

# BMJ Open Does quality of life improve in octogenarians following cardiac surgery? A systematic review

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## ABSTRACT

**Objectives:** Current outcome measures in cardiac surgery are largely described in terms of mortality. Given the changing demographic profiles and increasingly aged populations referred for cardiac surgery this may not be the most appropriate measure. Postoperative quality of life is an outcome of importance to all ages, but perhaps particularly so for those whose absolute life expectancy is limited by virtue of age. We undertook a systematic review of the literature to clarify and summarise the existing evidence regarding postoperative quality of life of older people following cardiac surgery. For the purpose of this review we defined our population as people aged 80 years of age or over.

**Methods:** A systematic review of MEDLINE, EMBASE, Cochrane Library, trial registers and conference abstracts was undertaken to identify studies addressing quality of life following cardiac surgery in patients 80 or over.

**Results:** Forty-four studies were identified that addressed this topic, of these nine were prospective therefore overall conclusions are drawn from largely retrospective observational studies. No randomised controlled data were identified.

**Conclusions:** Overall there appears to be an improvement in quality of life in the majority of elderly patients following cardiac surgery, however there was a minority in whom quality of life declined (8–19%). There is an urgent need to validate these data and if correct to develop a robust prediction tool to identify these patients before surgery. Such a tool could guide informed consent, policy development and resource allocation.

## INTRODUCTION

The two essential reasons to offer cardiac surgery are to improve quality of life (QoL) and prognosis. The latter probably becomes less important with increasing age. Useful preoperative risk calculators help surgeons estimate an individual's chance of death as a complication of planned cardiac surgery,<sup>1</sup> but there is little to guide the likelihood of

## Strengths and limitations of this study

- The studies included in our systematic review are largely retrospective in nature.
- The majority of studies were of fair or poor quality as assessed by the US Preventative Services Task Force Quality Rating Criteria.
- The studies did not provide sufficient quantitative data for meta-analysis.

an improved QoL following surgery. This suggests that heart surgeons are falling short when seeking informed consent for their planned operations; especially so in the elderly where life's quality is likely to be valued over duration. This paper reviews the current literature on QoL following cardiac surgery in older participants. It provides a synthesis of evidence to identify gaps in our knowledge for new research, which is needed to inform patients as they consider consent for surgery and perhaps for health economists in resource allocation.

## METHODS

This systematic review was designed and reported following PRISMA criteria.<sup>2</sup> Studies addressing QoL and functional status following cardiac surgery in patients aged 80 and over were identified by searching the electronic databases; MEDLINE (1950–22 February 2013, including articles in review stage), EMBASE (1980–22 February 2013) and the Cochrane Library (Issue 1 of 12 January 2013). A broad/sensitive search strategy was employed: truncated free-text searches within titles/abstracts/keywords were paired with exploded subject heading searches (MeSH and Emtree). Search strategy/search terms used (TERMS IN CAPITALS are subject heading searches, 'exp' = exploded, MeSH terms given, equivalent Emtree headings used in EMBASE): “quality of life” OR qol<sup>1</sup> in

*title/abstracts/keywords* OR exp QUALITY OF LIFE/AND '(Heart\* NEXT surg\*) OR (heart\* NEXT operat\*) OR (cardi\* NEXT surg\*) OR (cardi\* NEXT operat\*)' *in title/abstracts/keywords* OR exp CARDIAC SURGICAL PROCEDURES/OR THORACIC SURGERY/AND '8? NEXT yr? OR 8? NEXT year? OR 8?yr? OR 8?year? OR octagen\* OR eighty NEAR/2 year? OR 9? NEXT yr? OR 9? NEXT year? OR 9?yr? OR 9?year? OR nonagen\* OR ninety NEAR/2 year?' OR AGED, 80 AND OVER *in title/abstracts/keywords*. All searches were completed on 22 February 2013. An advanced Google search, search of the National Health Service (NHS) Evidence portal (<http://www.evidence.nhs.uk/>), and the reference lists of articles were reviewed to check the rigour of the database search strategy. No language, publication date or publication status restrictions were imposed; however during the article review stage, manuscripts that were not in English language were excluded. Two reviewers (UA/MD) performed eligibility assessments independently in an un-blinded standardised manner. Disagreements between reviewers were resolved by consensus. [Figure 1](#) details study selection.

