Long-term institutional residents: does the environment affect outcomes?

ABSTRACT—Quality in institutional care is frequently questioned, yet there has been little research on the effects of different environments on important outcomes such as disability and quality of life. These outcomes are difficult to measure, and randomised trials difficult to perform. An alternative to formal trials is to assess the effects of ‘natural experiments’ arising from service reforms. We have studied the relocation of 95 residents from the continuing-care wards of a hospital which closed to two different ward environments: one new and purpose built, the other refurbished maternity wards. Deaths and changes in disability over 12 months from pre-relocation measurements were recorded, using the Barthel Index and Clifton Assessment Procedure for the Elderly (CAPE) Behavioural Rating and Cognitive Assessment Scales. No advantage could be shown for the new wards in terms of changes in disability; in fact, Barthel scores improved more on the refurbished wards (the difference being 2.5 points at 4 months, \( p < 0.0005 \)). Changes in CAPE scores did not differ between the wards. Mortality at 1 year was 44%, with no significant difference between the ward types. Logistic regression analysis and multivariate analysis of variance showed this effect to be independent of initial differences between the groups. Efforts to improve quality in long-term care for the elderly are not wholly dependent on the provision of expensive new facilities.

Some 500,000 elderly people live in institutional care in the UK, comprising 6.3% of the population over 65 years of age [1,2]. Of these, 179,000 are in skilled-nursing facilities (hospitals and nursing homes) and 318,000 in residential homes.

The objectives of such care include maximising and maintaining physical functioning, promoting emotional and social well-being, respect for autonomy, freedom and choice, and avoiding institutionalisation (‘normalisation’) [3]. Attempts to measure the achievements of these objectives are few, and there are major problems in choosing appropriate indicators [4]. However, brief, validated scales covering several dimensions of disability (self-care, continence, mobility, behaviour, communication, cognition) are available and have been used in longitudinal studies of elderly people in institutional care [5,6], and may give an indication of success or failure in continuing care.

Many of the buildings used to accommodate continuing-care wards are old and were originally designed for other purposes. Few facilities are able to offer the option of a single room for privacy and personal space [7,8], but whether this is important for good quality continuing care is unknown. There is conflicting evidence on what elderly residents actually prefer [9,10].

This study aimed to use the opportunity given by the opening of a purpose-built continuing-care unit to assess the effects on severely disabled long-stay residents of two contrasting environments: one modern and ‘state of the art’, the other being two redecorated maternity wards. It was intended that residents on these latter wards would eventually transfer to a purpose-built housing association sponsored nursing home. Consequently, allocation to the environments was not random, but attempts were made to select less disabled residents for the older, redecorated wards.

Our hypothesis was that residents allocated to modern wards would maintain (or improve) their levels of ability better than those allocated to the older wards.

Methods

When Bethnal Green Hospital closed in June 1990, 101 continuing-care residents were transferred from nine Nightingale style wards to accommodation at the Royal London Hospital (Mile End). Prior to transfer all residents were assessed by a multidisciplinary panel [11]. Their suitability for continuing hospital care was confirmed and they were allocated, on the basis of overall functional ability, to one of two different ward types.

Forty-eight residents were transferred to type A wards. These were refurbished former maternity wards. They had four-bedded bays and a separate day area. They accommodated residents expected to transfer eventually to a new nursing home. Forty-seven residents were relocated to type B wards. These were purpose-built, on the ground floor, with single and twin bedrooms, and separate day and dining areas. They accommodated the remaining, higher dependency residents. Staff for both ward types were recruited from the old hospital.

All residents were assessed 1 month prior to relocation and 1, 4, 6 and 12 months after relocation. The Barthel activities of daily living index [12,13] and

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CAPE Behavioural Rating Scale (BRS) [14] were completed by interviewing nursing staff. CAPE Cognitive Assessment Scale (CAS) scores were obtained by interviewing residents. The Barthel index was scored according to Wade’s modification [13] giving scores out of 20 (20 representing maximum ability). CAPE BRS scores are out of 36, higher scores representing greater disability. CAS scores are out of 35, higher scores representing better cognitive function. From these indices ‘dependency grades’ were assigned [14].

