Appendixes

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Appendix A. Detailed Methods

Literature Search Strategies for Primary Literature

Sources searched:
Cochrane Central Register of Controlled Clinical Trials, via Wiley
Cochrane Database of Systematic Reviews, via Wiley
Database of Abstracts of Reviews of Effects, via Wiley
Medline, via Ovid
PubMed, publisher-supplied

Key:
* = truncation
$ = truncation
ab = word in abstract
kf = keyword heading [word not phrase indexed]
kw = keyword
pt = publication type
ti = word in title

MEDLINE: Screening

Database: Ovid MEDLINE(R) <1946 to September Week 1 2018>, Ovid MEDLINE(R) Daily Update <September 14, 2018>
----
1 Aortic Aneurysm, Abdominal/ (17370)
2 abdominal aortic aneurysm$.ti,ab. (15021)
3 1 or 2 (20880)
4 Mass screening/ (95905)
5 (screen$ or rescreen$ or re screen$).ti,ab. (555648)
6 4 or 5 (583442)
7 3 and 6 (1298)
8 limit 7 to (english language and yr="2013 -Current") (293)

MEDLINE: Clinical trials

Database: Ovid MEDLINE(R) <1946 to September Week 1 2018>, Ovid MEDLINE(R) Daily Update <September 14, 2018>
----
1 Aortic Aneurysm, Abdominal/ (17370)
2 abdominal aortic aneurysm$.ti,ab. (15021)
3 1 or 2 (20880)
4 clinical trials as topic/ or controlled clinical trials as topic/ or randomized controlled trials as topic/ or meta-analysis as topic/ (318970)
5 (clinical trial or controlled clinical trial or meta analysis or randomized controlled trial).pt. (896853)
6 random$.ti,ab. (853765)
7 control groups/ or double-blind method/ or single-blind method/ (178983)
8 clinical trial$.ti,ab. (271317)
9 controlled trial$.ti,ab. (160123)
10 (metaanaly$ or meta analy$).ti,ab. (100793)
11 or/4-10 (1645301)
12 3 and 11 (2052)
13 limit 12 to (english language and yr="2013 -Current") (518)
14 remove duplicates from 13 (467)

Appendix A. Detailed Methods

MEDLINE: Treatment cohort studies

Database: Ovid MEDLINE(R) <1946 to September Week 1 2018>, Ovid MEDLINE(R) Daily Update <September 14, 2018>

----

1 Aortic Aneurysm, Abdominal/co, dt, mo, pc, px, rh, su, th [Complications, Drug Therapy, Mortality, Prevention & Control, Psychology, Rehabilitation, Surgery, Therapy] (13967)
2 cohort studies/ or longitudinal studies/ or follow-up studies/ or prospective studies/ or retrospective studies/ (1761323)
3 Registries/ (73991)
4 cohort$.ti,ab. (385596)
5 2 or 3 or 4 (1940167)
6 1 and 5 (4757)
7 limit 6 to (english language and yr="2013 -Current") (1114)
8 remove duplicates from 7 (1020)

MEDLINE: All key questions [in-process/non-indexed records]

Database: Ovid MEDLINE(R) Epub Ahead of Print <September 14, 2018>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <September 14, 2018>

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1 abdominal aortic aneurysm$.ti,ab,kf. (1526)
2 limit 1 to (english language and yr="2013 -Current") (1169)
3 remove duplicates from 2 (1168)

Cochrane (Wiley)

Cochrane Database of Systematic Reviews : Issue 9 of 12, September 2017
Database of Abstracts of Reviews of Effects : Issue 2 of 4, April 2015
Cochrane Central Register of Controlled Trials : Issue 8 of 12, August 2017

#1 "abdominal aortic aneurysm":ti,ab,kw
#2 "abdominal aortic aneurysm*":ti,ab,kw
#3 #1 or #2 Publication Year from 2013 to 2017, in Cochrane Reviews (Reviews and Protocols)
#4 #1 or #2 Publication Year from 2013 to 2017, in Other Reviews
#5 #1 or #2 Publication Year from 2013 to 2017 , in Trials

PubMed, publisher-supplied

Search	Query
#5	#4 AND ("2013/01/01"[Date - Publication] : "3000"[Date - Publication]) AND English[Language]
#4	#3 AND publisher[sb]
#3	#1 AND #2
#2	screen*[tiab] OR rescreen*[tiab] OR re screen*[tiab]OR trial[tiab] OR trials[tiab] OR random*[tiab] OR cohort*[tiab] OR longitudinal*[tiab] OR "follow up"[tiab] OR "followed up"[tiab] OR followup*[tiab] OR prospective*[tiab] OR retrospective*[tiab] OR meta analy*[tiab] OR metaanaly*[tiab] OR registry[tiab] OR registries[tiab] OR register[tiab] OR registers[tiab]
#1	abdominal aortic aneurysm*[tiab]

