Assessing quality of life in the elderly: a comparison of two utility instruments.

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Abstract:

As more research is undertaken on the elderly, accurately assessing changes in their quality of life becomes increasingly important. Generic instruments are the most popular method by which to assess quality of life, and the most well used in recent years is the EQ-5D. However, there have been mixed results in using the EQ-5D to assess quality of life in the elderly, with the sufficiency of dimensions, sensitivity of scales and completion rates being of most concern.

In considering instruments to assess changes in health status in a population aged over 80 years, as part of a trial investigating the cost-effectiveness of home-based medication review, alternatives to the EQ-5D were considered. Of these, the most promising alternative appeared to be the new Assessment of Quality of Life (AQoL) instrument developed in Australia. This was purported to offer greater richness in dimensions, and sensitivity to small changes in quality of life. This paper therefore presents the results of a "head-to-head" comparison of the EQ-5D and AQoL in terms of practicality, construct validity, agreement (of absolute scores and their change over time) and sensitivity.

Results showed poor agreement between both the absolute scores from each instrument and their change in scores over time. Although the AQoL appeared to have more favourable construct validity, the EQ-5D was easier to administer and had a higher completion rate. EQ-5D also proved more sensitive than the AQoL. The results of the analysis presented in this paper suggest that the EQ-5D is a more practical, valid and sensitive tool with which to assess quality of life within the elderly than the AQoL.

Introduction

The growth of the elderly population and the medicalisation of old age[1] has far-reaching implications for health service delivery[2] and expenditure. As more research is undertaken on the elderly, accurately assessing changes in their quality of life becomes increasingly important.

However, it is unclear which of the available generic quality of life instruments is the most appropriate to assess changes in quality of life in the elderly. This became clear to the authors when designing a large randomised-controlled trial to investigate the cost-effectiveness of

home-based medication review by pharmacists in patients over 80 years old who had just been discharged from hospital on multiple medications.

In recent years, the most well used generic quality of life instrument for obtaining utility weights has been the EQ-5D, which has good evidence of validity and is simple to administer. However, we feared that it may ignore elements of quality of life of specific relevance to the elderly, and may, additionally, be insufficiently sensitive to small changes in health status. For these reasons we considered the use of a new instrument, the Assessment of Quality of Life (AQoL) instrument, as it appeared likely to be more sensitive to changes in dimensions of quality of life of importance within elderly patients not picked up by EQ-5D's narrower perspective. The AQoL was therefore used in conjunction with the EQ-5D: it was not considered to have sufficient evidence (as described below) to justify replacing the EQ-5D. This paper therefore presents a "head-to-head" comparison of these two instruments, investigating:

A. *practicality* of using both the EQ-5D and AQoL instruments in the elderly (aged over 80 years) population;
B. *test performance* as assessed by *construct validity* and *internal consistency* of each instrument;
C. *agreement* between the two instruments (i.e. investigating if absolute scores are equal between the two instruments and their changes over follow-up); and the
D. *sensitivity* of both the EQ-5D and AQoL instruments to changes in health status over time.

A review of the EQ-5D and AQoL instruments and their use in assessing quality of life in the elderly

Whilst there are a very large number of health related quality of life instruments, only six multi-attribute utility scales exist. These include: the QWB (Quality of Well-being scale)[3 4], the Rosser classification[5 6], the HUI (health utility instrument - of which there are three versions; I, II and III)[7-9], the EQ-5D (Euroqol instrument)[10], the 15D[11 12] and, most recently, the AQoL[13 14]. All these instruments measure health status by a self-completed or interviewer administered questionnaire.

Scores from each instrument are converted to a health utility score on a scale where 0 represents a health state equivalent to death and 1 represents 'perfect' health. Certain scales (EQ-5D, HUI, AqoL) include negative scores (i.e. health states worse than death). The technique of valuing each health state varies between scales: visual analogue scales, standard gamble, time trade-off and magnitude estimation have all been used. A recent review recommended that economic

evaluations should use either the EQ-5D or HUI scales, but commented that the AQoL (which was not released at the time of the review) was a *potentially* important instrument warranting further evaluation[15]. Most recently, a team in Sheffield has developed a method for deriving a single index utility value from the SF-36, the SF-6D[16].

The EQ-5D (EUROQOL) questionnaire

This is a generic measure of health status for use in the evaluation of health and healthcare[17]. It was specifically developed to measure a generic cardinal index of health. Its development resulted from a cross-European partnership. It defines health in terms of the following five domains: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has three levels: no problem, a moderate problem or an extreme problem. This yields 243 potential combinations of health states across the five dimensions. Results from this questionnaire are converted to utility values by an additive function. Final utility scores can vary between -0.59 (worst imaginable health state) and 1 (perfect health). Finally, subjects rate their overall health on a visual analogue scale from 0 (worst imaginable health state) to 100 (best state).

Valuations of scores from this instrument were elicited by time-trade-off techniques. The EQ-5D authors undertook a very large "Measurement and Valuation of Health" survey to elicit these values[18]. This achieved a reasonable response rate (64%) and is considered to provide high quality valuations from a reasonably representative population sample[15]. The authors of the EQ-5D claim that it is a reliable[19] and practical[20] way of measuring health status and has the capacity to measure change in status.

A Medline, EMBase and CINAHL search from 1989 (when EQ-5D was first created) to 2002, captured 325 citations using the textwords EQ-5D or EUROQOL, after repeat citations were removed. Of these, 44 described its use within a predominantly or exclusively elderly population (e.g. investigating stroke or Parkinson's disease). Review of abstracts from these citations suggests the EQ-5D performs with varied success among the elderly (table 1). Whilst some authors found the EQ-5D to be valid and responsive[21-24] others found it to be of less use[25-27]. Those authors comparing it with other questionnaires (e.g. SF-36 and disease specific questionnaires) were often particularly critical of the results it yielded[27].

