](#_ENREF_42)), after controlling for other facility characteristics, found that residents in larger facilities (>133 beds) had a 7% higher risk of hospital readmission for heart failure and a 7% higher risk for mortality. Similarly, Li and colleagues (1996), using logic regression analysis in a study of infection rates, found that larger facilities (>149 beds) (were significantly associated with more infections, whereas other structural factors had weaker associations. McGregor and colleagues (2006) reported a statistically significant association between larger facilities (> 60 beds), higher rates of hospitalisations and mortality in a Canadian study.

Weaker studies had similar results. Rantz and colleagues (2004, p. 24), using simple statistical analysis and a composite of outcome indicators reported that size was the only statistically significant variable between a range of demographic and structural variables. They commented that smaller size (<67 beds) may enable more consistent staff assignment, team work and team processes. An Australian study (Pearson et al., 1992), (employing regression analysis but with few details on the statistical controls used) also using a variety of resident outcome measures including privacy and dignity, freedom of choice and independence and reported more favourable results in facilities with between 40 and 60 beds. The only article examining outcomes that found in favour of large facilities was a cross sectional study of 65 large nursing homes in the Netherlands. After allowing for the effects of resident characteristics and governance practices the researchers found a small statistically significant association between facilities with more than 193 beds and fewer bed ulcers ([Wagner et al., 2006](#_ENREF_44)), although the associations with other outcome indicators (incontinence, restraint and behaviour) were not significant.

**Studies finding a relationship between size and the quality of care**

Eight studies were identified that examined quality of care indicators, or composite indicators that combined both outcome and care indicators. Of these four found more favourable results in relation to smaller facilities, three in larger facilities and one found no association.

A robust study across six states in the USA involving 1,071 facilities ([Castle & Engberg, 2007](#_ENREF_11)) found that larger facilities (>131 beds) was associated with lower quality measures using a composite score of 14 quality measures. In Canada, after controlling for other variables, Bravo and colleagues ([1999](#_ENREF_7)) found lower quality of care in facilities with more than 60 beds using a composite score for both outcomes and the process of care. The researchers speculated that in larger facilities staff may miss individual residents’ needs. Phillips et al ([2005](#_ENREF_35)), using regression analysis, reported that Medicare expenditure, as a proxy indicator of medical care needs was higher for residents of larger facilities (> 73 beds), compared with smaller facilities. They speculated that smaller facilities are better at detecting health deterioration and instituting early intervention than larger facilities. Kane and colleagues ([2007](#_ENREF_26)) reported a significant difference between very small group homes (10 beds) and traditionally sized facilities using both quality of life and care indicators, however, the very small sample size limits generalisation.

In contrast to his later study cited above Castle’s ([2000](#_ENREF_8)) study of 15,455 facilities used multinomial logistic regression analysis and found that facilities with more than 100 beds are more likely to decrease their restraint use. Similarly, a study of 164 Texan residential aged care facilities ([Anderson, Issel, & McDaniel Jr, 2003](#_ENREF_4)) reported a relationship between a size greater than 113 beds with less frequent use of physical restraint and lower prevalence of aggressive behaviour in residents. In addition, a study of 1,174 facilities, using multivariate analysis to estimate odds ratios, reported the number of residents who were simultaneously administering more than nine drugs was statistically greater in small facilities ([Dwyer, Han, Woodwell, & Rechtsteiner, 2010](#_ENREF_17)).

**Studies finding a relationship between size and regulatory compliance for quality, and complaints**

Thirteen studies examined regulatory compliance against quality standards, and complaints, as key variables, and some also included additional quality of care variables. All reported a statistical relationship between size and quality. Ten found a more favourable results in smaller facilities. The dependent variables used were ‘deficiencies against standards’ (n=6), ‘complaints’ and ‘reports’ of abuse (n=2), ‘citations for abuse’ (n=2), and ‘citations for deficiencies’, ‘penalties’ and ‘sanctions’ (n=3).