### Data collection process

A data extraction sheet was pilot tested on the first 10 studies identified and refined accordingly. Information was extracted from each study on: (1) characteristics of study participants (2) type of operation and (3) QoL outcome measure employed. The quality of evidence was assessed using the US Preventative Services Task Force Quality Rating Criteria<sup>3</sup> (USPSTFQR).

### Quality of life assessment tools

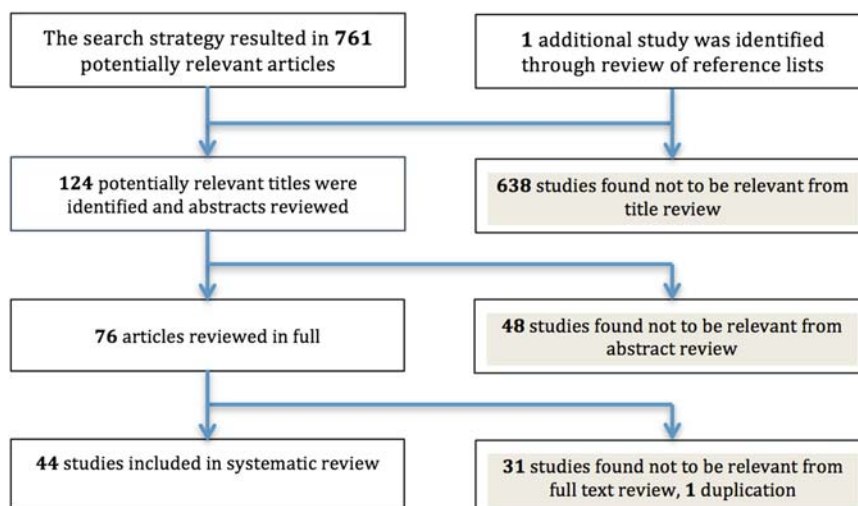
The primary outcome measure was QoL of octogenarians (>80 years) following cardiac surgery. Assessment tools in the identified studies ranged from established QoL measures to bespoke questionnaires and objective assessments of independence, including physical functioning and activities of daily living. Of the validated tools used, the Medical Outcome Study Short Form-36

questionnaire (SF-36)<sup>4</sup> and Karnofsky performance status score<sup>5</sup> were most commonly employed. The SF-36 is validated for the assessment of QoL in multiple disease states including cardiovascular disease and elderly populations.<sup>6</sup> Introduced in 1990<sup>7</sup> and upgraded to V.2 in 1996,<sup>8</sup> the questionnaire consists of 36 questions covering 8 domains (physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and mental health), scaled from 0 to 100, a higher score indicates a better QoL. The domains are summarised into physical and mental health scores. The SF-12 is a shortened version covering the same eight domains. The Karnofsky score addresses functional impairment and was originally designed to assess overall performance status in patients with cancer. It is scored in 10% increments; from normal activity (100%), through to death at 0%. Other QoL and functional measures employed throughout the literature include; the Seattle Angina Questionnaire<sup>9</sup> and Barthel Index,<sup>10</sup> Nottingham Health profile,<sup>11</sup> EQ-5D-3L,<sup>12</sup> Hospital anxiety and depression scale (HADS),<sup>13</sup> Swedish health-related quality of life survey (SWED-QUAL)<sup>14</sup> and the Minnesota Living with Heart Failure Questionnaire (MLHFQ).<sup>15</sup>

### RESULTS

Forty-four studies were identified that reported the QoL of octogenarians following cardiac surgery. Eight of the studies reported functional status as a measurement of QoL; these studies are included in our results ([table 1](#)). Twenty-three studies originated from Europe, 10 from the USA, 7 from Canada, 3 from Australia and 1 from Japan. The mean age of study participants ranged from 81 to 86.5 years and the study size from 21 to 1062 participants. Thirty-six of the 44 studies reported preoperative comorbidities but significant variation of conditions reported prevents meaningful comparison. The majority of studies were retrospective, however, nine studies

