Eur J Vasc Endovasc Surg (2025) 69, 921–922

RESEARCH LETTER

Change in Quality Adjusted Life Years in 65 Year Old Men Screened for Abdominal Aortic Aneurysm: A Longitudinal Case Control Study

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For health economic studies and decision making, access to data that are a composite of health related quality of life (HRQoL) and survival is key.[1] Contemporary HRQoL data for individuals screened for abdominal aortic aneurysm (AAA) are limited, with only short follow ups available.[2,3]

EuroQol's EQ-5D is a validated instrument for quantifying HRQoL. The EQ-5D can be converted to health utilities (HUs) ranging from 0 (worst health) to 1 (best health). Health utilities are used to calculate quality adjusted life years (QALYs) reflecting both survival and HRQoL in longitudinal studies and health economic analyses. Health utilities vary between populations over time and commonly decrease with increasing age, poor lifestyle, and comorbidities, highlighting the importance of up to date population specific and disease specific HUs.[1,2]

This study aimed to (a) calculate disease specific HUs in 65 year old men with AAA detected during screening and to compare them with those in men with normal aortas (controls); (b) determine the association between HUs and individual risk factors; and (c) compare HUs in those who did and did not have AAA repair during follow up.

Between 1 January 2009 and 31 December 2015, all 65 year old men in Uppsala, Sweden, were invited for an ultrasound examination of their abdominal aorta. In addition to a standardised health questionnaire on smoking, family, and medical history, all men with an AAA (diameter $\geq$ 30 mm) and other 65 year old men from the same population with an aortic diameter $<$ 25 mm at screening, selected by convenience sampling, were asked to assess their HRQoL by completing an EQ-5D-3L questionnaire two weeks after baseline screening and after five years. Participants who re-assessed their HRQoL after five years were considered for analysis. A country specific value set was used to transform EQ-5D health states into HUs.[2] Results were presented as mean with 95% confidence intervals. Comparisons were made at baseline and after five years. Dichotomous variables were analysed using the χ^2 test and continuous variables using the Mann–Whitney *U* test. The association between EQ-5D HUs and individual risk factors was analysed. Statistically significant variables from univariable analyses were analysed in a multivariable regression model. The ethical review board in Uppsala/Örebro approved the study (Dnr. 2007/052). All participants signed informed consent.

A total of 14 586 men were invited for AAA screening, of whom 12 218 attended (uptake rate 83.8%) and 153 (1.3%) had an AAA. A total of 150 men with AAA and 150 men with a normal aorta completed the EQ-5D-3L questionnaires at baseline, of whom 110 (73.3%) and 123 (82.0%), respectively, completed the same questionnaire after five years. Among non-responders at five years in the AAA group, ten had died, 24 ended participation, and six were lost to follow up. In the control group, one had emigrated, five died, and 21 declined participation.

Health utilities at baseline and after five years as well as baseline characteristics and comparison between groups are presented in the Table 1. At baseline, HUs did not differ between individuals with AAA and controls: 0.92 *vs*. 0.94 ($p = .11$), while after five years, patients with AAA reported lower HUs than controls: 0.90 *vs*. 0.93 ($p = .049$). Smoking, coronary artery disease, cerebrovascular disease, and chronic obstructive pulmonary disease were statistically significantly more prevalent in the AAA group (Table 1). In a sensitivity analysis, no meaningful differences in baseline characteristics between responders and non-responders were observed at the five year follow up.

Multivariable regression identified smoking years ($p = .020$), rheumatological disease ($p < .001$), neurological disease ($p = .012$), and diabetes ($p < .001$) to be independently associated with lower HUs, while the presence of AAA was not ($p = .54$).

Among the 110 patients with AAA who completed the two questionnaires, 31 (28.2%) underwent AAA repair within five years; 20 of the 31 patients (65%) were treated endovascularly and 11 (36%) were treated by open surgery. No differences in HUs were seen between those who underwent AAA repair and those still under surveillance: 0.90 (0.87 – 0.93) *vs*. 0.90 (0.88 – 0.94) ($p = .76$).