Data were entered into a computer for statistical analysis, which was done using SPSS/PC+ [15]. Since the groups were not matched for initial disability scores, comparisons between the two ward types were made by considering changes in scores at each measurement point from those before relocation. Differences between ward types were tested for significance using a non-parametric test, the Mann-Whitney U test. Logistic regression analysis was also used to test whether ward type was an independent predictor of change in disability score apart from the effects of initial Barthel score, CAPE BRS, CAPE CAS, age and sex. Patients were classified as either ‘dead or deteriorated by two or more points’ or ‘unchanged or improved’, this forming the dependent variable in the logistic regression. Finally, a multivariate analysis of variance (MANOVA) was also performed, with changes in Barthel, BRS and CAS as dependent variables, and initial disability scores and age introduced as covariates to adjust for initial differences between the groups.

The study was sufficiently large to detect a difference of 2 points on the Barthel index, and 3 points on the BRS and CAS, at 4 and 6 months with a power of 90% (alpha = 5%).

Results

Initial characteristics

Table 1 shows initial characteristics for residents on the two ward types. Significant differences between median Barthel and CAPE scores for the different ward types were found, although all the Barthel and CAS (cognitive) scores were very low, and there was considerable overlap. The majority of patients (92%) were classified as CAPE dependency grades D and E, characteristic for those requiring skilled nursing care.

The prevalences of dementia and dysphasia were high. On type A wards, 13% were dysphasic; of the rest, 71% scored less than 8 (out of 12) on the CAPE information-orientation scale, indicating significant cognitive impairment [16]. On type B wards, 33% were dysphasic, and 89% of the rest were cognitively impaired.

Deaths

Figure 1 shows survival curves for residents relocated to each ward type. By 12 months, 44% had died, with

| Table 1. Initial characteristics of relocated population. |
|---------------------------------------------------------|
| Ward type A     | Ward type B     | Significance of difference |
|-----------------|-----------------|---------------------------|
| Number          | 48              | 47                        |                           |
| % female        | 81              | 64                        |                           |
| Mean age (years)| 85.5            | 82.9                      | NS                        |
| Mean residence in continuing care (Median)             | (619 days)      | (641 days)                |                           |
| Dependency grades B, C                                 | 8               | 0                         | p < 0.001                 |
| Dependency grade D                                    | 22              | 11                        | p < 0.001                 |
| Dependency grade E                                   | 18              | 36                        |                           |

Mann-Whitney U test or Chi-square as appropriate. NS, not statistically significant.

40% dead on type A wards and 49% on type B wards (log rank test chi-squared = 1.89, 1 df, not significant).

Disability

Table 2 indicates the changes from baseline scores seen in the Barthel and CAPE over the 12 months of follow-up. There are significant differences between the changes seen on the two ward types. Changes in scores were normally distributed; however, since the scales used measure at the ordinal level, non-parametric statistical tests were used, with the exception of MANOVA where the assumptions of normality of distributions were acceptable (tested with Box’s M statis-

![Fig. 1. Survival curves for the two different ward types, A and B.](image)
Table 2. Median changes in disability scores with time after relocation, according to ward types A and B.

|          | Barthel |          |           |          |           | CAS        |
|----------|---------|----------|-----------|----------|-----------|------------|
|          | A       | B        | A         | B        | A         | B         |
| 1 month  | 0       | 0 NS     | +1        | +1 NS    | 0         | 0 NS      |
| (Range)  | (-6, +8)| (-4, +4) | (-16, +9) | (-8, +8) | (-24, +11)| (-11, +5) |
| 4 months | +2.5    | 0        | 0 NS      | 0        | 0         | 0 NS      |
| (Range)  | (-6, +6)| (-5, +2) | (-11, +8) | (-9, +9) | (-21, +8) | (-12, +14)|
| 6 months | +1.5    | 0        | 0 NS      | 0        | 0 NS      | 0 NS      |
| (Range)  | (-3, +6)| (-4, +4) | (-11, +6) | (-11, +8)| (-25, +9) | (-14, +7) |
| 12 months| +1      | 0 NS     | -2        | 0        | -1        | 0 c       |
| (Range)  | (-7, +5)| (-5, +4) | (-16, +3) | (-12, +7)| (-26, +8) | (-12, +3) |

