
Received 26 September 2011; accepted in revised form 5 April 2012

Will-to-live and survival in a 10-year follow-up among older people

HELENA KARPPINEN1,2, MARJA-LIISA LAAKKONEN1,3, TIMO E. STRANDBERG4,5, REIJO S. TILVIS6, KAISU H. PITKÄLÄ1,2

1Unit of General Practice, Helsinki University Central Hospital, Helsinki, Finland
2Department of General Practice and Primary Health Care, University of Helsinki, Helsinki, Finland
3Helsinki Health Care, Laakso Hospital, Helsinki, Finland
4Department of Health Sciences/Geriatrics, University of Oulu, Oulu, Finland
5Unit of General Practice, Oulu University Hospital, Oulu, Finland
6Clinics of General Internal Medicine and Geriatrics, Helsinki University Central Hospital, Helsinki, Finland

Address correspondence to: H. Karppinen. Tel: (+358) 919127406; Fax: (+358) 919127536. Email: helena.karppinen@helsinki.fi

Abstract

Background: there is little research how older people’s will-to-live predicts their survival.
Objective: to investigate how many years home-dwelling older people wish to live and how this will-to-live predicts their survival.
Methods: as a part of the Drugs and Evidence-Based Medicine in the Elderly (DEBATE) study, 400 home-dwelling individuals aged 75–90 were recruited into a cardiovascular prevention trial in Helsinki. In 2000, a questionnaire about the wishes of their remaining life was completed by 283 participants. Participants were inquired how many years they would still wish to live, and divided into three groups according to their response: group 1: wishes to live <5 years, group 2: 5–10 years, group 3: >10 years. Mortality was confirmed from central registers during a 10-year follow-up. The adjusted Cox proportional hazard model was used to determine how will-to-live predicted survival.
Results: in group 1 wishing to live less than 5 years, the mean age and the Charlson comorbidity index were the highest, and subjective health the poorest. There were no differences between the groups in cognitive functioning or feeling

Received 26 September 2011; accepted in revised form 5 April 2012

Will-to-live and survival in a 10-year follow-up among older people

HELENA KARPPINEN1,2, MARJA-LIISA LAAKKONEN1,3, TIMO E. STRANDBERG4,5, REIJO S. TILVIS6, KAISU H. PITKÄLÄ1,2

1Unit of General Practice, Helsinki University Central Hospital, Helsinki, Finland
2Department of General Practice and Primary Health Care, University of Helsinki, Helsinki, Finland
3Helsinki Health Care, Laakso Hospital, Helsinki, Finland
4Department of Health Sciences/Geriatrics, University of Oulu, Oulu, Finland
5Unit of General Practice, Oulu University Hospital, Oulu, Finland
6Clinics of General Internal Medicine and Geriatrics, Helsinki University Central Hospital, Helsinki, Finland

Address correspondence to: H. Karppinen. Tel: (+358) 919127406; Fax: (+358) 919127536. Email: helena.karppinen@helsinki.fi

Abstract

Background: there is little research how older people’s will-to-live predicts their survival.
Objective: to investigate how many years home-dwelling older people wish to live and how this will-to-live predicts their survival.
Methods: as a part of the Drugs and Evidence-Based Medicine in the Elderly (DEBATE) study, 400 home-dwelling individuals aged 75–90 were recruited into a cardiovascular prevention trial in Helsinki. In 2000, a questionnaire about the wishes of their remaining life was completed by 283 participants. Participants were inquired how many years they would still wish to live, and divided into three groups according to their response: group 1: wishes to live <5 years, group 2: 5–10 years, group 3: >10 years. Mortality was confirmed from central registers during a 10-year follow-up. The adjusted Cox proportional hazard model was used to determine how will-to-live predicted survival.
Results: in group 1 wishing to live less than 5 years, the mean age and the Charlson comorbidity index were the highest, and subjective health the poorest. There were no differences between the groups in cognitive functioning or feeling

Received 26 September 2011; accepted in revised form 5 April 2012
depressed. Mortality was the highest (68.0%) among those wishing to live <5 years compared with those wishing to live 5–10 years (45.6%) or over 10 years (33.3%) \((P < 0.001)\). With group 1 as referent (HR: 1.0) in the Cox proportional hazard model adjusting for age, gender, Charlson comorbidity index and depressive feelings, HR for mortality was 0.66 (95% CI: 0.45–0.95) \((P = 0.027)\) and 0.47 (95% CI: 0.26–0.86) \((P = 0.011)\) in groups 2 and 3, respectively.