Appendix A. Detailed Methods

Existing Systematic Reviews Search

Sources searched (2014-present)	Number of items retrieved
Agency for Healthcare Research and Quality	0
Canadian Agency for Drugs and Technologies in Health	0
Cochrane Database of Systematic Reviews	13 (file attached)
Database of Abstracts of Reviews of Effects	16 (file attached)
Dynamed	1 (links below)
Health Technology Assessment (Centre for Reviews and Dissemination)	8 (file attached)
Institute of Medicine	0
NHS Health Technology Assessment Programme	6 (links below)
National Institute for Health and Clinical Excellence	2 (links below)
PubMed	187 (file attached)

Cochrane (Wiley)

Cochrane Database of Systematic Reviews : Issue 2 of 12, February 2017
Database of Abstracts of Reviews of Effects : Issue 2 of 4, April 2015
Health Technology Assessment Database : Issue 4 of 4, October 2016

#1 "abdominal aortic aneurysm":ti,ab,kw 642
#2 "abdominal aortic aneurysms":ti,ab,kw 306
#3 #1 or #2 Publication Year from 2014 to 2017, in Cochrane Reviews (Reviews and Protocols) 13
#4 #1 or #2 Publication Year from 2014 to 2017, in Other Reviews 16
#5 #1 or #2 Publication Year from 2014 to 2017, in Technology Assessments 8

Dynamed

Abdominal aortic aneurysm (last updated 12/19/2016)
http://search.ebscohost.com/login.aspx?direct=true&db=dme&AN=114361&site=dynamed-live&scope=site

NHS HTA Programme

HTA - 09/91/39: The development of an algorithm to calculate in individual patients with abdominal aortic aneurysm (AAA) when repair is indicated to improve survival , May 2015
https://www.journalslibrary.nihr.ac.uk/programmes/hta/099139/#/

Calculating when elective abdominal aortic aneurysm repair improves survival for individual patients: development of the Aneurysm Repair Decision Aid and economic evaluation, May 2015
https://www.journalslibrary.nihr.ac.uk/hta/hta19320/ - DUPLICATE

Screening women for abdominal aortic aneurysm, in progress
https://www.journalslibrary.nihr.ac.uk/programmes/hta/1417901/

Endovascular treatment for ruptured abdominal aortic aneurysm, in progress

Appendix A. Detailed Methods

https://www.journalslibrary.nihr.ac.uk/programmes/sr/167205/

Magnetic Resonance Imaging Using Ultrasmall Superparamagnetic Particles of Iron Oxide to Predict Clinical Outcome in Patients Under Surveillance for Abdominal Aortic Aneurysms, in progress
https://www.journalslibrary.nihr.ac.uk/programmes/eme/112003/

Surveillance following endovascular aortic aneurysm repair, in progress
https://www.journalslibrary.nihr.ac.uk/programmes/hta/157801/

NICE

Endovascular aneurysm sealing for abdominal aortic aneurysm (IPG547), February 2016
https://www.nice.org.uk/guidance/ipg547

Abdominal aortic aneurysm: diagnosis and management, in development
https://www.nice.org.uk/guidance/indevelopment/gid-cgwave0769

PubMed

Search	Query	Items found
#5	Search ((#4) AND English[Language]) AND ("2014/01/01"[Date - Publication] : "3000"[Date - Publication])	187
#4	Search #3 AND systematic[sb]	618
#3	Search #1 OR #2	18887
#2	Search abdominal aortic aneurysm*[tiab] AND (publisher[sb] OR inprocess[sb] OR pubmednotmedline[sb])	1424
#1	Search "Aortic Aneurysm, Abdominal"[Mesh] OR abdominal aortic aneurysm*[title]	18334