In a major study of over 80,000 inspection reports and using multiple regression analysis Harrington and colleagues ([2000](#_ENREF_23)) found that facilities with fewer than 119 beds were less likely than larger facilities to have deficiencies against standards. A similar result was reported in a later study of large service providers by the same principal author ([Charlene Harrington, Olney, Carrillo, & Kang, 2011](#_ENREF_22)). In this study, of 1,977 facilities operated by large provider chains, the researchers found that facilities with more than 120 beds had more deficiencies and the deficiencies were more serious than smaller services. A study of 19,000 facilities ([Banaszak-Holl, Berta, Bowman, Baum, & Mitchell, 2002](#_ENREF_6)), using data ranging over six years and after controlling for other facility characteristics speciality services and staffing, found that larger facilities (>106 beds) had greater increases in deficiency citations and ulcer rates than smaller facilities. Amirkhanyan Kim and Lambright ([2008](#_ENREF_3)) also controlled for other structural variables and found larger facilities (>90 beds) experienced more quality deficiencies than smaller facilities across a sample of 14,000 facilities. Jogerst and colleagues ([2006](#_ENREF_24)), in a study of more than 14,000 facilities found that larger nursing homes had higher rates of incidents and reports of abuse and validated abuse.

Studies with smaller sample sizes and also with statistical controls for other variables also found more favourable results with the smaller facilities in their samples. O’Neill and colleagues ([2003](#_ENREF_32)), after controlling for resident and facility characteristics and financial variables found that nursing homes in California (n=1098) with more than 100 beds had significantly more deficiencies against regulatory compliance than smaller facilities. Similar to the larger study by Jogerst and colleagues ([2006](#_ENREF_24)) reviewed above, Allen, Kellett and Gruman ([2004](#_ENREF_2)) reported that larger nursing homes (>120 beds) among a sample of 261 facilities are associated with higher rates of complaints related to abuse. Kamimura and colleagues ([2007](#_ENREF_25)), in a study of 203 facilities, reported that total regulatory deficiencies and pressure ulcer prevalence were higher in facilities of more than 100 beds. Flynn and colleagues ([2010, p. 2404](#_ENREF_19)), in a study of 63 facilities, reported that larger *‘facility* size [> 150 beds] *was the only facility characteristic associated with higher deficiency citations’*. Phillips and Goa ([2011](#_ENREF_36)), in a study of 454 assisted living facilities, found more complaints in facilities of more than 55 beds compared with those with fewer beds.

Conversely, larger facilities (> 110 beds) were found to be associated with a lower chance of having a citation for abuse of residents ([Castle, 2011](#_ENREF_9)) in a study of over 17,000 facilities. Similarly, Zinn and colleagues (2009) found that nursing homes with more than 100 beds were less likely to fail assessment of minimum standards than smaller facilities. An Australia-wide study ([Ellis & Howe, 2010](#_ENREF_18)) found that facilities with fewer than 60 beds had a statistically significant higher chance of being sanctioned for failure to meet minimum standards, than facilities in size range of 60 to 100 beds.

**Studies finding no relationship between size and quality indicators**

Three of the four studies that reported no relationship between size and outcomes ([R. L. Kane et al., 2004](#_ENREF_27); [Samus et al., 2005](#_ENREF_39); [Verbeek et al., 2010](#_ENREF_43)) investigated quality of life indicators and had relatively small sample sizes (fewer than 49 facilities) suggesting generalisation from these studies may be unreliable. In addition, Kane and colleagues ([2004](#_ENREF_27)) used a non-representative sample of 40 facilities and reported no association between quality of life indicators and size. However, this finding is inconsistent with a later and smaller study by the same principal author. Verbeek and colleagues ([2010](#_ENREF_43)) in The Netherlands, found no difference related to size utilising a composite score for quality of life but used only a simple t test. The fourth study, McGregor and colleagues ([2005](#_ENREF_30)), used only univariate regression analysis, examined 167 facilities in Canada and found no association between facility size and hours of care.