Criticisms applying to its use include:

- **Insufficient dimensions**

  The EQ-5D is criticised for lacking questions relating to important aspects of health in the elderly, such as the senses (measured in the AQoL) or cognition (measured in the HUI3).

Certain authors fear that this results in scores that may not accurately reflect the true health state of individuals with chronic diseases[28 29].

- **Insensitive scales**

  The EQ-5D is criticised for only giving three responses within each dimension, and thus is potentially unable to measure small health status changes[30 31]. This is considered to be particularly true for those with less severe morbidity[32-35]. This may also mean that the EQ-5D is insensitive to changes in health over short periods of follow-up, one author recommending that it should only be used for a minimum follow-up period of 12-months[36].

- **Low value health states**

  EQ-5D has been criticised for assigning excessively low utility values to certain health states[25 26 37]. To some extent this may reflect the disparities between individuals valuing their own health state and third parties valuing hypothetical health states.

- **Physical limitations related to the questionnaire.**

  Certain authors have criticised this questionnaire as difficult to complete. However, the typeface is larger than comparable generic measures (e.g. SF-36 or AQoL) and questions are simpler. Nonetheless, one author suggests that 73% of those over 85 would need this questionnaire administered by an interviewer[38]. Much of this confusion may relate to the health 'thermometer', the EQ-5D version of a visual analogue scale. However, this scale does not contribute to the utility score.

The Assessment of Quality of Life instrument (AQoL)

The Australian team who created this instrument aimed to construct and validate an instrument which would be psychometrically appropriate for the evaluation of a range of health interventions, from the medical and pharmacological treatment of acute illness through to health promotion activities[13]. They designed this scale to enable the economic evaluation of programmes through the computation of utilities before and after health-related interventions. Utility weights were generated using the time-trade-off technique. In total, 350 individuals were interviewed to provide these valuations.

The final instrument consists of five dimensions, each with three items. The five dimensions are as follows: illness, independent living, physical senses, psychological wellbeing, and social relationships (see Appendix).

Each item allows subjects to choose one of four responses (compared to three with EQ-5D). Unlike the EQ-5D where subjects are asked to rate their health that day, the AQoL asks subjects to rate their health over the previous week. In total the AQoL measures approximately 479 million health states, in contrast to the 243 states measured by the EQ-5D. Whilst the EQ-5D adopts an additive model for calculating total utility, the AQoL adopts a multiplicative model with scaling. The authors of the AQoL argue that this is a more flexible technique for modelling utility. AQoL scores can vary from -0.04 (a state worse than death) to +1 (perfect health) (c.f. EQ-5D scores from –0.59 to +1).

Of particular note is the AQoL's illness dimension. This is assessed in terms of health service consumption assuming that this would reflect the level of underlying morbidity. Subsequent validation analyses revealed a logical problem – those using highly effective services may have reduced illness and improved quality of life compared to certain others. Thus, this dimension is omitted from the final utility computation.

The AQoL instrument is cited only twice in Medline, EMBase and CINAHL up to 2002[13 14]. The AQoL's authors wrote both papers. The first describes its construction and design, whilst the second paper compares the AQoL with four other utility measures in a cross-sectional study. This found that the AQoL predicted utilities similar to those from the HUI3 and EQ-5D. By contrast the 15D and SF6D predict systematically higher utilities, and the differences between individuals are significantly smaller. The authors suggested that there was some evidence that the AQoL had greater sensitivity to health states than the other instruments. No other researchers have published its use and in particular its performance within the elderly has also to be reported. This paper is therefore the first study to report on its use solely within the elderly, and is also written by authors external to the team who developed the AQoL.

Methods

Patients were recruited to the trial shortly before discharge from hospital if they were aged over 80 years, taking two or more medications each day, admitted as an emergency and were being discharged to their own home or warden controlled accommodation. Recruitment occurred within three acute hospitals in Norfolk and Suffolk. Researchers administered the EQ-5D and AQoL to all participants in both intervention and control groups at recruitment. All trial participants were then followed up with self-complete questionnaires by post at three and six months post-recruitment. Non-responders received two further mailings.

To investigate the objectives (A-D) described in the introduction, the following analyses were performed:

1. Questionnaire practicality (Objective A)

(a) Questionnaire completion

An important criterion of a good quality of life questionnaire within the elderly is ease of completion. A measure of this is the proportion of participants managing to satisfactorily complete the questionnaires. Thus, the first assessment was to test the hypothesis that the EQ-5D would achieve a higher response rate than the AQoL.

(b) Individual item response

Responses to the questionnaires were further analysed by investigating participants' responses to items within the questionnaires. Given the age of respondents (over 80 years), items that yielded no response from any respondent would appear likely to be redundant.

2. Test performance (Objective B)

This was investigated in terms of internal consistency and construct validity.

(a) Internal consistency

This was assessed using Cronbach's alpha for the instruments as whole and, in the case of the AQoL, for items within each scale. Well-designed questionnaires should show high values as measured by Cronbach's alpha.

(b) Construct validity

There is no clear technique to measure the validity of an instrument in the absence of a gold standard. Other studies have demonstrated differences in quality of life scores by sex[39 40], age[20 39 41] and social class[20 35 39]. Equally, within this study it may be expected that quality of life differences may exist between those taking more medication, living alone or according to abbreviated mental test score. Therefore comparisons were made between EQ-5D and AQoL scores by sex, age (above median or below), social class (non-manual vs. manual), number of drugs on discharge (above vs. below median), living alone and abbreviated mental test scores (10 versus other scores[1]).

[1] The AMT was used to distinguish confused patients from unconfused using a cut-off of 7 or less to indicate confusion. However, few confused patients were recruited into the study, thus for this comparison those scoring a 'perfect' 10 were compared to all others.