Appendix A. Detailed Methods

Appendix A Table 1. Inclusion and Exclusion Criteria

Category	Included	Excluded
Populations	**KQs 1–3:** Asymptomatic adult population **KQs 4, 5:** Asymptomatic adult population with small AAAs (i.e., aortic diameter of 3.0 to 5.4 cm)	**KQs 1–3:** Patients experiencing symptoms related to AAA **KQs 4, 5:** Patients experiencing symptoms related to AAA; populations with AAAs with an aortic diameter larger than 5.4 cm or smaller than 3.0 cm
Setting	Studies conducted in primary care or other settings with a comparable population to primary care (e.g., general unselected population for screening [KQs 1, 3])	
Disease/ condition	AAA (aortic diameter ≥3.0 cm)	
Interventions	**KQs 1–3:** Screening with ultrasound **KQs 4, 5:** Treatment with pharmacotherapy (e.g., statins, angiotensin converting enzyme inhibitors, antibiotics) or surgical intervention	**KQs 1–3:** Screening with physical examination, computed tomography, or magnetic resonance imaging
Comparisons	**KQs 1, 3:** One-time screening vs. no screening **KQs 2, 3:** Repeat screening vs. no rescreening **KQ 4:** Pharmacotherapy vs. placebo, surgery vs surveillance alone	**KQ 2:** Comparison of surveillance interval **KQs 4, 5:** Comparative effectiveness of treatments
Outcomes	**KQs 1, 2:** All-cause mortality, aneurysm-related mortality, cardiovascular disease mortality, aneurysm rupture rate, cardiovascular disease events, and quality of life **KQ 3:** Anxiety and downstream procedures related to false-positive results **KQ 4:** AAA annual growth rate, all-cause mortality, aneurysm-related mortality, cardiovascular disease mortality, aneurysm rupture rate, cardiovascular disease events, and quality of life **KQ 5:** Harms (i.e., serious adverse events from pharmacotherapy or surgery)	
Study Designs	**KQs 1, 4:** Randomized, controlled trials **KQs 2, 3:** Randomized, controlled trials; large cohort studies (sample size >1,000) **KQ 5:** Randomized, controlled trials; large cohort studies (sample size >1,000); vascular surgery registries	**KQs 1, 4:** Case-control, cross-sectional, and cohort studies; editorials, letters, and opinions; cost studies **KQs 2, 3:** Case-control and cross-sectional studies; editorials, letters, and opinions; cost studies
Countries	Studies conducted in countries categorized as "Very High" on the 2016 Human Development Index (as defined by the United Nations Development Programme)	Studies conducted in countries that are not categorized as "Very High" on the 2016 Human Development Index
Language	English only	Languages other than English
Quality	Fair- and good-quality studies	Poor-quality studies

Abbreviations: KQ = Key Question; USPSTF = U.S. Preventive Services Task Force.

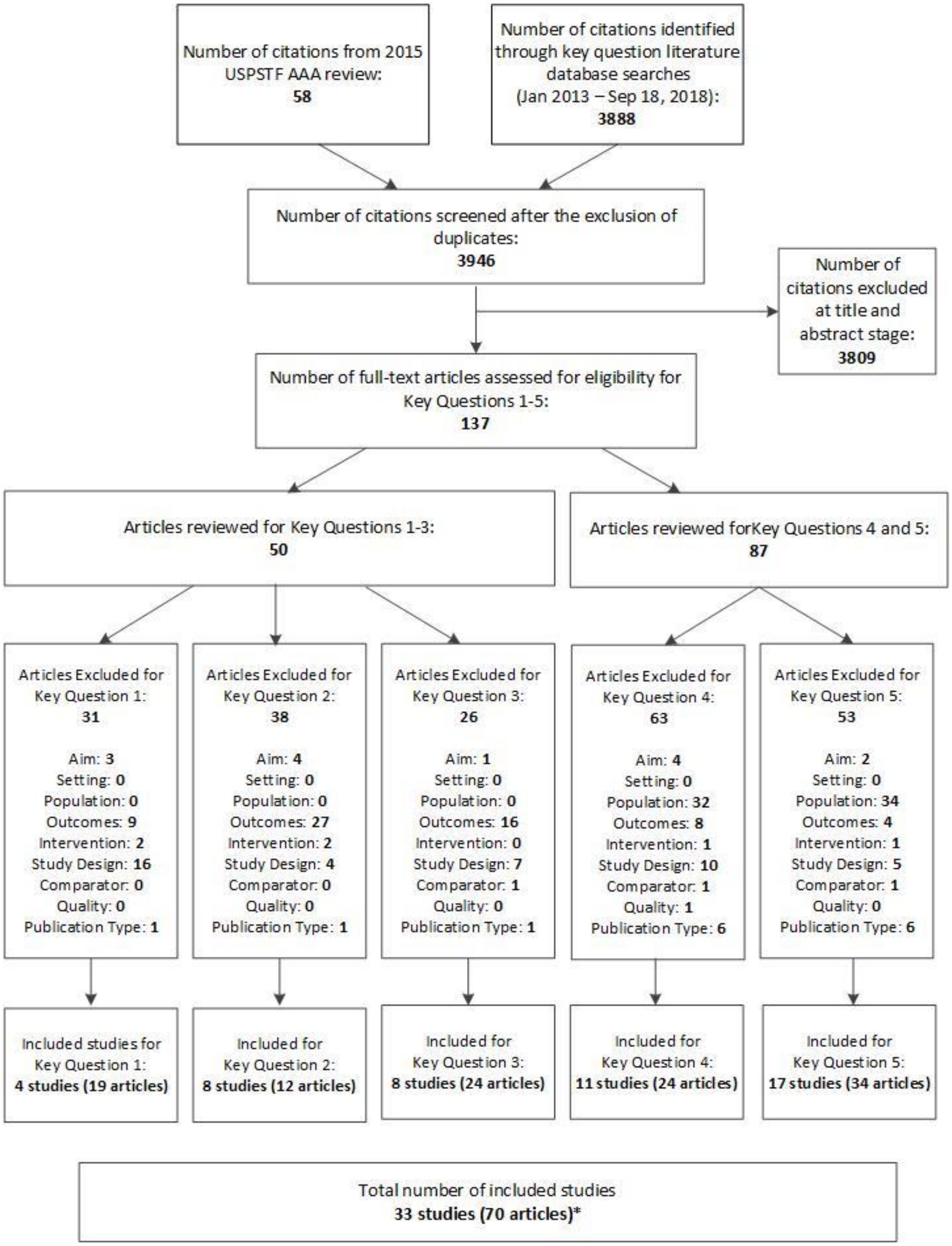
Appendix A Table 2. Quality Assessment Criteria*