**COMPARISON OF FINDINGS**

To aide in the understanding of these findings Figure 1 provides a visual comparison of the range of facilities sizes that is associated with more favourable results within the overall sample size for each study identified in Tier 4c. For each study the range of facility sizes (number of beds) in the sample is illustrated between the ‘whiskers’ at both ends of the line for each study and the range of facility sizes associated with the most favourable result is indicated in by the ‘box’. Where studies did not specifically repot the range of beds associated with the most favourable findings but reported only an association with ‘larger’ and ‘smaller’ facilities the range of bed sizes for the boxes in Figure 1 were estimated by interpreting these findings as ‘larger than the mean’ or ‘smaller than the mean’. Where the range of bed sizes in the sample is not specifically reported the range shown is between the mean and standard deviation.

**INSERT FIGURE 1 HERE**

## Practice Implications

Figure 1 illustrates that 19 of the 26 studies, which reported a significant relationship between size and one or more quality variables, found the most favourable result were in the smaller half of the facilities in the sample. In those studies that reported on the relationship between size and outcome indicators five of the six reported finding that the larger facilities had the least favourable results. The study with the contrary finding, Wagner and colleagues ([2006](#_ENREF_44)) had a much larger average size than all the other studies reviewed (193 beds), reflecting the larger average size of facilities in The Netherlands compared with other countries ([OECD, 2011](#_ENREF_33)). This much larger average facility size limits the generality of this findings.

The group of studies that included both individual quality of care indicators and composite indicators have conflicting findings in relation to size. The four studies in this group ([Bravo et al., 1999](#_ENREF_7); [Castle & Engberg, 2007](#_ENREF_11); [R. A. Kane et al., 2007](#_ENREF_26); [C. D. Phillips et al., 2005](#_ENREF_35)) that found in favour of smaller facilities used composite scores for quality of care. Conversely, the three studies ([Anderson et al., 2003](#_ENREF_4); [Castle, 2000](#_ENREF_8); [Dwyer et al., 2010](#_ENREF_17)) that reported more favourable results in larger facilities used individual indicators of quality. Castle ([2000](#_ENREF_8)) reported use of lower constraint use and Anderson ([2003](#_ENREF_4)) report of less aggression in larger facilities both differ from the finding of Wagner and colleagues ([2006](#_ENREF_44)) (discussed above) who found no difference in either restraint use and resident behaviour related to facility size. These inconsistent findings may suggest that larger facilities perform better in some individual indicators of care, however, when multiple indicators of quality of care are used smaller facilities were found to have more favourable results.

All of the studies that used ‘deficiencies against standards’ found in favour of ‘smaller’ facilities with fewer than 120 beds. The two studies ([Allen et al., 2004](#_ENREF_2); [L. R. Phillips & Guo, 2011](#_ENREF_36)) that examined complaints against abuse found fewer complains in smaller facilities. However, the findings on citations and sanctions are mixed. Castle and colleague’s ([2011](#_ENREF_9)) finding that citations for abuse were more prevalent in smaller facilities did not support the finding by Jogerst et al ([2006](#_ENREF_24)) in an earlier and smaller study that found smaller facilities had lower rates of citations for abuse. Similarly the finding of Banaszak-Holl et al ([2002](#_ENREF_6)) of lower rates of citations for deficiencies in smaller facilities is not consistent with Zinn et al ([Zinn, Mor, Feng, & Intrator, 2009](#_ENREF_45)) finding of higher rates of penalties in smaller facilities. Ellis and Howe ([2010](#_ENREF_18)) found in favour of larger facilities, however the sample had a comparatively low average size of facilities and ‘larger’ facilities in this study would be classified as ‘smaller’ in others.