**Figure 1** PRISMA flow chart of study selection.



**Table 1** Prospective studies

Reference study type (quality of study: USPSTFOR score)	Surgery: average age	Number in study (survivors, % assessed for QoL)	QoL tool	Length of follow-up	Outcome
Olsson <i>et al</i> <sup>16</sup> Prospective (Fair quality) Stockholm, Sweden	AVR Mean 83±2	32 (25, 96%)	Self-designed questionnaire	3 and 12 months	Physical ability improved, depression decreased, improvement in self-rated health
Deutsch <i>et al</i> <sup>17</sup> Prospective (Conference abstract) Munich, Germany	All cardiac surgery Median 82.5 (80–91.8)	87 (Not specified)	SF-36	3 months	The SF-36 scores for physical functioning (41.8 vs 48.7, p=0.05), role-physical (25.8 vs 36.4, p=0.05), bodily-pain (51.9 vs 74.4, p=0.001) and vitality (41.2 vs 49.8, p=0.006) increased 3 months postoperatively. No significant differences found for general health (54.3 vs 56.6, p=0.38), mental health (67.9 vs 71.8, p=0.1) role-emotional (59.5 vs 60.5, p=0.9), social functioning (75.4 vs 73.6, p=0.63) scores
Ferrari <i>et al</i> <sup>18</sup> Group 1: Retrospective Group 2: Prospective (Conference abstract) Modena, Italy	All cardiac surgery Not documented	Group 1: 192 Group 2: 21 (Not specified)	SF-36 HADS SAQ	Group 1: 5–7 years Group 2: not specified	Group 1: satisfaction with treatment in 80%, freedom from cardiac symptoms in 62% and overall well-being in 78% of cases. Group 2: improvement of QoL (SF-36 mean total score 57.1 vs 73.5, p=0.001), clinical conditions and anxiety-depressive symptoms (p=0.001 both for HADS-anxiety and HADS-depression)
Pontoni <i>et al</i> <sup>19</sup> Group 1: Retrospective Group 2: Prospective (Conference abstract) Modena, Italy	All cardiac surgery Not documented	Group 1: 86 Group 2: 21 (Not specified)	SF-36 HADS SAQ	Group 1: Mean 5.5 years Group 2: 6 months	Group 1: Retrospective analysis: absence of physical limitation in 50% of patients, treatment satisfaction in 80%, satisfactory well-being and enjoyment of life in 78% Group 2: QoL showed significant improvement in 4 of 5 modified SAQ domains (except of treatment satisfaction), 6 of 8 SF-36 domains (except of Emotional Role Limitation and Vitality) and in depression and anxiety HADS subscales
Oldroyd <i>et al</i> <sup>20</sup> Prospective (Conference abstract) Victoria, Australia	All cardiac surgery Mean 83.2±2.5	63 (Not specified)	SF-36	3 months	51(81%) felt that cardiac surgery had been worthwhile, despite no significant change in SF-36 scores
Lam <i>et al</i> <sup>21</sup> Prospective (Poor quality) Ontario, Canada	AVR±CABG Mean 83.7±3.4 (80–96)	58 (20, 35%)	SF-36	6 months	Better scores for bodily pain, vitality, social functioning and mental health than patients <80. Better scores for bodily pain, general health, vitality, social functioning and mental health than the general population >75
Wilson <i>et al</i> <sup>22</sup> Prospective (Fair quality) New York, USA	CABG Mean 82 (80–88)	73 (71, 97%)	Karnofsky performance score	Up to 5 years	Karnofsky performance score improved from a mean 67 to 78 (p<0.05), median of 50–80. 83% independent of ADLs. 97% living at home
Khan <i>et al</i> <sup>23</sup> Prospective (Fair quality) San Francisco, USA	Valve surgery ±CABG Mean 83.5 (80–89)	61 (54, 100%)	Karnofsky performance score	1 and 3 months	Median Karnofsky score increased from 30% to 80% 1 month post-operatively, sustained at 3-month follow-up
Glower <i>et al</i> <sup>24</sup> Prospective (Fair quality) North Carolina, USA	CABG Mean 81±2 (80–93)	86 (74, 100%)	Karnofsky performance score	QoL data at discharge Mean 17±17 months	Median Karnofsky score improved from 20% to 70% (p=0.0001) Mean Karnofsky score improved from 27±15 preoperatively to 60 ±27%

ADL, activities of daily living; AVR, aortic valve replacement; CABG, coronary artery bypass graft; HADS, Hospital anxiety and depression scale; QoL, quality of life; SAQ, Seattle Angina Questionnaire; SF-36, Short Form 36.

followed patients prospectively allowing for direct comparison before and after surgery.