Study Design	Adapted Quality Criteria
Randomized and non-randomized controlled trials, adapted from the U.S. Preventive Services Task Force methods[107]	**Bias arising in the randomization process or due to confounding** • Valid random assignment/random sequence generation method used • Allocation concealed • Balance in baseline characteristics **Bias in selecting participants into the study** • CCT only: No evidence of biased selection of sample **Bias due to departures from intended interventions** • Fidelity to the intervention protocol • Low risk of contamination between groups • Participants were analyzed as originally allocated **Bias from missing data** • No, or minimal, post-randomization exclusions • Outcome data are reasonably complete and comparable between groups • Reasons for missing data are similar across groups • Missing data are unlikely to bias results **Bias in measurement of outcomes** • Blinding of outcome assessors • Outcomes are measured using consistent and appropriate procedures and instruments across treatment groups • No evidence of inferential statistics **Bias in reporting results selectively** • No evidence that the measures, analyses, or subgroup analyses are selectively reported
Cohort studies, adapted from the Newcastle-Ottawa Scale[106]	• Was there representativeness of the exposed cohort? • Was the non-exposed systematic selected? • Was the ascertainment of exposure reported? • Were eligibility criteria specified? • Were groups similar at baseline? • Was the reading (interpretation) of the pathology results adequate? • Were outcome assessors blinded? • Were measurements equal, valid and reliable? • Was followup long enough for outcomes to occur? • Were the statistical methods acceptable? • Was the handling of missing data appropriate? • Was there adjustment for confounders? • Was there acceptable followup?

* Good quality studies generally meet all quality criteria. Fair quality studies do not meet all the criteria but do not have critical limitations that could invalidate study findings. Poor quality studies have a single fatal flaw or multiple important limitations that could invalidate study findings. Critical appraisal of studies using *a priori* quality criteria are conducted independently by at least two reviewers. Disagreements in final quality assessment are resolved by consensus, and, if needed, consultation with a third independent reviewer.

Appendix A. Detailed Methods

Appendix A Figure 1. Literature Flow Diagram



*Studies may appear under more than one Key Question.

Appendix B. AAA Screening With Ultrasonography Recommendations

Appendix B Table 1. Expert Groups' Recommendation of AAA Screening With Ultrasonography

Organization (Year)	Population	Surveillance interval
American College of Cardiology and American Heart Association (2013)[95]	Men age ≥60 years with a family history Men ages 65–75 years who have ever smoked Men & women age >50 years should be asked if they have AAA family history	<4.0 cm: every 2–3 years 4.0–5.4 cm: every 6–12 months
American Academy of Family Physicians (NR)[97]	Refers to USPSTF recommendation Men ages 65–75 years who have ever smoked Selectively screen men ages 65–75 years who have never smoked Recommends against routine screening for women who have never smoked	Not stated
American College of Preventive Medicine (2011)[96]	Men ages 65–75 years who have ever smoked Recommends against routine screening in women	Not stated
Society for Vascular Surgery (2018)[3]	All men and women ages 65–75 years with history of tobacco use Men age ≥55 years with family history Women age ≥65 years if family history/smoker	2.5–3.0 cm: after 10 years 3.0–3.9 cm: every 3 years 4.0–4.9 cm: every 12 months 5.0–5.4 cm: every 6 months
Canadian Task Force on Preventive Health Care (2017)[175]	Men ages 65–80 years Recommends not screening men age >80 or women at any age.	Not stated
Public Health England (2015)[246]	Men ages 65–74 years	3.0–4.4 cm: every 12 months 4.5–5.4 cm: every 3 months
National Institute for Health and Care Excellence (NICE) DRAFT Guideline (2018)[186]	All men age ≥66 years eligible to self-refer to screening Encourage men age ≥66 years with risk factors to be screened Consider screening women age ≥70 years with risk factors Risk factors: COPD, family history, history of tobacco use, hyperlipdemia, hypertension, European origin	3.0–4.4 cm: every 2 years 4.5–5.4 cm: every 3 months

Abbreviations: AAA = abdominal aortic aneurysm; COPD = chronic obstructive pulmonary disease.