These findings suggest that smaller facilities are more likely to meet standards and less likely to receive complaints than larger facilities. However, the evidence is less clear when the level of deficiency warrants the imposition of citations, sanctions or penalties. It may be that larger facilities, because they are larger and more complex, are more likely to be found on inspection to fail on some indicators of compliance than smaller facilities. That is, smaller facilities have a more achievable task of meeting all compliance standards. On the other hand, when deficiencies are detected, it may be that larger facilities have more resources to put in place to remedy deficiencies and avoid penalties.

Recent research interest in the outcomes generated by the introduction of very small aged care facilities appears to be inconclusive. Five of these studies included in this review, Kane et al ([2004](#_ENREF_27)), Kane et al ([2007](#_ENREF_26)), Leroi et al ([2007](#_ENREF_28)), Samus et al ([2005](#_ENREF_39)) and Verbeek et al ([2010](#_ENREF_43)) either found no difference in outcomes between very small facilities compared with traditionally sized facilities, or the findings were weak due to small sample sizes. Another study ([te Boekhorst et al., 2009](#_ENREF_41)) reported small homes had some greater impact on outcomes but does not report actual facility size thus limiting comparison with other studies.

This review has found, on balance, a lack of support for larger facilities (say, over 120 beds) in relation to the production of better quality, particularly where quality is measured using multiple indicators, such as with composite scores and accreditation assessments. Perhaps because of the complex nature of aged care, studies that use single or simple indicators of quality are more likely to produce inconclusive findings in relation to the relationship between size and quality. The findings serve as an indication to decision makers to take size into consideration and to policy makers of the danger of leaving decisions on the size of facilities solely to providers and investors.

**Assumptions and limitations of this study and the studies reviewed**

As this review includes studies from Australia, Canada, The United Kingdom, the Netherlands and the USA the degree of applicability of findings from one jurisdiction to another need to be kept in mind. Also, the majority of the studies are from the USA, which reflects the data collection systems in that country, and may limit application to other countries. On the other hand the majority of the studies included in this review used statistical controls to reduce the impact of confounding variables on the results and this practice may strengthen the cross jurisdictional applicability of the results in these studies.

It has been assumed the data on bed numbers refer to the whole facility and measure permanent beds that are occupied, or available to be occupied. In practice, some large facilities may be operated as a number of smaller units across one campus and quality may differ between these units as suggested by some researchers ([eg., Rantz et al., 2004](#_ENREF_37)).

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# Conclusions

This review identifies that a majority of the studies reviewed found a relationships between aged care facility size and indicators of quality. Of these studies the majority found more favourable results in the smaller facilities within their sample. Studies that used multiple or composite indicators of quality have a more consistent finding than those studies which used single indicators of quality. Although size is only one variable, and the strength of association between quality and other independent variables may be stronger, size may be more difficult to change than other factors and for this reason should be taken into consideration when investment decisions are made. Further research would be enhanced by the adoption of standard definitions of size categories for residential aged care facilities to aid in comparison of findings. The challenge for aged care facility owners, developers and policy makers is to take into consideration the relationship between size and quality when making investment decisions concerning new residential aged care facilities.