3. Agreement between instruments (Objective C)

(a) Absolute levels of health status

In theory, the absolute value of a participant's health state should be equal *irrespective* of the instrument used to judge this, and thus any difference shown in practice will be due to the instrument's design. Thus, individual scores across the two instruments were compared graphically, by their correlation and by testing the null hypothesis that there was no difference in individual subjects' absolute scores at any given time using the Wilcoxon signed ranks test. Furthermore, the distributions of EQ-5D and AQoL scores were investigated focusing particularly on differences between the two sets of scores at each end of the utility scale (perfect health and health states worse than death).

Bland and Altman[42 43] have criticised the use of correlation when comparing two measurement instruments. They argue that correlation coefficients measure the strength of a relation between two variables, not their agreement. (By agreement they mean absolute scores that are equal). Indeed, data which seem to show poor agreement can produce quite high correlations[44]. They therefore recommend a plot of the difference between an individual's score from each instrument against the mean of the two scores (as neither method is likely to perfectly estimate a subject's true utility state). Agreement between the two methods can then be summarised by the mean difference, with confidence limits of agreement given by the mean +/- 1.96 standard deviations. Results are also presented using this technique.

(b) Changes in health status over time

In order to assess the cost-utility of an intervention the *change* in health/utility measured between two time-points is the key component. Thus, irrespective of whether *absolute* scores are equivalent across instruments, the change in scores over time should be equivalent irrespective of the instrument used to assess it. Thus, a further null hypothesis was that there would be no difference in change scores for EQ-5D and AQoL from baseline to six months. Changes scores between 0 and six months were compared using the paired t-test.

4. Sensitivity to change (Objective D)

A utility instrument should be sensitive to changes in health. The sensitivity of instruments can be summarised by calculating effect sizes, i.e. the difference between mean scores at baseline and follow-up divided by the standard deviation of baseline responses. Cohen identified that an effect size of approximately 0.20 was small, 0.50 moderate and 0.80 or greater as large[45]. For non-normally distributed variables effect sizes can be calculated

by the ratio of the difference in median scores (from baseline to follow-up) to the semi-interquartile range at baseline. However, this can generate scores greater than 1, thus Cohen's suggested ranges are not meaningful for this measure.

Interviewers' views

Each researcher who completed both questionnaires with participants was interviewed to provide a qualitative comparison of their experience of the two instruments (objective C). In particular, researchers were asked about the practicality and length of time taken completing both instruments (objective A); whether any questions proved to be difficult to ask (to give some information on objective B); and whether either questionnaire provoked comments from participants (objective B).

Results

Sample size calculations suggested that the trial needed to recruit 850 patients. The AQoL questionnaire proved to be time-consuming and difficult to complete with elderly subjects at recruitment. As a result, it was decided at an early stage of the trial to discontinue collection of AQoL data, but to continue collecting EQ-5D data. At that stage 145 patients had been recruited to the trial. This paper reports data from all 145 patients recruited up to the point when the AQoL questionnaire was discontinued. Table 2 describes the demographic characteristics of these participants.

Each patient completed questionnaires up to three times (at baseline, 3-months and 6-months). Of the 145 patients recruited up to the discontinuation of AQoL, four were excluded from the trial after randomisation; these participants provided baseline data only. A further 17 patients withdrew from the trial at different stages of follow-up.

Table 3 describes the EQ-5D and AQoL scores yielded at baseline, 3-months and 6-months. At baseline the mean EQ-5D score was 0.61 (median = 0.69), whilst the mean AQoL score was 0.45 (median = 0.44). The two distributions of scores at baseline are shown in Figure 1. These can be seen to be markedly different. The distributions of scores at both follow-up points followed very similar patterns. The results of the analyses to test the four objectives outlined earlier are presented below.

1) Questionnaire practicality

a) Questionnaire completion

Baseline data were available for 141 subjects (97% of randomised subjects), 3-month follow-up data for 128 subjects (89% of those randomised) and 6-month follow-up data for

126 subjects (88% of those randomised). In total, 351 out of a possible 435 EQ-5D questionnaires were fully completed and returned (81%), whilst only 284 AQoL questionnaires were fully completed and returned (65%). This 15% difference in response rates was statistically significantly different ($p<0.001$, 95% C.I. 12% to 19%).

The authors' of the AQoL instrument allow scores within dimensions to be imputed if only one item is missing. The authors advise entering the mean of the individual's response to the other two items within that dimension. A further 42 AQoL questionnaires were completed sufficiently to allow imputing of scores, yielding a total of 326 (75%) responses. However, it should be noted that though the AQoL questions fall within 5 dimensions, individual questions in fact consider quite different problems (e.g. within the physical sense dimension questions concern vision, hearing and communication). Thus, imputing values in the recommended fashion may not be appropriate.

b) Item responses

Responses to individual items within each instrument were investigated. Of the five EQ-5D items less than 2% of subjects indicated a severe problem with walking and only 3% indicated severe anxiety or depression. Otherwise other possible responses were indicated by at least 5% of subjects.

For the AQoL's 15 items under 5% of subjects had no close relationships; 2% were socially isolated; 4% could only see general shapes or were blind; less than 1% heard very little; 2% suffered moderate or severe problems communicating with others; 2% felt extremely anxious or depressed and 1% suffered unbearable pain. Other responses were given by at least 5% of participants. Thus, almost half the questions incorporated into the AQoL utility score and a similar proportion of questions in the EQ-5D rarely evoke the most extreme answer even in this very elderly population. However, in both instruments there were no questions that never elicited an extreme answer.