**Conclusion:** the will-to-live was a strong predictor for survival among older people irrespective of age, gender and comorbidities.

**Keywords:** will-to-live, survival, aged, elderly

---

### Introduction

Will-to-live (WTL) has been defined as a psychological expression of the striving for life, including both rational and instinctual underpinnings [1]. WTL is a person’s subjective perception and it can be described only by the individual experiencing it. It depends on meaningfulness and quality of life as well as motivation and other less rational instincts [2]. The loss of WTL is an entity distinct from depression, despair, grief or sadness. A person may suffer from severe depression but WTL may be strong [3].

The concept of WTL has connections with such concepts as subjective life expectancy [4] or self-rated health (SRH) [5]. However, there are also distinctions between these concepts. Subjective life expectancy has been shown to correspond well with actuarial estimates of survival [4]. However, subjective life expectancy is an estimation of the length of own life having a rational base [6], whereas WTL may include more motivational dimensions. When estimating their subjective life expectancy, many people judge their possibilities to longevity according to their parents’ length of life [6, 7]. For decades, several follow-up studies all over the world have found that SRH is a strong predictor of survival [5, 8–10]. The origins of SRH lie in an active cognitive process combining numerous aspects of clinical, physiological, functional and, to a smaller extent, psychological dimensions of health [5]. SRH reflects a person’s evaluation of his/her current state of health. Although it has been shown to predict survival, the subject does not per se evaluate life expectancy. In WTL, evaluations of one’s own health, estimation of individual life expectancy and motivation and current quality-of-life may have influence on the years a person wants to live.

WTL has been studied among cancer and HIV patients, and among patients in palliative care approaching death [11–13]. The focus of these studies has mainly been on how final stages of illness, its symptoms and psychosocial aspects have effect on WTL among dying patients [11, 12, 14, 15], or how very ill, hospitalised patients would trade off time to better quality of life [13]. However, recently WTL has also been explored at the population level among healthy older people [14, 16]. Also religious patients seem to sustain a high WTL during a terminal illness [14, 16]. However, less is known about the associates of WTL among healthy older populations. Carmel showed that strong WTL is associated with male gender, younger age, having less symptoms, living with a partner, high self-esteem and fear of death.

One study has showed that WTL predicts survival among 70+ women at a population level [2], but we are aware of no other longitudinal prospective trials concerning WTL and survival among older people. We investigated this in our cohort aged 75–90 years and living independently at the baseline.

### Methods

Using the Population Information System of Finland, a random sample of people living in Helsinki and born in 1904, 1909, 1914, 1919, 1920, 1924 or 1925 \((n = 4821)\) was retrieved in 1998–2000, and a postal questionnaire was sent to them. Of the respondents, independent home-dwelling persons aged 75–90 years and with a history of atherosclerotic disease were recruited into a cardiovascular prevention trial (Drugs and Evidence Based Medicine in the Elderly, DEBATE study) \((n = 400)\). The details and outcome of the DEBATE study have been described previously [17, 18]. The present analyses are based on a 10-year follow-up of the participants of the DEBATE study.

The research protocol of the DEBATE study was approved by the Ethics Committee of the Department of Medicine, University of Helsinki. Each participant signed an informed consent.