Mann-Whitney U test.
NS, not statistically significant
\(^2 p < 0.0005\), \(^3 p < 0.01\), \(^* p < 0.05\).
Signs adjusted so that positive scores indicate improvements on all scales.

Other assumptions underlying the use of multivariate models were also shown to be satisfactorily fulfilled. Type A ward residents showed a median improvement of 2.5 Barthel points at 4 months, 1.5 points at 6 months, and 1 point at 12 months. On the type B wards the median change was zero at all measurement points. The difference between ward types was statistically significant at 4 and 6 months.

Differences between changes in CAPE cognitive assessment scores on the different ward types were small but reached statistical significance at 12 months. CAPE behavioural rating scores showed significant differences between the ward types at 6 months only. The median change on type B wards was zero, while on type A wards there was a deterioration of 2 points. Analysis of changes in BRS subscales demonstrated a significant deterioration in the social disturbance scores on type A wards at 6 and 12 months (median difference of 1 point out of 10, \( p < 0.001\), Mann-Whitney U test), but no significant change in physical disability, apathy or communication subscales.

The results of the logistic regression analysis are shown in Table 3. Independent predictors of change in Barthel and CAPE scores were taken to be variables whose regression coefficients were significantly different from zero, using the Wald statistic, at the \( p < 0.05\) level. Models with forced entry of variables, forward stepwise selection and backward stepwise elimination of variables were tested, and all gave similar results. Only a single independent predictor emerged for each dependent variable, and this was the same at 6 and 12 months. The column marked Exp(B) gives the factor by which the odds ratio for a favourable outcome (stability or improvement) changes with unit change in the predictor variable.

Ward type is an independent predictor of change in Barthel score. Type B wards were associated with an odds ratio for a favourable outcome one-quarter that for type A wards. Ward was not an independent predictor of changes in CAS (patients with higher initial CAS did worse, possibly a 'floor effect') or BRS (women did worse). In this population, changes in Barthel index and BRS were not independently predicted by initial scores.

The MANOVA confirmed the differences between ward types at 4, 6 and 12 months, after adjusting for covariates (\( p < 0.005\) using Hotelling’s \( T^2\) statistic, at

Table 3. Independent predictors of change in disability score at 6 and 12 months from logistic regression analysis.

| Dependent variable | Independent variable | B     | Wald (df) | Significance | Exp (B) |
|--------------------|----------------------|-------|-----------|--------------|---------|
| Change in Barthel  | New ward type         | -1.54 | 7.13 (1)  | 0.0076       | 0.21    |
| (6 months)         | New ward type         | -1.28 | 5.17 (1)  | 0.023        | 0.28    |
| Change in BRS      | Female sex            | -1.25 | 4.44 (1)  | 0.035        | 0.29    |
| (6 months)         | Female sex            | -1.20 | 4.40 (1)  | 0.036        | 0.30    |
| Change in CAS      | Initial CAS           | -0.10 | 7.14 (1)  | 0.004        | 0.91    |
| (6 months)         | Initial CAS           | -0.11 | 7.05 (1)  | 0.008        | 0.90    |
| Change in CAS      | Initial CAS           | -0.11 | 7.05 (1)  | 0.008        | 0.90    |
| (12 months)        | Initial CAS           | -0.11 | 7.05 (1)  | 0.008        | 0.90    |
each measurement point). Univariate analysis of variance suggested that the change in Barthel score was the only significant contributor to this; changes in BRS and CAS were not significant. The canonical correlation coefficient for the ward effect was 0.51. Hence the ward effect accounted for 26% (0.51 squared) of the variability overall.