### Prospective studies

Nine prospective studies were identified, five studies employed the SF-36, three the Karnofsky score and one used a self-designed questionnaire (table 1). These studies included 780 patients, with an age range of 80–96. Length of follow-up varied from 3 months to 7 years. Those studies employing the SF-36 and one self-designed questionnaire<sup>16</sup> found generally an overall improvement after surgery,<sup>17–19</sup> with one study demonstrating no significant difference at 3 months.<sup>20</sup> Domains that significantly improved varied between studies. Superior SF-36 scores were also found when comparing octogenarians to a younger cohort and an age-matched general population.<sup>21</sup> The three studies using Karnofsky score<sup>22–24</sup> found significant improvement in functional status following surgery.

### Retrospective studies

Thirty-five retrospective studies were identified and five used multiple QoL tools (table 2). These studies included 8456 patients, with an age range of 80–99 and length of follow-up that varied from 6 months to 11.8 years. The tools employed in these studies included SF-36 in 10 studies, SF-12 in 3, self-designed questionnaires in 11, Karnofsky performance score in 4, SAQ in 4, Barthel index in 3, SWED-QAL 2, EQ-5D in 1, Nottingham Health Index in 1 and MLHFQ in 1. Eleven studies compared QoL following cardiac surgery to an age-matched cohort of the general population. Nine studies found comparable or superior QoL scores for the study population in most domains.<sup>25–33</sup> One study found lower scores in the physical domains of the study population.<sup>34</sup> Two studies reported poorer outcomes in women,<sup>35 36</sup> however a third paper revealed the opposite.<sup>29</sup> Three studies compared postoperative QoL in octogenarians against a younger patient cohort. While the first found superior SF-36 scores in the majority of domains<sup>37</sup> the second found inferior SF-12 summary scores in the octogenarian cohort<sup>38</sup> and the third found significantly lower physical function and the physical component summary scores in octogenarians.<sup>39</sup> Two studies asked patients for their subjective comparison of QoL following surgery with that before. Both found a general improvement in QoL after surgery,<sup>40</sup> although the second found a 33% reduction in physical fitness.<sup>41</sup> The Seattle Angina Questionnaire was used to report QoL in three studies<sup>41–43</sup> and reported that the majority of patients had a good functional status following surgery and were satisfied with their QoL. Eleven studies employed self-designed questionnaires, reporting an improvement in QoL in the majority of patients.<sup>44–54</sup> However, in a small but significant minority QoL decreased following surgery. One study reported that QoL worsened in 12%,<sup>46</sup> a second found a reduction in 15%,<sup>47</sup> a third study reported that 17.8% felt their

autonomy was worse following surgery<sup>48</sup> and a fourth reported that 13.2% felt their dependence on social support had increased. Interestingly, at 1 month following surgery 43% would not recommend surgery. This fell to 14% at 1 year.<sup>49</sup> In one study multivariate analysis revealed female gender to be the only predictor of impaired autonomy<sup>50</sup> and a second found poor left ventricular ejection fraction was an independent factor reducing QoL.<sup>44</sup> Lower QoL scores in females were also demonstrated in one study employing the Nottingham Health profile<sup>54</sup> Five studies employed the Karnofsky and/or Barthel Index to report the functional status of octogenarians following cardiac surgery and found an improvement in the majority of patients.<sup>55–59</sup>