In 2000, the participants visited the study nurse and geriatrician for an interview and thorough clinical examinations. Diagnoses were retrieved from medical records and confirmed in the clinical examination. Comorbidity was assessed by the Charlson comorbidity index, a weighed measure taking into account the number and severity of co-morbid conditions [19]. Participants were assessed for cognition with
CERAD test battery including the Mini-mental State Examination (MMSE) [20]. Subjective health was assessed at the baseline using a four-point scale (feeling healthy, quite healthy, unhealthy and very unhealthy). The responses were categorised as ‘healthy’ (=healthy or quite healthy) and ‘unhealthy’ (=unhealthy or very unhealthy). Depressive feelings were assessed with a question: ‘Have you felt yourself depressed during the fortnight’? (no/sometimes/daily), and categorised as not depressed (‘no’ or ‘sometimes’) and depressed (‘daily’). Smoking habits were inquired by simple claim allowing to choose one alternative: smoking: (i) I currently smoke, (ii) I have stopped smoking __ years ago or (iii) I have never smoked. Participants were categorised as ‘ever smokers’ and ‘never smokers’. The presence of a living will document (yes/no) was inquired by the study nurse.

Of the 400 participants, 283 (70.8%) responded to the question ‘How many years would you still wish to live?’ The non-responders (n = 117) were older than the responders (mean age 82.5 versus 79.1 years, P < 0.001), their MMSE score was lower (25.5 versus 26.6, P < 0.001) and their Charlson comorbidity index was higher (2.7 versus 2.3, P = 0.010). There were relatively more females among non-responders than among responders (72.6 versus 62.2%, P = 0.046).

The responders were divided into three groups according to their WTL in years: group 1 wished to live less than 5 years, persons in group 2 wished to live 5–10 years and persons in group 3 wished to live more than 10 years, respectively.

Census data were retrieved from the Population Information System through January, 2010.

### Statistical methods

Three WTL groups were compared with the Chi-square test or the Fisher exact test for categorical variables and Kruskall–Wallis tests for continuous, non-normally distributed variables. Cox regression analysis was used to compare prognosis, the group with WTL less than 5 years as the reference group. Model was adjusted for age, gender, education, Charlson comorbidity index, smoking habits, subjective feelings of depression and MMSE score. We did not enter other variables into the model because many are highly dependent on each other, i.e. diagnoses versus comorbidity versus subjective health, or the presence of a living will versus WTL. The underlying proportional hazards assumption was tested by computing the Schoenfeld residuals for each of the covariates in the final model and plotting them against the length of survival. Unadjusted Kaplan–Meier curves were constructed for total mortality from the baseline to death or to the end of follow-up period in all three WTL groups.

### Results

The mean age of the study subjects was 79.1 years, and the majority were females (n = 176, 62.2%). Of the participants, 26.1% (n = 74) wished to live less than five years (mean WTL 2.3 years) (group 1), 55.8% (n = 158) wished to live 5 to 10 years (mean WTL 7.9 years) (group 2), and 18.0% (n = 51) wished to live more than 10 years (mean WTL 17.6 years) (group 3).

At the baseline the groups 1–3 differed from each other in several ways (Table 1). The mean age in group 1 was higher (81.3 years) than in groups 2 (78.5) or 3 (77.8) (P < 0.001), and their Charlson comorbidity index was higher (2.7 versus 2.3 versus 2.0, respectively) (P = 0.042). Those wishing to live longer had better subjective health: they felt more often healthy or very healthy. There was no difference in years of education, feeling depressed or in MMSE scores between the groups. Of group 1, 2 and 3, 18.9, 12.0 and 5.9% had a living will, respectively (P = 0.092).

Half of the responders were deceased in the 10-year follow-up. Mortality rates in groups 1, 2 and 3 were 68.9, 45.6 and 33.3%, respectively (P < 0.001). The survival difference seemed to appear during the first 4 years of the follow-up (Figure 1). Of those deceased, 57% (n = 80) died of cardiovascular disease, and 14% of cancer. There were no differences between the groups in causes of death (Table 2).