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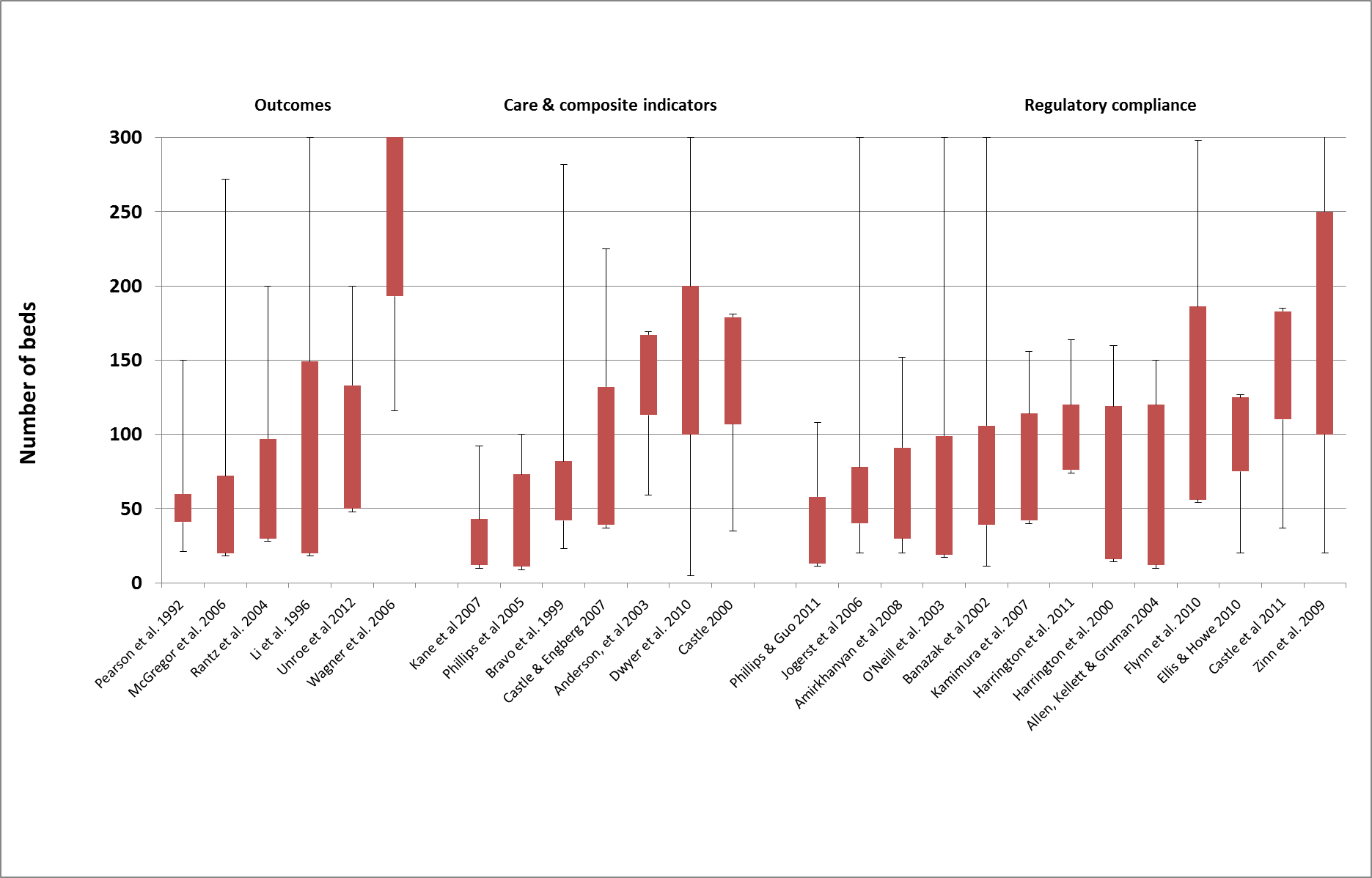
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**Figure 1 Box plot of the range of beds found in each study to have the most favourable results for either quality (n=2)**



**Table 1 Search and review strategy**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Searches and review** | | **Final number of studies identified** | | |
| Tier 1 | **Databases and structural terms used in searches** | | | |
|  |  | **Size** | **Ownership** | **Chain** |
|  | CINAHL | 444 | 170 | 153 |
| Medline | 579 | 218 | 228 |
| Pubmed | 766 | 630 | 252 |
| Tier 2 | Search results after removal of duplicates across searches | 438 | | |
| Tier 3 | After removal of articles which did not meet selection criteria | 263 | | |
| Tier 4 | Articles that reported significant findings between size and quality | 42 | | |
| Tier 4a | Articles that reported a relationship but insufficient details for comparison | 12 | | |
| Tier 4b | Articles that reported no relationship between size and quality | 4 | | |
| Tier 4c | Articles that reported a relationship and sufficient details to enable comparison | 26 | | |