### DISCUSSION

This systematic review was constructed according to the PRISMA guidelines. A comprehensive search strategy of the key medical electronic databases identified 44 studies. These included 9236 patients in total and all studies were retrospective but for 9. There was marked heterogeneity between studies. In general both prospective and retrospective series indicated an improvement in postoperative QoL for the majority of patients or a postoperative QoL comparable to an age-matched general population. Established tools used in measurement of QoL and functional status are validated and well designed. Self-designed questionnaires, though not validated, identified a significant minority in whom QoL fell after surgery (8–19%). Variable results may reflect different populations studied and individual centre's selection bias for surgery, as well as disparities in measurement methods. One key difference is the inclusion of a value for death, as overall results will differ if death is accounted for rather than excluded. The Karnofsky Performance Score and EQ-5D include a score for death. Only one of the seven studies employing these tools attributed a score for death.<sup>22</sup> Another key factor affecting QoL after surgery is the time at which it was measured. It is inevitable that QoL worsens immediately following surgery and hopefully improves as the patient recovers. However, while there is evidence of improvement over the first postoperative year,<sup>49</sup> a number of studies detailing QoL at multiple time points found no significant interval change.<sup>16 23</sup> In our analysis there is insufficient evidence to describe the postoperative pattern of QoL. The key finding of this review is the apparent decrease in QoL in 8–19% of octogenarians following cardiac surgery. It is essential to validate this finding and to identify these patients so that at worst, harm to their well-being can be avoided and at best, we can better understand who these individuals are. A prediction model for postoperative QoL is required to allow clinicians to select and help patients better understand the consequences of their heart surgery and hence improve the quality of patients' informed consent.

Table 2 Retrospective studies

Reference study type (quality of study: USPSTFQR score)	Surgery: average age	Number in study (survivors, % assessed for QoL)	QoL tool	Length of follow-up	Outcome
Fruitman <i>et al</i> <sup>25</sup> Retrospective (Fair quality)	All cardiac surgery Mean 83±2.5 (80–92)	127 (103, 96.1%)	SF-36 SAQ	Mean 15.7 (4.7–27.7) months	SF-36 scores were equal to or better than those for the general population 83.7% living in their own home, 74.8% rated their health, as good or excellent, 82.5% would undergo operation again SF-36 scores comparable to age-adjusted norms in mental and physical summary scores
Nova Scotia, Canada Kurlansky <i>et al</i> <sup>26</sup> Retrospective (Good quality)	CABG Mean 83.1±2.8 (80–99)	1062 (555, 98.2%)	SF-36	Mean 3.4 (0.1–12.6) years	