2) Test performance

a) Internal consistency

For the AQoL questionnaire as a whole the Cronbach alpha score was 0.83, compared to a score of 0.72 for the EQ-5D. This supports the AQoL authors' contention that their questionnaire is a well-constructed instrument[13]. However, within the five sub-scales of the AQoL Cronbach alpha scores varied from 0.5 to 0.6, with the exception of items exploring independent living (Cronbach alpha = 0.85). These values suggest that caution is needed before using imputed values to improve response rates.

b) Construct validity

Table 4 compares EQ-5D and AQoL scores across the measures previously identified (using the Mann-Whitney U test). This shows that both questionnaires detected differences in reported health by sex and numbers of drugs at discharge. However, the AQoL also demonstrated a difference between those scoring the highest mental test score versus all others. AQoL scores also appeared to decrease with age, though this difference was not statistically significant.

3) Agreement between instruments

a) Absolute utility values

The difference in mean EQ-5D and AQoL scores at baseline was 0.16 units and the median difference was 0.25 units. Given the non-normal distributions, scores were compared using the Wilcoxon Signed Ranks test which demonstrated that individuals' scores were highly statistically significantly different ($p<0.001$). This remained the case at each follow-up.

Correlating EQ-5D scores with AQoL scores

Participants' scores on the two questionnaires were correlated at baseline, producing a Spearman rank correlation of 0.77 ($p<0.001$). Figure 2 presents a scattergraph showing individuals' scores on EQ-5D versus AQoL at baseline. This correlation was similar at both follow-up points (three- and six-months).

"Bland & Altman" analysis

Figure 3 presents a graph of differences between individuals EQ-5D and AQoL scores against the mean of individuals' two utility scores. This demonstrates that though figure 2 may suggest that the two utility instruments are in reasonable agreement, in reality the EQ-5D tends to score individuals on average 0.16 units higher. Furthermore the confidence limits on the likely range of difference between an individual's EQ-5D score and their AQoL score was from –0.28 units to +0.63 units (i.e. the mean difference +/- 1.96 standard deviations). This suggests considerable difference between these two utility instruments in the absolute values they measure.

Exploring perfect health and health states worse than death

In both instruments perfect health is indicated by a score of 1. In total, 31 EQ-5D questionnaires (9%) yielded a score of 1. These 31 participants' equivalent AQoL scores had a mean of 0.83, though one individual's score was as low as 0.51. In contrast to the EQ-5D, only five AQoL questionnaires (2%) yielded a score of 1. For all but one of these five participants' equivalent EQ-5D score also suggested perfect health, with the minimum EQ-5D score equal to 0.85.

Health states worse than death are suggested by scores below 0 on both instruments. Whilst the EQ-5D can yield scores as low as -0.59, the lowest AQoL score is -0.04. Thirty-four EQ-5D questionnaires (10%) scored below 0, whilst their equivalent AQoL scores varied between -0.04 and +0.32, with a mean score of 0.07. Fifteen AQoL questionnaires (5%) scored below 0, whilst their equivalent EQ-5D scores varied between -0.36 and +0.52, with a mean score of 0.04.

b) Comparison of changes in scores over the six month follow-up

Over the six months follow-up the mean change in EQ-5D scores was a decrease of 0.16 units, whilst AQoL scores decreased 0.12 units. The distribution of changes in scores on both questionnaires was approximately normally distributed. Comparing changes in participants' EQ-5D and AQoL scores using the paired t-test demonstrated no statistically significant difference ($p=0.06$, 95% C.I. -0.14 to +0.003). However, this reasonably wide confidence interval does include the possibility that the EQ-5D may change more markedly than the AQoL. Comparing changes in EQ-5D and AQoL scores from 0 to 3 months and 3 to 6 months also demonstrated no statistically significant differences in paired changes.

Figure 4 shows a scattergraph of differences between changes in individual's EQ-5D scores and AQoL scores over 6-months of follow-up. The Pearson correlation coefficient was 0.49, which is highly statistically significant ($p<0.001$). Nonetheless, the scattergraph demonstrates that many participants indicated no change in their EQ-5D scores but then indicated improved or worsened health in their AQoL score. Likewise a number of participants indicated no change in their AQoL score, but marked changes in their EQ-5D scores. Repeating the Bland and Altman analysis here again suggests there may be considerable difference between changes in EQ-5D scores and changes in AQoL scores.

4) Sensitivity to change

For EQ-5D the effect size between baseline and 6-month follow-up was 0.52 (moderate sensitivity) whilst for the AQoL the effect size was 0.34 (poor sensitivity). Calculating the non-parametric equivalent yielded a value of 1.17 for EQ-5D and 0.616 for the AQoL. Thus, the EQ-5D appeared more sensitive to change over the 6-month follow-up than the AQoL.

Researchers attitudes to completing the EQ-5D and AQoL questionnaires

Four researchers administered the questionnaires with participants. Whilst all researchers found the first four items straightforward within the EQ-5D the fifth item concerning anxiety or depression occasionally appears to cause some embarrassment. The EQ-5D health

'thermometer' caused most difficulty, although scores from this thermometer are not used in calculation of utilities. This questionnaire was administered successfully in less than five minutes with most elderly participants.

All four researchers considered the AQoL questionnaire to be considerably harder to complete. It took between 5 and 10 minutes to complete. Researchers found certain questions difficult to ask. Two pairs of questions appeared repetitive (1 & 2 and 7 & 8). Question 11 contains two choices which appear very similar, thus the response categories are not exclusive. A number of questions are long, appearing to combine two different topics within one question making them overly complex (questions 2, 6 and 9). Questions on social isolation (questions 7-9) were perceived as being particularly sensitive, with certain subjects indicating fewer problems than suggested during previous parts of the recruitment interview. As with the EQ-5D, the question concerning anxiety and depression causes embarrassment.