**Table 2 Summary of the studies that reported a relationship between the size of facilities and quality**

| **Study** | | **Sample** | | | **Analysis for confounding variables: Significance** | **Summary of Findings** |
| --- | --- | --- | --- | --- | --- | --- |
| **Author** | **Dependant Variables** | **Size** (No. facilities) | **Range** (No. of beds) | **Mean & SD** (No. beds) |  |
| **Studies which reported outcome indicators as the key quality variable** | | | | | | |
| Pearson, Hocking, Mott, & Riggs, 1992 Australia | Health status and other QoL indicators | 200 | 20-150 | n/a n/a | n/a: P=.01 | Medium sized homes 41-60 beds have better resident outcomes |
| McGregor et al., 2006 Canada | Pneumonia, ulcers and deaths | 301 | 20-300[[1]](#endnote-1) | 72[[2]](#endnote-2) n/a | No: P=.01 | Larger size >71 beds have higher crude rates for pneumonia, ulcers and death in residents |
| Rantz et al., 2004 USA | Multiple outcome indicators | 92 | 30-200 | 97[[3]](#endnote-3) n/a | No: P=.006 | Smaller facilities 30-60 beds have better resident outcomes |
| Li et al., 1996 [[4]](#endnote-4) USA | Infections rates | 171 | 20-889 | 149[[5]](#endnote-5) n/a | Yes: P=.05 | Larger size is significantly associated with resident respiratory or gastrointestinal disease outbreaks |
| Unroe et al., 2012 USA | Readmission and mortality rates | 13,619 | 51->200 | 104 n/a | Yes: P=.001 | Larger facilities have higher readmission and mortality rates |
| Wagner et al., 2006 Netherlands | Multiple outcome indicators | 65 | n/a | 193 77 | Yes: P=.05 | Larger nursing homes have small decrease in ulcers but no difference in incontinence, behaviour or restraint use |
| R. L. Kane et al., 2004 | Composite QoL score | 40 | 49-287 | 128 n/a | No: n/a | No significant relationship between size and QoL score |
| Samus et al., 2005 USA | QoL indicators and homelike quality of facility | 22 | n/a | 12 | Yes: n/a | No significant relationship between size and QoL score |
| Verbeek et al., 2010 The Netherlands | QoL composite score QUALIDEM , plus others | 49 | <8->20 | n/a | Yes: n/a | No significant relationship between size and QoL scores |
| **Studies which reported care and composite (care and outcome) indicators** | | | | | | |
| R. A. Kane et al., 2007 USA | Scales for 11 domains of resident QoL and QoC | 6 | 10-80 | n/a | Yes; P=.001 | Smaller facilities have more favourable outcomes than traditionally sized facilities but same quality of care |
| C. D. Phillips et al., 2005 USA | Medicare expenditure | 293 | 11-100 | 73 n/a | Yes: P=.01 | Larger facilities had higher Medicare expenditure indicating poorer health management |
| Bravo et al., 1999 Canada | QUALCARE scale composite | 88 | <10-241 | 29 42 | Yes: P=.001 | Larger facilities have more difficulty in caring for residents with cognitive deficits |
| Castle & Engberg, 2007 USA | Composite quality indicators | 1,071 | n/a | 131 93 | Yes: P=.01 | Larger facilities are associated with lower quality |
| Anderson et al., 2003 USA | Behaviour, restraint, complications of immobility and fractures | 164 | n/a | 113 54 | Yes: P=.001 | Larger facility size predicts lower prevalence  of aggressive behaviour and restraint use |
| Dwyer et al., 2010 USA | Poly-pharmacy | 1,174 | 3->200 | > 100 est. n/a | Yes: P=.01 | Poly-pharmacy use decreases with increasing bed size |