Florida, USA Sjogren <i>et al</i> <sup>27</sup> Retrospective (Fair quality)	All cardiac surgery Mean 81.8±2.3 (80–91)	117 (41, 95%)	SF-36	Mean 8.3 ±1.9 years	QoL comparable to age-matched population, lower physical function, but less bodily pain in study population
Lund, Sweden Vicchio <i>et al</i> <sup>28</sup> Retrospective (Fair quality)	AVR± CABG BP: Mean 82.9±2.7 MP: Mean 81.8±1.8	160 (125, 97.6%)	SF-36	Mean 3.4±2.8 years	Scores higher than age-matched and sex-matched Italian population in all domains other than vitality
Naples, Italy Collins <i>et al</i> <sup>29</sup> Retrospective (Fair quality)	All cardiac surgery Mean 81.9±1.3 (80–84)	183 (155, 94.2%)	SWED-QUAL	1–6 years	Patients had significantly better physical functioning, satisfaction with physical functioning, relief of pain and emotional well-being (p=0.01) compared to the normal population
Stockholm, Sweden Kurlansky <i>et al</i> <sup>30</sup> Retrospective (Good quality)	CABG (Arterial vs SVG) SVG: Mean 83.5 ±3.0 (80–99)	987 Arterial (247/97%) SVG (247/98.8%)	SF-36	Arterial 3.8 years (0.4–12.6) SVG 3.1 (0.2–11.2)	Patients with arterial grafts scored significantly higher than SVG patients and age-adjusted normal participants
Florida, USA Ghanta <i>et al</i> <sup>31</sup> Retrospective (Good quality)	ART+SVG: Mean 82.5±2.5 (80–92) CABG, AVR±CABG Mean 82 (80–94)	459 (158, 72%)	SF-12	Median 7.9 years	Survivors' median quality of life mental health score was higher (55.2 vs 48.9; p<0.05) and physical health score was equivalent (39.3 vs 39.8; p=0.66) to the general elderly population
Massachusetts, USA Krane <i>et al</i> <sup>32</sup> Retrospective (Fair quality)	CABG, AVR±CABG Mean 82.3 (80–94)	1003 (514, 75.1%)	SF-36	Mean 3.62 ±2.42 years	Physical functioning 49.7; role-emotional 58.5; social functioning 76.2; mental health 69.7, bodily pain 70.5, vitality 48.7, role-physical 43.6, general health 55.5. Bodily pain, general health higher than age-matched population (p<0.01). Role-physical and role-emotional lower (p<0.02) Summarised physical health score increased (p<0.05) compared with the general population, the mental health summarised scores showed no difference
Munich, Germany Sundt <i>et al</i> <sup>33</sup> Retrospective (Fair quality)	AVR±other cardiac procedure Mean 83.5±2.6 (80.1–90.6)	133 (65, 98%)	SF-36	Up to 5 years	SF-36 scores comparable to general population >75. Participants scored higher than the control population in 5 areas: bodily pain, general health, social functioning, role-emotional and mental health
St Louis, USA Schonebeck <i>et al</i> <sup>34</sup> Retrospective (Conference abstract)	All cardiac surgery Mean 82±2.5	107 (Not specified)	SF-36	Not specified	Lower scores for physical functioning (37±10.5), general health (44.1±11.0), physical role (41.0±7.8), and physical component summary (44.7±9.3) compared to the normal population (p=0.001)
Hamburg, Germany Ghosh <i>et al</i> <sup>35</sup> Retrospective (Fair quality)	All cardiac surgery Mean 82.2±1.8	212 (186, not specified)	EQ-5D	Mean 40.2 (2–144) months	Concluded excellent postoperative QoL. Mean EQ-5D score of 6.5. Score slightly poorer in women (6.7), than men (6.2)
Salzburg, Austria					Continued