Discussion

The trial presented in this paper provided an opportunity to test a new utility instrument, the AQoL, within an elderly population and compare it against a well-established instrument, the EQ-5D. Unlike the two previous studies [13 14] using the AqoL, this trial provided longitudinal data, rather than simply cross-sectional data.

In terms of practicality, it was expected that the AQoL would be a more difficult instrument to administer than the EQ-5D, given that it contains over twice as many questions. This appears to be supported, with researchers finding further difficulties over-and-above its length. Certain questions appeared repetitive, confusing or culturally insensitive. These difficulties may have been partly responsible for the significantly different response rate to postal follow-up, with 15% fewer AQoL questionnaires returned which were fully completed (95% C.I. 12 to 19%).

Extreme answers to individual items were rarely found in approximately half of questions on both questionnaires. Nonetheless, all questions elicited at least one extreme answer. Thus to remove these choices would further limit the sensitivity of these instruments.

In terms of internal validity, the AQoL demonstrated good internal consistency (Cronbach alpha=0.83) and at baseline was slightly better able to distinguish groups predicted to have different levels of health than the EQ-5D. In particular, AQoL scores of those with mild to moderate levels of confusion were different to those who appeared not confused. There was no such difference detected by the EQ-5D.

In terms of agreement between the two instruments, summary scores across the across the two instruments were highly correlated (Spearman rank correlation > 0.76, $p<0.001$) at each point of follow-up. However, the AQoL produced utility values which were significantly below those of the EQ-5D at each stage of follow-up. It is likely that this simply reflects that the AQoL covers over twice as many health domains as the EQ-5D (e.g. sleep, sensory functions, communication, social role and intimacy). However, the reasonable correlation between scores in fact conceals considerable lack of agreement between an individual's EQ-5D and their AQoL scores suggested by the wide confidence limits to the differences between scores (Bland & Altman analysis[42 43]).

In practice, absolute utility values are not necessarily important in assessing the efficiency of an intervention. Instead, the critical value is measuring a *change* in utility over a follow-up period. Given the broader coverage of the AQoL it is not surprising that certain subjects indicated no change in their EQ-5D but improvement or deterioration in their AQoL score. However, intuitively it is more surprising that certain subjects indicated no change on AQoL but marked changes on their EQ-5D (figure 3). Some of this is likely to be random misclassification as subjects were unlikely to remember how they answered each questionnaire previously. However, questionnaires were developed as tools to compare groups of individuals rather than track changes in health status at the individual level. In this study the mean utility score on both instruments for trial participants fell. The difference between the mean changes was relatively small (0.04 units, 95% C.I. –0.14 to +0.003) and did not reach statistical significance. However, the confidence interval is broad and includes the possibility that the EQ-5D may change more markedly than the AQoL.

There is no gold standard instrument for measuring health status. Equally, no other instruments were incorporated in this study with which to compare the results. It is possible that changes evident in EQ-5D scores did not truly reflect a change in the health status of participants. Instead, AQoL scores at both baseline and follow-up may better reflect true health status. Given the simplicity of the EQ-5D it seems unlikely that participants gave erroneous or false answers during postal follow-up. However, certain AQoL questions were considered confusing by researchers administering this questionnaire. It is possible that postal follow-up may have introduced more errors in this instrument which potentially may have biased AQoL results.

The possibility that different utility instruments could yield different absolute utility scores is not as important in assessing the efficiency of new interventions as the possibility that different instruments may change to different extents over follow-up. If interventions are compared on the basis of cost per quality adjusted life-year it appears important that changes in health status

are valued using the same instrument. This study suggests that it can not be assumed that two utility instruments will yield similar utility changes from a given intervention.

Finally, the AQoL was chosen for this study as it appeared likely that it would be more sensitive to changes in health status than the EQ-5D, given that it includes more dimensions and each answer has four, as opposed to three, possible responses. In practice this did not prove to be the case. Participants' EQ-5D scores decreased at least as much as AQoL scores. This, combined with the smaller standard deviation of EQ-5D scores at baseline, resulted in the EQ-5D having a larger effect size (0.52 for EQ-5D versus 0.34 for the AQoL).

Overall, this study has demonstrated that the EQ-5D is a practical tool for measuring health status within an elderly population. It appears to be simple to complete with elderly subjects and yields good response rates when administered by post. Within this elderly population, recently admitted to hospital as an emergency, mean EQ-5D scores decreased by 30% (0.16 units) over a reasonably short follow-up period (6-months). It thus does appear to be a moderately sensitive instrument to health status changes.

In contrast to the EQ-5D, and contrary to our expectations, the AQoL is not only more difficult to administer, but crucially yields worse response rates to postal administration and shows no more sensitivity to changes in health status over a 6-month follow-up period. In its favour, the instrument appears to be psychometrically well constructed with good internal consistency and possibly better construct validity than the EQ-5D. However, on the basis of this study we conclude that the AQoL appears certainly no better (and probably less well) suited to measuring health status in a very elderly population than the EQ-5D.

Acknowledgements

Richard Holland is funded by the MRC as a Research Fellow in Health Services Research and Public Health. The trial described in this paper (the "HOMER trial") is funded by a grant from the Eastern Region NHS R&D, Norfolk Health Authority, and Norfolk and Suffolk Social Services.