Below is a list of included studies and their ancillary publications (indented below main results publication):

Key Questions 1 & 3

Chichester

Ashton HA, Gao L, Kim LG, et al. Fifteen-year follow-up of a randomized clinical trial of ultrasonographic screening for abdominal aortic aneurysms. The British journal of surgery. 2007;94(6):696-701. PMID: 17514666. https://doi.org/10.1002/bjs.5780.

> Scott RA, Wilson NM, Ashton HA, et al. Influence of screening on the incidence of ruptured abdominal aortic aneurysm: 5-year results of a randomized controlled study. The British journal of surgery. 1995;82(8):1066-70. PMID: 7648155.
>
> Scott RA, Bridgewater SG, Ashton HA. Randomized clinical trial of screening for abdominal aortic aneurysm in women. The British journal of surgery. 2002;89(3):283-5. PMID: 11872050. https://doi.org/10.1046/j.0007-1323.2001.02014.x.
>
> Vardulaki KA, Walker NM, Couto E, et al. Late results concerning feasibility and compliance from a randomized trial of ultrasonographic screening for abdominal aortic aneurysm. The British journal of surgery. 2002;89(7):861-4. PMID: 12081734. https://doi.org/10.1046/j.1365-2168.2002.02133.x.

Multicentre Aneurysm Screening Study (MASS)

Thompson SG, Ashton HA, Gao L, et al. Final follow-up of the Multicentre Aneurysm Screening Study (MASS) randomized trial of abdominal aortic aneurysm screening. The British journal of surgery. 2012;99(12):1649-56. PMID: 23034729. https://doi.org/10.1002/bjs.8897.

> Ashton HA, Buxton MJ, Day NE, et al. The Multicentre Aneurysm Screening Study (MASS) into the effect of abdominal aortic aneurysm screening on mortality in men: a randomised controlled trial. Lancet. 2002;360(9345):1531-9. PMID: 12443589.
>
> Kim LG, Ra PS, Ashton HA, et al. A sustained mortality benefit from screening for abdominal aortic aneurysm. Annals of internal medicine. 2007;146(10):699-706. PMID: 17502630.
>
> Kim LG, Scott RAP, Ashton HA, et al. A prolonged mortality benefit from screening for abdominal aortic aneurysm: seven-year follow-up of the MASS trial. SO: The Vascular Society of Great Britain & Ireland Yearbook 2006. 2006:77.
>
> Thompson SG, Ashton HA, Gao L, et al. Screening men for abdominal aortic aneurysm: 10 year mortality and cost effectiveness results from the randomised Multicentre Aneurysm Screening Study. BMJ. 2009;338:b2307. PMID: 19553269.

Viborg

Lindholt JS, Sorensen J, Sogaard R, et al. Long-term benefit and cost-effectiveness analysis of screening for abdominal aortic aneurysms from a randomized controlled trial. The British journal of surgery. 2010;97(6):826-34. PMID: 20473995. https://doi.org/10.1002/bjs.7001.

Lindholt JS, Juul S, Fasting H, et al. Hospital costs and benefits of screening for abdominal aortic aneurysms. Results from a randomised population screening trial. Eur J Vasc Endovasc Surg. 2002;23(1):55-60. PMID: 11748949. https://doi.org/10.1053/ejvs.2001.1534.

Lindholt JS, Juul S, Fasting H, et al. Screening for abdominal aortic aneurysms: single centre randomised controlled trial. BMJ. 2005;330(7494):750. PMID: 15757960. 10.1136/bmj.38369.620162.82

Lindholt JS, Juul S, Henneberg EW. High-risk and low-risk screening for abdominal aortic aneurysm both reduce aneurysm-related mortality. A stratified analysis from a single-centre randomised screening trial. Eur J Vasc Endovasc Surg. 2007;34(1):53-8. PMID: 17331750. https://doi.org/10.1016/j.ejvs.2006.12.031.

Lindholt JS, Juul S, Fasting H, et al. Preliminary ten year results from a randomised single centre mass screening trial for abdominal aortic aneurysm. Eur J Vasc Endovasc Surg. 2006;32(6):608-14. PMID: 16893663. https://doi.org/10.1016/j.ejvs.2006.06.008.