In the Cox regression analysis adjusted for age, gender, education, Charlson comorbidity index, smoking, MMSE score and feelings of depression, and with WTL group 1 as referent (HR 1.0), those wishing to live 5–10 years had significantly lower HR for mortality (HR: 0.67, 95% CI:

### Table 1. Baseline characteristics and mortality of participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Will-to-live</th>
<th>Will-to-live</th>
<th>Will-to-live</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;5 years</td>
<td>5–10 years</td>
<td>&gt;10 years</td>
<td></td>
</tr>
<tr>
<td>Mean age (SD)</td>
<td>81.3 (4.8)</td>
<td>78.5 (4.3)</td>
<td>77.9 (4.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Female gender (%)</td>
<td>74.3</td>
<td>60.8</td>
<td>49.0</td>
<td>0.014</td>
</tr>
<tr>
<td>Education ≤ 8 years (%)</td>
<td>58.1</td>
<td>53.8</td>
<td>58.8</td>
<td>0.74</td>
</tr>
<tr>
<td>Mean Charlson comorbidity index (SD)</td>
<td>2.7 (1.7)</td>
<td>2.3 (1.4)</td>
<td>2.0 (1.2)</td>
<td>0.042</td>
</tr>
<tr>
<td>Prior myocardial infarction (%)</td>
<td>50.0</td>
<td>35.4</td>
<td>35.2</td>
<td>0.087</td>
</tr>
<tr>
<td>Prior stroke (%)</td>
<td>33.8</td>
<td>38.0</td>
<td>33.0</td>
<td>0.75</td>
</tr>
<tr>
<td>Diabetes (%)</td>
<td>25.7</td>
<td>19.6</td>
<td>13.7</td>
<td>0.25</td>
</tr>
<tr>
<td>Mean MMSE (SD)</td>
<td>26.3 (2.4)</td>
<td>26.6 (2.4)</td>
<td>27.2 (1.9)</td>
<td>0.15</td>
</tr>
<tr>
<td>Feels depressed daily (%)</td>
<td>8.2</td>
<td>4.4</td>
<td>2.0</td>
<td>0.26</td>
</tr>
<tr>
<td>Never smoker (%)</td>
<td>63.5</td>
<td>52.5</td>
<td>52.9</td>
<td>0.27</td>
</tr>
<tr>
<td>Subjective health: feels healthy or very healthy (%)</td>
<td>57.5</td>
<td>76.3</td>
<td>86.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Living will (%)</td>
<td>18.9</td>
<td>12.0</td>
<td>5.9</td>
<td>0.092</td>
</tr>
<tr>
<td>Decreased 2010 (%)</td>
<td>68.9 (51)</td>
<td>45.6 (72)</td>
<td>33.3 (17)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*SD, standard deviation.
*

Differences between the groups were tested with the χ²-test for categorical variables and with the Kruskall–Wallis test for non-normally distributed continuous variables.
Figure 1. Kaplan–Meier survival curves in days during a 10-year follow-up in study groups 1, 2 and 3 (group 1: Will-to-live <5 years; group 2: Will-to-live 5–10 years; group 3: Will-to-live >10 years). Difference between the groups tested with the log-rank test (P < 0.001).

Table 2. Cause of death among participants who were deceased during the 10-year follow-up

<table>
<thead>
<tr>
<th></th>
<th>Will-to-live &lt;5 years (n = 51)</th>
<th>Will-to-live 5–10 years (n = 72)</th>
<th>Will-to-live &gt;10 years (n = 17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atherosclerotic disease [%]</td>
<td>33 (65)</td>
<td>35 (49)</td>
<td>12 (71)</td>
</tr>
<tr>
<td>Malignancy [%]</td>
<td>6 (12)</td>
<td>13 (18)</td>
<td>1 (6)</td>
</tr>
<tr>
<td>Other [%]</td>
<td>12 (24)</td>
<td>24 (33)</td>
<td>4 (24)</td>
</tr>
</tbody>
</table>

0.46–0.99, P = 0.047). Among those wishing to live over 10 years, HR for mortality was 0.50, respectively (95% CI: 0.27–0.91, P = 0.024). We performed an additional sensitivity analysis by excluding all those (n = 3) who were deceased during the first follow-up year. The survival among those wishing to live >10 years remained significant (HR: 0.53, 95% CI: 0.29–0.97, P = 0.038) while it was no longer significant among those wishing to live 5–10 years (HR: 0.71, 95% CI: 0.48–1.03, P = 0.087). The findings were essentially the same when entering WTL as a continuous variable into the Cox regression model and adjusting for age, gender, education, comorbidity, MMSE score and feelings of depression: each year the participants wished to live reduced their risk of mortality (HR: 0.95, 95% CI: 0.91–0.99, P = 0.0059).