Discussion

This study was not a randomised controlled trial. Residents were allocated to groups on clinical grounds, independently of the study, giving rise to a ‘natural experiment’. Comparisons between groups not initially matched for relevant variables are difficult to interpret, but this is an area where randomised trials are difficult to do, and useful information can be gained by evaluating service ‘reforms’ [17]. The two previous randomised trials in this field failed to recruit their intended numbers of subjects, and took from 3 to 5 years to complete [18,19].

The population studied here was typical of that in skilled-nursing facilities in this country. The majority were classified by the CAPE behavioural rating scale as being in the highest two dependency grades. The CAPE is a good predictor of care requirements, and people in these grades often need skilled-nursing institutional care [14,20,21]. The mortality (44% at 12 months) was similar to that reported elsewhere for hospital long-stay care [4,22–24].

Much of the evidence that the institutional environment can contribute to enhanced resident well-being comes from anecdotal reports from pioneering and innovative units [25]. However, studies have shown the main determinants of functional ability and mortality to be initial disability rather than the type of institution [4,6]. Disability is positively correlated with risk of death [24,26,27]. Thus, it is likely that the small, and statistically insignificant, survival advantage on type A wards was simply a reflection of the somewhat better physical and mental abilities of the residents.

In this study, activities of daily living (ADL) scores improved, possibly at the cost of behavioural deterioration, when less dependent residents were transferred to old, redecorated (type A) wards. In comparison, higher dependency residents transferred to new, ‘state of the art’ (type B) wards showed little change. The null hypothesis, that there was no difference between the ward types, can be rejected on the basis of the MANOVA. The logistic regression analysis demonstrates that only for the changes in Barthel score was ward type an independent predictor of change, and in this case more favourable outcomes were seen on type A wards. With relatively small numbers of subjects, however, a type II error is possible.

It is possible that a more aggressively ‘rehabilitative’ approach and more activities were provided on type A wards, leading to improvements in ADL scores. However, none of the wards had regular access to rehabilitation and occupational therapy staff, and all activities were determined by nursing staff. Moreover, nursing staff on both ward types offered the opinion that they were not satisfied with the level of activities which they could provide.

The problem of possible distortion in mean disability scores introduced by different death rates between the two groups was also considered [28]. When comparing two groups with different death rates, survivors of the group with the higher death rate will appear to have improved disability scores with respect to the group with the lower death rate (because the most disabled were at highest risk of dying). This effect would tend to show a relative disadvantage for the type A wards. However, no differences were seen when patients who survived the whole 12 months follow-up period were analysed separately. Categorising patients as having adverse (dead or deteriorated) or favourable (stable or improved) outcomes for the logistic regression analysis also avoids this problem.

Only two studies have examined the effects of different institutional environments on residents matched for initial disability; they compared NHS nursing homes with long-stay hospital wards [18,19]. One of these trials [19] suffered from only randomising relatively ‘able’ residents, and thus its findings may not be generalisable. Neither trial was able to show that the better environments in more modern facilities led to measurable differences in survival, and physical or mental ability.

There is evidence that ward type and regimen are important in other ways. The use of non-participant observers to assess engagement and quality of life showed that the provision of group recreational activities is beneficial [29] and that (new) NHS nursing homes were associated with a better quality of life than (old) long-stay hospital wards [19,30]. Interviews with mentally competent residents have demonstrated a more positive overall attitude towards institutional care in nursing home residents, although no differences were found in personal well-being using the Neugarten Life Satisfaction Index [30]. One earlier study showed striking differences in CAPE scores after the introduction of an individualised nursing care model [31].

This study provides evidence that different ward environments may influence their residents’ abilities and behaviour. There was no clear evidence that well designed, new wards offered residents any particular benefit. The findings of this and other studies suggest that the process of care on the wards is at least as important as their design. The costs of new buildings are often prohibitive, but efforts to improve the quality of long-term care do not solely depend on this.

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