Western Australia

McCaul KA, Lawrence-Brown M, Dickinson JA, et al. Long-term Outcomes of the Western Australian Trial of Screening for Abdominal Aortic Aneurysms: Secondary Analysis of a Randomized Clinical Trial. JAMA Intern Med. 2016;176(12):1761-7. PMID: 27802493. https://doi.org/10.1001/jamainternmed.2016.6633.

Jamrozik K, Norman PE, Spencer CA, et al. Screening for abdominal aortic aneurysm: lessons from a population-based study. Med J Aust. 2000;173(7):345-50. PMID: 11062788.

Norman PE, Jamrozik K, Lawrence-Brown MM, et al. Western Australian randomized controlled trial of screening for abdominal aortic aneurysm. The British journal of surgery. 2003;90(4):492.

Norman PE, Jamrozik K, Lawrence-Brown MM, et al. Population based randomised controlled trial on impact of screening on mortality from abdominal aortic aneurysm. BMJ. 2004;329(7477):1259. PMID: 15545293. https://doi.org/10.1136/bmj.38272.478438.55.

Spencer CA, Norman PE, Jamrozik K, et al. Is screening for abdominal aortic aneurysm bad for your health and well-being? ANZ J Surg. 2004;74(12):1069-75. PMID: 15574151. https://doi.org/10.1111/j.1445-1433.2004.03270.x.

Key Question 2

d'Audiffret A, Santilli S, Tretinyak A, et al. Fate of the ectatic infrarenal aorta: expansion rates and outcomes. Annals of vascular surgery. 2002;16(5):534-6.

Devaraj S, Dodds SR. Ultrasound surveillance of ectatic abdominal aortas. Ann R Coll Surg Engl. 2008;90(6):477-82. PMID: 18765027. https://doi.org/10.1308/003588408X301064.

Lederle FA, Johnson GR, Wilson SE, et al. Yield of repeated screening for abdominal aortic aneurysm after a 4-year interval. Aneurysm Detection and Management Veterans Affairs Cooperative Study Investigators. Arch Intern Med. 2000;160(8):1117-21. PMID: 10789604.

Oliver-Williams C, Sweeting MJ, Turton G, et al. Lessons learned about prevalence and growth rates of abdominal aortic aneurysms from a 25-year ultrasound population screening programme. Br J Surg. 2018;105(1):68-74. PMID: 29265406. https://doi.org/10.1002/bjs.10715.

Crow P, Shaw E, Earnshaw JJ, et al. A single normal ultrasonographic scan at age 65 years rules out significant aneurysm disease for life in men. The British journal of surgery. 2001;88(7):941-4. PMID: 11442524. https://doi.org/10.1046/j.0007-1323.2001.01822.x.

Darwood R, Earnshaw JJ, Turton G, et al. Twenty-year review of abdominal aortic aneurysm screening in men in the county of Gloucestershire, United Kingdom. Journal of vascular surgery. 2012;56(1):8-13. PMID: 22503187. https://doi.org/10.1016/j.jvs.2011.12.069.

Emerton ME, Shaw E, Poskitt K, et al. Screening for abdominal aortic aneurysm: a single scan is enough. The British journal of surgery. 1994;81(8):1112-3. PMID: 7953333.

McCarthy RJ, Shaw E, Whyman MR, et al. Recommendations for screening intervals for small aortic aneurysms. The British journal of surgery. 2003;90(7):821-6. PMID: 12854107. https://doi.org/10.1002/bjs.4216.

Chichester
Scott RA, Vardulaki KA, Walker NM, et al. The long-term benefits of a single scan for abdominal aortic aneurysm (AAA) at age 65. Eur J Vasc Endovasc Surg. 2001;21(6):535-40. PMID: 11397028. https://doi.org/10.1053/ejvs.2001.1368.

Soderberg P, Wanhainen A, Svensjo S. Five Year Natural History of Screening Detected Sub-Aneurysms and Abdominal Aortic Aneurysms in 70 Year Old Women and Systematic Review of Repair Rate in Women. Eur J Vasc Endovasc Surg. 2017;53(6):802-9. PMID: 28389251. https://dx.doi.org/10.1016/j.ejvs.2017.02.024.

Svensjo S, Bjorck M, Wanhainen A. Editor's choice: five-year outcomes in men screened for abdominal aortic aneurysm at 65 years of age: a population-based cohort study. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2014;47(1):37-44. PMID: 24262320. https://dx.doi.org/10.1016/j.ejvs.2013.10.007.

Additional studies for Key Question 3 (only included for screening harms)

Lesjak M, Boreland F, Lyle D, et al. Screening for abdominal aortic aneurysm: does it affect men's quality of life? Aust J Prim Health. 2012. PMID: 22951209. https://doi.org/10.1071/PY11131.