Table 1

Use of EQ-5D in the elderly, authors' comments on its performance

	Type of paper using EQ-5D				
Authors' views	**Systematic review [refs.]**	**RCT [refs.]**	**Prospective study (non-RCT) [refs.]**	**Cross-sectional study [refs.]**	**Review [refs.]**
EQ-5D good	-	-	**2 papers** [21 22]	**2 papers** [23 24]	-
EQ-5D intermediate	**1 paper** [46]	**4 papers** [38 47-49]	**4 papers** [33 34 36 50 51]	**1 paper** [52]	-
EQ-5D poor	-	**1 paper** [27]	-	**2 papers** [25 26]	-
No clear view expressed	-	**6 papers** [53-59]	**9 papers** [30 60-66]	**8 papers** [67-75]	**4 papers** [76-79]

1. "Good" - includes statements such as *"the EQ-5D is a feasible and valid instrument…reflecting severity and complications of the disease[24]"*
2. "Intermediate" includes statements such as: *"where brevity is required and the health changes are expected to be substantial, then EQ may be sufficient.[47]"*
3. "Poor" includes statements such as: *"it is suggested that the EuroQol does not contain questions which relate to important aspects of health and well-being and may not accurately reflect the health state of individuals.[27]*"

Table 2

Demographic characteristics of participants

	Mean (median) or percentage	**Range (where appropriate)**
Age	84.8 (84)	80 - 100
Sex	57% women	
Socio-economic class	(IIIM)	I - V
Marital status	Married – 39% Widowed – 55% Single – 3% Divorced – 1%	
Living alone	51%	
Total no. drugs on discharge	6.2 (6)	2 - 15
Abbreviated mental test score **(scores range from 0 to 10)**	9.2 (10)	0 - 10
% receiving intervention	50%	

Table 3

Comparison of EQ-5D and AQoL scores

	Mean EQ-5D (median)	Mean AQoL (median)
Baseline	0.61 (0.69)	0.45 (0.44)
3-months	0.51 (0.62)	0.33 (0.26)
6-months	0.47 (0.52)	0.35 (0.31)

Table 4

Comparison of mean (median) EQ-5D and AQoL scores at baseline according to different characteristics of respondents.

		Mean EQ-5D score (median)		Mean AQoL score (median)	
Sex	Male	0.69 (0.71)	**p=0.03**	0.50 (0.47)	**p=0.05**
	Female	0.56 (0.62)		0.41 (0.38)	
Age	=< 84 years	0.61 (0.69)	p=0.66	0.49 (0.45)	p=0.10
	>84 years	0.62 (0.69)		0.40 (0.41)	
Social class	Manual	0.59 (0.69)	p=0.76	0.45 (0.44)	p=0.62
	Non-manual	0.63 (0.69)		0.43 (0.40)	
Number of drugs	=<6	0.65 (0.72)	**p=0.02**	0.50 (0.48)	**p=0.03**
	>6	0.57 (0.63)		0.38 (0.36)	
Living alone	No	0.61 (0.69)	p=0.93	0.46 (0.44)	p=0.68
	Yes	0.62 (0.69)		0.43 (0.43)	
Abbreviated mental test score	10	0.62 (0.70)	p=0.27	0.52 (0.49)	**p<0.01**
	<10	0.61 (0.69)		0.36 (0.35)	

Note: p-values refer to comparisons within each utility instrument by sex, age, social class etc. using the Mann Whitney U test.

Figure 1
Distribution of baseline EQ-5D and AQoL scores

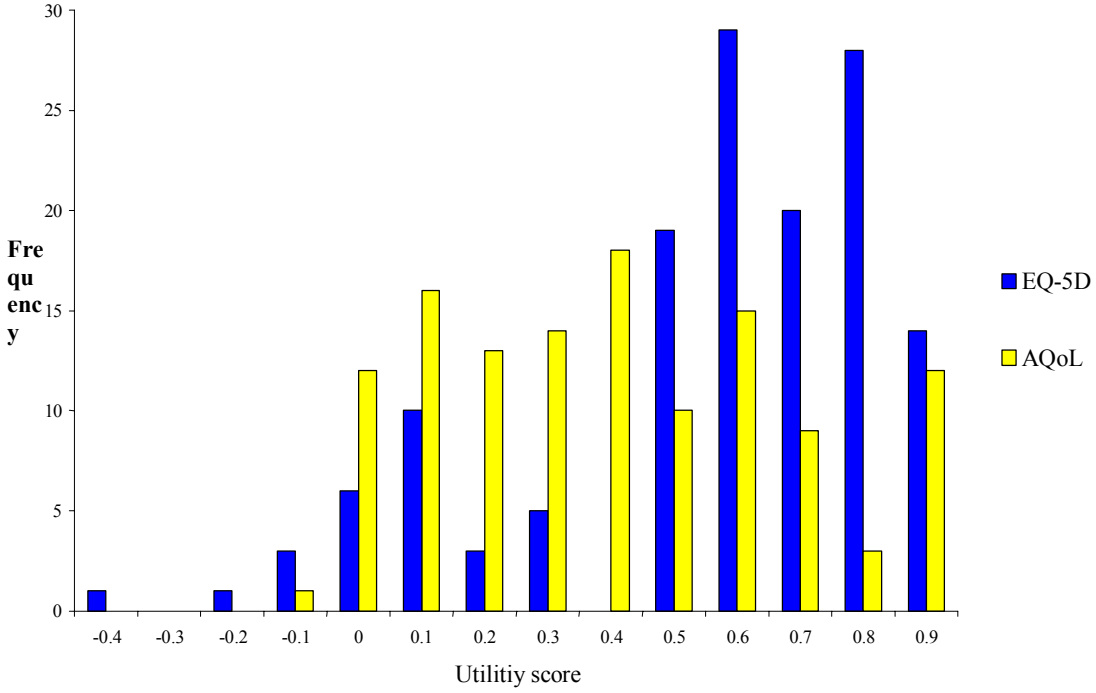


Figure 2
Scatterplot of individuals' AQoL score against their EQ-5D score at baseline