This study provides important disease specific AAA HUs in a contemporary population based setting. By necessity, previous analyses of the cost effectiveness of AAA screening have had to rely on extrapolated and non-disease specific general population data to calculate HUs and the gain in QALYs for patients

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Table 1. Health utility in 65 year old men screened with abdominal aortic aneurysm (AAA ≥ 30 mm) and controls (aortic diameter < 25 mm) at the initial screening and after a five year follow up and baseline characteristics.

Factor	Controls (< 25 mm) (*n* = 123)	Abdominal aortic aneurysm (≥ 30 mm) (*n* = 110)	*p* value
Health utility			
Baseline*	0.94 (0.93–0.95)	0.92 (0.91–0.93)	.11
Five year follow up*	0.93 (0.92–0.94)	0.90 (0.88–0.92)	.049
Body mass index* – kg/m^2	26.9 (26.3–27.6)	27.6 (26.9–28.4)	.27
Body surface area* – m^2	2.08 (2.05–2.11)	2.10 (2.07–2.13)	.18
Ever smoking – %	54.9 (46.1–63.37)	85.3 (78.7–91.9)	<.001
Smoke years*	12.4 (9.72–15.2)	29.7 (26.3–33.0)	<.001
First degree relative with AAA – %	8.5 (3.5–13.5)	18.7 (11.4–26.0)	.024
Coronary disease – %	10.7 (5.2–16.2)	38.5 (29.4–47.6)	<.001
Hypertension – %	39.3 (30.6–47.9)	57.8 (48.5–67.1)	.005
Hyperlipidaemia – %	25.4 (17.7–33.1)	45.0 (35.7–54.3)	.002
Cerebrovascular disease – %	3.3 (0.2–6.5)	10.1 (4.4–15.8)	.036
Peripheral artery disease – %	1.6 (0.0–3.8)	2.8 (0.0–5.9)	.56
Chronic obstructive pulmonary disease – %	3.3 (0.2–6.5)	11.0 (5.1–16.9)	.021
Diabetes – %	7.4 (2.8–12.0)	18.3 (11.0–25.6)	.012
Renal disease – %	0	1.8 (0.0–4.3)	.13
Cancer – %	6.6 (2.2–11.0)	8.3 (3.1–13.5)	.62
Neurological disease – %	2.5 (0.0–5.3)	0	.099
Rheumatological disease – %	4.9 (1.1–8.7)	5.5 (1.2–9.8)	.84

* Categorical variables are presented as percentages and continuous variables as means, both with 95% confidence intervals in parentheses. AAA = abdominal aortic aneurysm.

with AAA.[4,5] The observed HUs of the 65 year old males who were screened were approximately 15% higher (0.94 *vs.* 0.83) than those used to determine the cost effectiveness of the Swedish AAA Screening Program 10 years ago, indicating a considerable increase in HRQoL in the target population.[4] This could presumably be explained by the experience based EQ-5D tariffs used in the present study instead of the hypothetical ones used in previous studies[1] as well as by the falling smoking rates, better management of cardiovascular disorders and malignancies, and generally improved health in the elderly population. Furthermore, there were no meaningful differences between males with AAA and controls at baseline screening. The difference in HUs between the groups after five years was explained by comorbidity, which was evident after adjusting for risk factors. Also, the difference was below the threshold that is generally considered to be a minimum clinically important difference with the EQ-5D instrument (0.04 – 0.08 HU).[6]

Interestingly, AAA repair did not result in any detectable change in HUs; however, this could only be assessed in the small subgroup that underwent repair during the five years.

The higher HUs observed in the general population and patients with AAA in particular entails a potentially generally better HU gain for all interventions, such as screening and repair. These contemporary disease specific HUs can serve as benchmarks in future health economic evaluations involving patients with AAA.

CONFLICT OF INTEREST

None.

FUNDING

Anders Wanhainen received funding from Swedish Research Council (Grant # K2013-64X-20406-07-3), the Swedish Heart-Lung Foundation (Grant 2012-0353), and Konung Gustaf V:s och Drottning Victorias Frimurarestiftelse. Knut Thorbjørnsen received funding from the Centre for Research and Development, Uppsala University, Region Gävleborg, Sweden.

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Keywords:
Abdominal aortic aneurysm, EQ-5D, Health utility, Quality adjusted life years, Screening

Available online 14 February 2025

https://doi.org/10.1016/j.ejvs.2025.02.013