Viborg Vascular (VIVA)
Lindholt JS, Sogaard R. Population screening and intervention for vascular disease in Danish men (VIVA): a randomised controlled trial. Lancet. 2017. PMID: 28859943. https://dx.doi.org/10.1016/s0140-6736(17)32250-x.

Grondal N, Sogaard R, Lindholt JS. Baseline prevalence of abdominal aortic aneurysm, peripheral arterial disease and hypertension in men aged 65-74 years from a population screening study (VIVA trial). Br J Surg. 2015;102(8):902-6. PMID: 25923784. https://dx.doi.org/10.1002/bjs.9825.

Lucarotti ME, Heather BP, Shaw E, et al. Psychological morbidity associated with abdominal aortic aneurysm screening. Eur J Vasc Endovasc Surg. 1997;14(6):499-501. PMID: 9467527.

Wanhainen A, Rosen C, Rutegard J, et al. Low quality of life prior to screening for abdominal aortic aneurysm: a possible risk factor for negative mental effects. Annals of vascular surgery. 2004;18(3):287-93. PMID: 15354629. https://doi.org/10.1007/s10016-004-0021-x.

Key Questions 4 & 5

Open vs. Surveillance

ADAM

Lederle FA, Wilson SE, Johnson GR, et al. Immediate repair compared with surveillance of small abdominal aortic aneurysms. N Engl J Med. 2002;346(19):1437-44. PMID: 12000813. https://doi.org/10.1056/NEJMoa012573.

Lederle FA, Wilson SE, Johnson GR, et al. Design of the abdominal aortic Aneurysm Detection and Management Study. ADAM VA Cooperative Study Group. Journal of vascular surgery. 1994;20(2):296-303. PMID: 8040955.

Filardo G, Lederle FA, Ballard DJ, et al. Immediate open repair vs surveillance in patients with small abdominal aortic aneurysms: survival differences by aneurysm size. Mayo Clin Proc. 2013;88(9):910-9. PMID: 24001483. https://dx.doi.org/10.1016/j.mayocp.2013.05.014.

UKSAT

Powell JT, Brown LC, Forbes JF, et al. Final 12-year follow-up of surgery versus surveillance in the UK Small Aneurysm Trial. Br J Surg. 2007;94(6):702-8. PMID: 17514693. https://doi.org/10.1002/bjs.5778.

Brown LC, Powell JT. Risk factors for aneurysm rupture in patients kept under ultrasound surveillance. UK Small Aneurysm Trial Participants. Ann Surg. 1999;230(3):289-96; discussion 96-7. PMID: 10493476.

Brown LC, Thompson SG, Greenhalgh RM, et al. Fit patients with small abdominal aortic aneurysms (AAAs) do not benefit from early intervention. J Vasc Surg. 2008;48(6):1375-81. PMID: 19118733. https://doi.org/10.1016/j.jvs.2008.07.014

Fowkes FG, Greenhalgh RM, Powell JT, et al. Length of hospital stay following elective abdominal aortic aneurysm repair. U.K. Small Aneurysm Trial Participants. Eur J Vasc Endovasc Surg. 1998;16(3):185-91. PMID: 9787298.

Greenhalgh RM, Forbes JF, Fowkes FG, et al. The UK Small Aneurysm Trial: design, methods and progress. Eur J Vasc Endovasc Surg. 1995;9(1):42-8. PMID: 7664011.

Powell JT. Long-term outcomes of immediate repair compared with surveillance of small abdominal aortic aneurysms. N Engl J Med. 2002;346(19):1445-52. PMID: 12000814. https://doi.org/10.1056/NEJMoa013527.

Powell JT, Brady AR, Brown LC, et al. Mortality results for randomised controlled trial of early elective surgery or ultrasonographic surveillance for small abdominal aortic aneurysms. The UK Small Aneurysm Trial Participants. Lancet. 1998;352(9141):1649-55. PMID: 9853436.

Filardo G, Lederle FA, Ballard DJ, et al. Immediate open repair vs surveillance in patients with small abdominal aortic aneurysms: survival differences by aneurysm size. Mayo Clin Proc. 2013;88(9):910-9. PMID: 24001483. https://dx.doi.org/10.1016/j.mayocp.2013.05.014.

EVAR vs. Surveillance

CAESAR

Cao P, De RP, Verzini F, et al. Comparison of surveillance versus aortic endografting for small aneurysm repair (CAESAR): results from a randomised trial. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2011;41(1):13-25. PMID: 20869890. https://doi.org/10.1016/j.ejvs.2010.08.026

Cao P. Comparison of surveillance vs aortic endografting for small aneurysm repair (CAESAR) trial: study design and progress. Eur J Vasc Endovasc Surg. 2005;30(3):245-51. PMID: 16130206.