Table 2 Continued

Reference study type (quality of study: USPSTFQR score)	Surgery: average age	Number in study (survivors, % assessed for QoL)	QoL tool	Length of follow-up	Outcome
Spaziano <i>et al</i> <sup>66</sup> Retrospective (Fair quality) Quebec, Canada	Valve replacement Mean 82 (80–89)	133 (118, 64.4%)	SF-12v2 MLHFQ	Mean 2.0±1.1 years	Men similar to age-matched population. Women similar in physical component scale but lower mental component. Data from MLHFQ revealed worse QoL in females than in males, both on the physical and emotional scales
Aboud <i>et al</i> <sup>67</sup> Retrospective (Fair quality) Jena, Germany	AVR Not documented	<53 (Not specified)	SF-36	Mean 21.4 months (18–24)	SF-36 scores better in bodily pain, mental health, social functioning, role emotional in patients >80
Sen <i>et al</i> <sup>68</sup> Retrospective (Good quality) Giessen, Germany	CABG Mean 82.3±2.13	240 (97.1%)	SF-12	Mean 53 months	Four years after surgery, 95.2% of the octogenarians lived alone, with a partner or with relatives, and only 4% required permanent nursing care. 83.9% of the octogenarians would recommend surgery to their friends and relatives for relief of symptoms. Mental component scores higher than physical component scores and overall summary scores lower than in a younger age group
Nydegger <i>et al</i> <sup>69</sup> Retrospective (Conference abstract) Zurich, Switzerland	All cardiac surgery Mean 82.2±2.7	53 (Not specified)	SF-36	1 year	Physical function (p=0.002) and the physical component summary (p=0.03) were lower in patients >80. The mental component summary was similar between both groups (compared with patients <80)
Levin <i>et al</i> <sup>40</sup> Retrospective (Poor quality) Lund, Sweden	AVR±CABG >85 Mean 86.5±1.5 (85–91)	21 (13, 100%)	SWED-QUAL	9–83 months	Significant improvement in physical functioning, satisfaction with physical ability, sleep, health status and perception of general health
Folkman <i>et al</i> <sup>71</sup> Retrospective (Fair quality) Vienna, Austria	AVR±CABG Mean 82.9±2.5	154 (126, 100%)	SAQ	1 year	Improvement in QoL in 96% reduction in physical fitness in 33%
Huber <i>et al</i> <sup>42</sup> Retrospective (Fair quality) Inselspital, Switzerland	CABG, AVR±CABG Mean 82.3±2.1 (80–91)	136 (120, 100%)	SAQ	Mean 890 (69–1853) days	81% had no or 'little' disability in ADL, 65% very satisfied with QoL
Graham <i>et al</i> <sup>43</sup> Retrospective (Fair quality) Calgary, Canada	CABG (compared with PCI and medical mx) Median 81.8 CABG+PCI Mean 82.1±2.1	66 at 1 year 55 at 3 years	SAQ	At 1 and 3 years	All domains (angina stability, angina frequency, QoL, treatment satisfaction) other than exertional capacity significantly better with CABG than medical management, at both 1 and 3 years
Kamiya <i>et al</i> <sup>44</sup> Retrospective (Poor quality) Tokyo, Japan	CABG+PCI Mean 82.1±2.1	28 (15, 100%)	Self-designed based on SAQ	Mean 39.9±30.1 months	80% no limitation dressing, 66.7% no or little limitation walking 300 m, 86.7% satisfied with their treatment
Nikolaïdis <i>et al</i> <sup>45</sup> Retrospective (Fair quality) Southampton, UK	AVR±CABG Mean 82.9±2.3	345 (279, 62%)	Self-designed questionnaire	Mean 39.3 ±29 months	83.7% satisfied with operation outcome, 82% independent personal care, 88.3% had positive feelings about life
Tsai <i>et al</i> <sup>66</sup> Retrospective (Fair quality) California, USA	All cardiac surgery Mean 83.1±2.7 (80–94)	528 (Not specified)	Self-designed questionnaire	6 months	70% improved QoL, 18% same, 12% worse. 38% active lives, 26% sedentary, 35% restricted
Schmidler <i>et al</i> <sup>77</sup> Retrospective (Good quality) Munich Germany	All cardiac surgery Mean 82.6±2.9 (80–93)	641 (227/90%)	Self-designed questionnaire	Mean 3.6 (0.1–11.8) years	At mid-term follow-up QoL had improved in 54%, there was no difference in 31% and was impaired in 15%. 80% of all surviving patients lived in their own home