| Castle, 2000 USA | Physical restraint | 15,455 | n/a | 107 72 | Yes: P=.001 | Larger facilities are more likely to decrease their restraint use |
| McGregor et al., 2005 Canada | Hours of care per resident | 167 | n/a | 87 53 | Yes: P=.43 | No association between number of beds and hours of care |
| **Studies that reported regulatory compliance and complaints as the key quality variable** | | | | | | |
| L. R. Phillips & Guo, 2011 USA | Abuse complaints and substantiated allegations | 454 | <11->100 | 45.4-75 n/a | No: P=.001 | Smaller facilities had significantly fewer complaints than smaller facilities |
| Ellis & Howe, 2010 Australia | Government sanctions imposed | 138 | <20->100 | 75 n/a | No: P=.007 | Larger homes < 60 beds are less likely to have sanctions |
| Jogerst et al., 2006 USA | Citations for abuse | 409 | 16-544 | 79 40 | Yes: P=<.05 | Smaller facilities had lower rates of incidents, reports and validations of abuse |
| Amirkhanyan et al., 2008 USA | Deficiencies against standards | 14,423 | n/a | 90.88 60.6 | Yes: P=.001 | Smaller facilities have fewer deficiencies against standards |
| O'Neill et al., 2003 USA | Deficiencies against standards | 1098 | 19–391 | 99[[6]](#endnote-6) 49 | Yes: P=.05 | Smaller facilities have fewer quality deficiencies |
| Banaszak-Holl et al., 2002 USA | Citations for deficiencies and prevalence of pressure ulcers | 19,559 | 10-500 | 106 67 | Yes: P=.05 | Smaller facilities had lower increases in ulcer rates and deficiency citations |
| Kamimura et al., 2007 USA | Deficiencies against standards, ulcers | 203 | n/a | 114 42 | Yes: P=.001 | Smaller facilities have fewer deficiencies against quality standards and fewer resident pressure ulcers |
| Charlene Harrington, Olney, et al., 2011 USA | Deficiencies against standards | 1,977 | n/a | 120 44 | Yes: P=.001 | Smaller facilities have fewer quality deficiencies and serious deficiencies |
| C. Harrington et al., 2000 USA | Deficiencies against standards | 13,770 | 16->160 | n/a n/a | Yes: P=.01 | Smaller facilities are less likely to have quality of care/life deficiencies |
| Allen et al., 2004 USA | Complaints of abuse | 261 | <10->150 | 120 n/a | Yes: P=<.001 | Smaller facilities had lower rates of complaints for abuse |
| Castle, 2011 USA | Citations for abuse | 17,000 approx. | n/a | 110 n/a | Yes: P=.001 | Larger facilities had a lower chance of having a citation for abuse |
| Flynn et al., 2010 USA | Deficiencies against standards | 63 | 54-552 | 186 107 | Yes: P=.02 | Smaller facility size are negatively associated with quality deficiencies |
| Zinn, Mor, Feng, & Intrator, 2009 USA | Government penalties imposed | 10,901 | <100->200 | 100 n/a | Yes: P=.001 | Larger facilities are least likely to have sanctions imposed |

1. Estimated from the range of sizes in the sample of facilities in British Columbia homes cited in (McGregor et al., 2005) [↑](#endnote-ref-1)
2. The authors defined ‘large facilities as having more than 72 beds. [↑](#endnote-ref-2)
3. Median, as means were not reported. [↑](#endnote-ref-3)
4. Li reported results significant increase in risk for each 100 beds; hence less than 100 beds is favourable. [↑](#endnote-ref-4)
5. Mean for cohort facilities. [↑](#endnote-ref-5)
6. Weighted average across both FP and NFP facilities [↑](#endnote-ref-6)