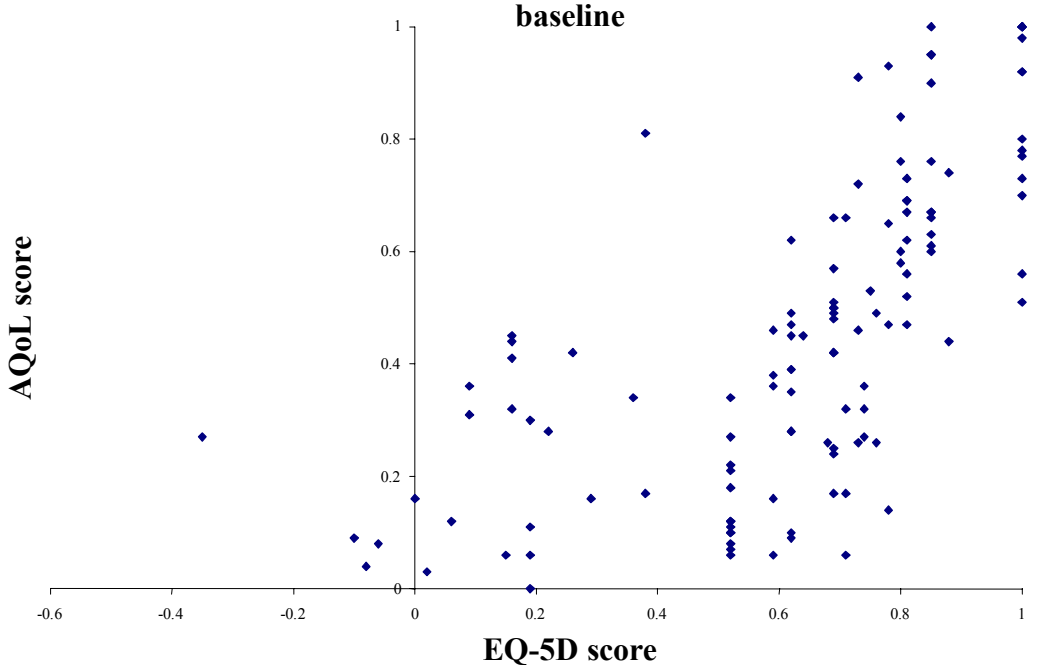


Figure 3

Bland & Altman plot of difference between EQ-5D and AQoL scores vs. mean utility scores

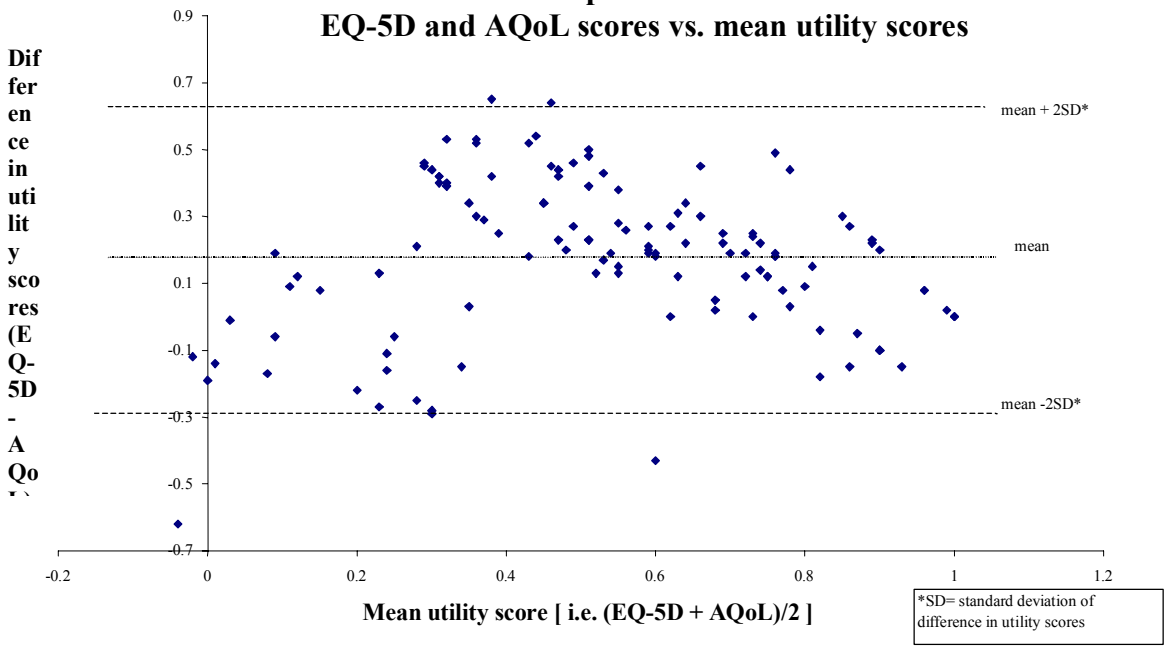
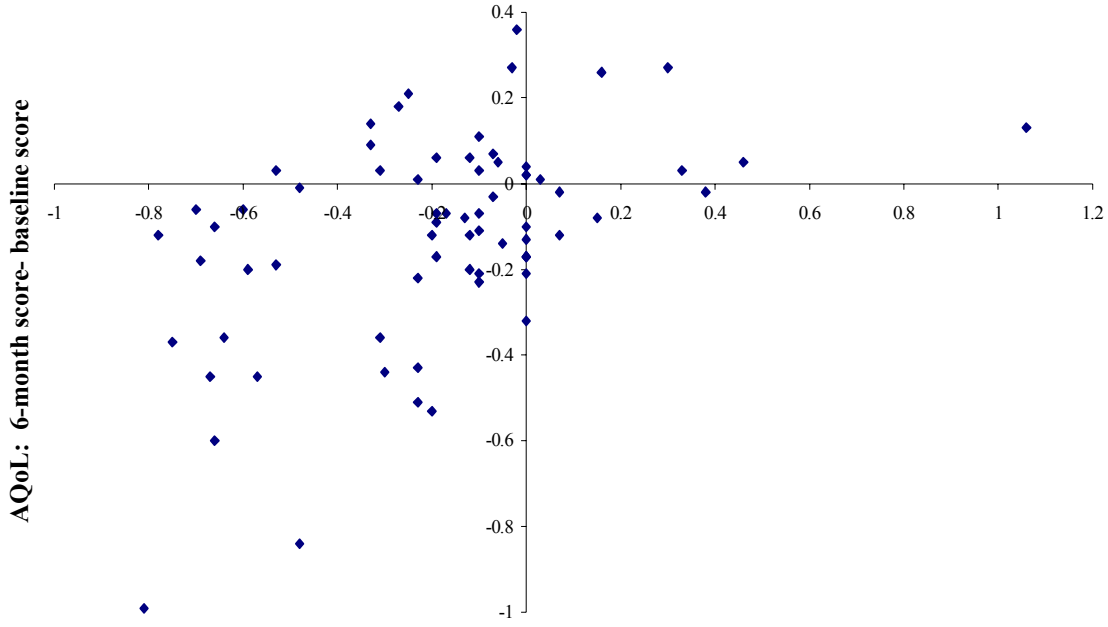