Discussion

Of the home-dwelling 75+ people with a history of atherosclerotic disease, 74% wished to live at least 5 years and 18% more than 10 years. Those who wanted to live longer also survived longer. The mortality rate was half among those wishing to live more than 10 years compared with those wishing to live less than 5 years. The difference remained significant even after adjusting for several prognostic variables such as age, gender, education, comorbidities, smoking, cognition and depressive feelings. The strengths of this study were that the participants were thoroughly assessed at the baseline, and their long 10-year follow-up was complete. Because each of them had a confirmed cardiovascular disease, the participants were probably more likely to be aware of the possibility of an imminent death and may have thought about their last years of life, in contrast to older people with less severe diseases. We found it easy for these very old people to comprehend and to value the forthcoming years according to their own premises.

Despite being old, many of our responders wanted to lead a remarkably long life, although statistical life expectancy at the age of 80 years was 7.7 years in Finland in 2000 [21]. This is in line with a previous study suggesting that also octogenarians value length of life more than healthy life if they are asked to trade-off time to be healthy [22]. In comparison with the groups 2 and 3, people who wanted to live less than 5 years (group 1) were older, they had more comorbidities, and they felt unhealthy or very unhealthy more often than the others. Logically, they were also deceased sooner than the others. Similar education and sufficient MMSE scores in all groups did not cause any bias between the groups. Knowing this, after adjusting for important confounding variables, the predictive value of simple WTL in years makes a novel finding that, to our knowledge, has not been studied before.

For WTL, our study supports findings of a previous study: WTL seems to predict survival [2]. In previous study, WTL was inquired with a six-step scale (from 'very strong' to 'no will to live'), whereas we inquired about WTL in years. Our findings are also in line with a longitudinal American study among primary care patients, according to which wish-to-die predicted mortality among older people [23–25]. Wish-to-die may be associated with depression and it may be attenuated with treatment [23]. However, our WTL concept was not associated with feelings of depression, thus, implicating that these two concepts are distinct. Additionally, our study differs from the earlier studies in other aspects: all our participants were home dwelling, the mean age was very high and the follow-up was especially long.

Limitation of the study is that our responders, due to their history of clinical cardiovascular disease, do not represent all home-dwelling older people. In addition, there was a large number of non-responders (n = 117) who were not willing to elaborate their WTL in years. Therefore, the responders may have been more willing and honest than older people in general to think about end-of-life issues. Moreover, the responders of this analysis were younger, and they had less comorbidities and better cognition than non-responders, who had a higher mortality rate during the follow-up (75.2 versus 49.5%). Caution must be taken for interpreting the results for practical use: societally transmitted negative stereotypes of ageing can weaken some older
people's WTL [26]. The inquired WTL in years may also be decreased if a person is afraid of being burden to others [7].

**Conclusion**

An older person's WTL seems to be a strong predictor for survival irrespective of age, gender and comorbidities among older people. Therefore, WTL should be studied more in other populations. Meanwhile, clinicians should not underestimate the significance of talking with an old patient about the person's wishes concerning the last years of life.

**Key points**

- How many years would you still want to live? Two in three of 75-90-year-old home-dwelling people want to live remarkably long.
- WTL is not associated with education, depressive feelings or cognition.
- A person's WTL in years seems to be a strong predictor for survival irrespective of age, gender and comorbidities.

**Acknowledgements**

We thank PhD statistician Hannu Kautiainen for his expertise.

**Conflicts of interest**

None declared.

**Funding**

This work was supported by the grants to DEBATE: the Academy of Finland (grant 48613), the Lions Organization (Red Feather), the Ragnar Ekberg Foundation, the Finnish Foundation for Cardiovascular Research, and the Helsinki University Central Hospital.

**References**


Received 26 September 2011; accepted in revised form 5 April 2012