Continued

Table 2 Continued

Reference study type (quality of study; USPSTFOR score)	Surgery: average age	Number in study (survivors, % assessed for QoL)	QoL tool	Length of follow-up	Outcome
Maillet <i>et al</i> <sup>48</sup> Retrospective (Fair quality) Saint-Denis, France	AVR±CABG Mean 83.7±3.3 (80–94)	84 (51/100%)	Self-designed questionnaire	Mean 723±404 days	91.1% living in their own homes, Self-rated health 'excellent' or 'good' in 76.8%, 66.1% reported health had improved postoperatively, 60.7% would have operation again, 26.7% required help for ADL. 17.8% felt autonomy was worse postoperatively
Goyal <i>et al</i> <sup>49</sup> Prospective (Fair quality) Victoria, Australia	All cardiac surgery Mean 82.4 (80–94)	100 (80,85%)	Self-designed questionnaire	6–60 months	86.76% were less dependent on others, 13.23% felt their dependence on social support had increased, 80.9% were feeling well and looking positively to the future, 94.2% patients would have the procedure again, in retrospect, 41.2% lived alone
Kirsch <i>et al</i> <sup>50</sup> Retrospective (Fair quality) Creteil, France	All cardiac surgery Mean 83±2.7 (80–91)	191 (129, 97%)	Self-designed questionnaire	Mean 22.24 (0–73.3) months	64% of long-term survivors fully autonomous, female sex only independent predictor of impaired autonomy, 83% satisfied with QoL
Kolh <i>et al</i> <sup>51</sup> Retrospective (Fair quality) Liege, Belgium	AVR Mean 82.8±2.4 (80–94)	220 (59%)	Self-designed questionnaire	Mean 58.2 months	91% believed that having heart surgery after age 80 years was a good choice, and similarly 88% felt as good as or better than they had preoperatively
Hewitt <i>et al</i> <sup>52</sup> Retrospective (Fair quality) Perth, Australia	All cardiac surgery Mean 8.13±1.2 (80–88)	64 (44/100%)	Modified SF-36 (16 questions)	1 month, 1 year, final+mean 2.8±0.8 years	98% thought surgery was worthwhile and would recommend to a friend and 86% were living independently
Diegeler <i>et al</i> <sup>53</sup> Retrospective (Fair quality) Göttingen, Germany	All cardiac surgery Mean 82.2±1.79 (80–87)	54 (43, 100%)	Self-designed questionnaire	Mean 26.2±16.54 (6–91) months	Of 43 survivors 41 lived independently, 38 capable of ADLs without help. 40 of the 43 survivors described significant improvement in their QoL
Ennker <i>et al</i> <sup>54</sup> Retrospective (Fair quality) Baden, Germany	Stentless AVR Mean 82±2	76 (Not specified)	Nottingham health profile	Mean 35±23 months	QoL equal to or better than general population. Women had slightly lower QoL than men
Kumar <i>et al</i> <sup>55</sup> Retrospective (Fair quality) Baltimore, USA	All cardiac surgery Group 1 Mean 83.2 ±2.2 (80–87) Group 2 Mean 83.0 ±2.0 (80–89)	Group 1: 15 (8/100%) Group 2: 52 (38/100%)	Karnofsky performance score Self-designed questionnaire	Mean 1.5 years	Improvement in QoL, 75% group 1 and 84% group 2, would have operation in retrospect. Mean Karnofsky dependency category decreased from 2.0±0.4 to 1.5±0.5 p<0.01
NNwaejike <i>et al</i> <sup>56</sup> Retrospective (Fair quality) Maryland, USA	All cardiac surgery Mean 82.4±1.28 (80–88)	66 (Not specified)	Barthel Index	Not specified	Mean Barthel Index 17.7 (min 0, max 20)
Chaturvedi <i>et al</i> <sup>57</sup> Retrospective (Good quality) Quebec, Canada	All cardiac surgery Mean 82.5 (80–92)	300 (188, 100%)	Barthel Index Karnofsky performance score	Up to 5 years	At 3.6 years: 64.9% autonomous, 28.1% semiautonomous, and 9.2% dependent. 71.8% were at home, 21.2% in a residence, and 6.9% in a supervised setting
Leung <i>et al</i> <sup>58</sup> Retrospective (Fair quality) Quebec, Canada	Valve surgery ±CABG Mean 8.5 (80–92) AVR	185 (110, 100%)	Karnofsky performance score Barthel Index	Mean 38 (7–78) months	66% autonomous, 26% semiautonomous, 8% dependent 72% living at home, 19% in residence, 9% in a supervised nursing facility
Caus <i>et al</i> <sup>59</sup> Retrospective (Fair quality) Ottawa, Canada	Not documented	101 (61, not specified)	Karnofsky performance score	Mean 2.7 years per patient	Mean Karnofsky score 61

ADL, activities of daily living; AVR, aortic valve replacement; CABG, coronary artery bypass graft; MLHFQ, Minnesota Living with Heart Failure Questionnaire; PCI, percutaneous coronary intervention; QoL, quality of life; SAQ, Seattle Angina Questionnaire; SF-36, Short Form 36; SVG, Saphenous vein grafts; SWED-QUAL, The Swedish health-related quality of life survey.

## CONCLUSION

QoL following cardiac surgery in octogenarians improves in the majority of patients. However some 8%–19% appear to experience a fall in QoL and regret their decision to go forward with heart surgery. Considering the expanding numbers of elderly patients in contemporary practice, it is desirable to identify patients who will not enjoy an improvement in QoL. At a population level such work may also inform the appropriate provision of limited healthcare resources. A prediction model for postoperative QoL is required to help patients better understand the consequences of surgery, and hence improve the quality of their informed consent.

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