Figure 4

Scatterplot showing changes in AQoL vs changes in EQ-5D over 6-months follow-up



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Assessment of Quality of Life (AQOL)[1]

INSTRUCTIONS:

Please circle the alternative that best describes you *during the last week*.

ILLNESS

1 Concerning my use of prescribed medicines:
- A. I do not or rarely use any medicines at all.
- B. I use one or two medicinal drugs regularly.
- C. I need to use three or four medicinal drugs regularly.
- D. I use five or more medicinal drugs regularly.

2 To what extent do I rely on medicines or a medical aid? (NOT glasses or a hearing aid.) *(For example: walking frame, wheelchair, prosthesis etc.)*
- A. I do not use any medicines and/or medical aids.
- B. I occasionally use medicines and/or medical aids.
- C. I regularly use medicines and/or medical aids.
- D. I have to constantly take medicines or use a medical aid.

3 Do I need regular medical treatment from a doctor or other health professional?
- A. I do not need regular medical treatment.
- B. Although I have some regular medical treatment, I am not dependent on this.
- C. I am dependent on having regular medical treatment.
- D. My life is dependent upon regular medical treatment.

INDEPENDENT LIVING

4 Do I need any help looking after myself?
- A. I need no help at all.
- B. Occasionally I need some help with personal care tasks.
- C. I need help with the more difficult personal care tasks.
- D. I need daily help with most or all personal care tasks.

5 When doing household tasks: *(For example, preparing food, gardening, using the video recorder, radio, telephone or washing the car)*
- A. I need no help at all.
- B. Occasionally I need some help with household tasks.
- C. I need help with the more difficult household tasks.
- D. I need daily help with most or all household tasks.

6 Thinking about how easily I can get around my home and community:
- A. I get around my home and community by myself without any difficulty.
- B. I find it difficult to get around my home and community by myself.
- C. I cannot get around the community by myself, but I can get around my home with some difficulty.
- D. I cannot get around either the community or my home by myself.

SOCIAL RELATIONSHIPS

7 Because of my health, my relationships *(for example: with my friends, partner or parents)* generally:

A. Are very close and warm.
B. Are sometimes close and warm.
C. Are seldom close and warm.
D. I have no close and warm relationships.

8 Thinking about my relationship with other people:

A. I have plenty of friends, and am never lonely.
B. Although I have friends, I am occasionally lonely.
C. I have some friends, but am often lonely for company.
D. I am socially isolated and feel lonely.

9 Thinking about my health and my relationship with my family:

A. My role in the family is unaffected by my health.
B. There are some parts of my family role I cannot carry out.
C. There are many parts of my family role I cannot carry out.
D. I cannot carry out any part of my family role.

PHYSICAL SENSES

10 Thinking about my vision, including when using my glasses or contact lenses if needed:

A. I see normally.
B. I have some difficulty focusing on things, or I do not see them sharply. *For example: small print, a newspaper, or seeing objects in the distance.*
C. I have a lot of difficulty seeing things. My vision is blurred. *For* example: I can see just enough to get by with.
D. I only see general shapes, or am blind. *For example: I need a guide to move around.*

11 Thinking about my hearing, including using my hearing aid if needed:

A. I hear normally.
B. I have some difficulty hearing or I do not hear clearly. *For example: I ask people to speak up, or turn up the TV or radio volume.*
C. I have difficulty hearing things clearly. *For example: Often I do not understand what is said. I usually do not take part in conversations because I cannot hear what is said.*
D. I hear very little indeed. *For example: I cannot fully understand loud voices speaking directly to me.*

12 When I communicate with others: *(For example: by talking, listening, writing or signing)*

A. I have no trouble speaking to them or understanding what they are saying.
B. I have some difficulty being understood by people who do not know me. I have no trouble understanding what others are saying to me.
C. I am only understood by people who know me well. I have great trouble understanding what others are saying to me.
D. I cannot adequately communicate with others.

PSYCHOLOGICAL WELL-BEING

13 If I think about how I sleep:

A. I am able to sleep without difficulty most of the time.
B. My sleep is interrupted some of the time, but I am usually able to go back to sleep without difficulty.
C. My sleep is interrupted most nights, but I am usually able to go back to sleep without difficulty.
D. I sleep in short bursts only. I am awake most of the night.

14 Thinking about how I generally feel:

A. I do not feel anxious, worried or depressed.
B. I am slightly anxious, worried or depressed.
C. I feel moderately anxious, worried or depressed.
D. I am extremely anxious, worried or depressed.

15 How much pain or discomfort do I experience?

A. None at all.
B. I have moderate pain.
C. I suffer from severe pain.
D. I suffer unbearable pain.