PIVOTAL

Ouriel K, Clair DG, Kent KC, et al. Endovascular repair compared with surveillance for patients with small abdominal aortic aneurysms. Journal of vascular surgery. 2010;51(5):1081-7. PMID: 20304589. https://doi.org/10.1016/j.jvs.2009.10.113

Ouriel K. The PIVOTAL study: A randomized comparison of endovascular repair versus surveillance in patients with smaller abdominal aortic aneurysms. Journal of vascular surgery. 2009;49(1):266-9. PMID: 19174266. https://doi.org/10.1016/j.jvs.2008.11.048.

Pharmacotherapy vs. Placebo

Bicknell CD, Kiru G, Falaschetti E, et al. An evaluation of the effect of an angiotensin-converting enzyme inhibitor on the growth rate of small abdominal aortic aneurysms: a randomized placebo-controlled trial (AARDVARK). European heart journal. 2016;37(42):3213-21. PMID: 27371719. https://doi.org/10.1093/eurheartj/ehw257.

Kiru G, Bicknell C, Falaschetti E, et al. An evaluation of the effect of an angiotensin-converting enzyme inhibitor on the growth rate of small abdominal aortic aneurysms: a randomised placebo-controlled trial (AARDVARK). Health technology assessment (Winchester, England). 2016;20(59):1-180. PMID: 27488944. https://dx.doi.org/10.3310/hta20590.

Karlsson L, Gnarpe J, Bergqvist D, et al. The effect of azithromycin and Chlamydophilia pneumonia infection on expansion of small abdominal aortic aneurysms--a prospective randomized double-blind trial. Journal of vascular surgery. 2009;50(1):23-9. PMID: 19563951. https://doi.org/10.1016/j.jvs.2008.12.048.

Hogh A, Vammen S, Ostergaard L, et al. Intermittent roxithromycin for preventing progression of small abdominal aortic aneurysms: long-term results of a small clinical trial. Vasc Endovascular Surg. 2009;43(5):452-6. PMID: 19640922. https://doi.org/10.1177/1538574409335037.

Vammen S, Lindholt JS, Ostergaard L, et al. Randomized double-blind controlled trial of roxithromycin for prevention of abdominal aortic aneurysm expansion. The British journal of surgery. 2001;88(8):1066-72. PMID: 11488791. https://doi.org/10.1046/j.0007-1323.2001.01845.x.

Hogh A, Vammen S, Joensen J, et al., editors. Intermittent Roxithromycin Treatment for Preventing Small Abdominal Aortic Aneurysms Progression. Long Term Results from a Small Randomised Double-blinded Clinical Controlled Trial2008 2008. PMID: None.

Meijer C, Stijnen T, Wasser M, et al. Doxycycline for stabilization of abdominal aortic aneurysms: A randomized trial. Annals of internal medicine. 2013;159(12):815-23. PMID: 24490266. https://doi.org/10.7326/0003-4819-159-12-201312170-00007.

Mosorin M, Juvonen J, Biancari F, et al. Use of doxycycline to decrease the growth rate of abdominal aortic aneurysms: a randomized, double-blind, placebo-controlled pilot study. Journal of vascular surgery. 2001;34(4):606-10. PMID: 11668312. https://doi.org/10.1067/mva.2001.117891.

Propranolol Aneurysm Trial Investigators. Propranolol for small abdominal aortic aneurysms: results of a randomized trial. Journal of vascular surgery. 2002;35(1):72-9. PMID: 11802135.

Sillesen H, Eldrup N, Hultgren R, et al. Randomized clinical trial of mast cell inhibition in patients with a medium-sized abdominal aortic aneurysm. The British journal of surgery. 2015;102(8):894-901. PMID: 25963302. https://doi.org/10.1002/bjs.9824

Additional studies for Key Question 5 (only included for treatment harms)

Open vs. Surveillance

ADAM

Lederle FA, Johnson GR, Wilson SE, et al. Quality of life, impotence, and activity level in a randomized trial of immediate repair versus surveillance of small abdominal aortic aneurysm. Journal of vascular surgery. 2003;38(4):745-52. PMID: 14560224.

UKSAT

Forbes JF, Brady AR, Brown LC, et al. Health service costs and quality of life for early elective surgery or ultrasonographic surveillance for small abdominal aortic aneurysms. UK Small Aneurysm Trial Participants. Lancet. 1998;352(9141):1656-60. PMID: 9853437.

EVAR vs. Surveillance

CAESAR

De Rango P, Verzini F, Parlani G, et al. Quality of life in patients with small abdominal aortic aneurysm: the effect of early endovascular repair versus surveillance in the CAESAR trial. Eur J Vasc Endovasc Surg. 2011;41(3):324-31. PMID: 21145269. https://doi.org/10.1016/j.ejvs.2010.11.005.

PIVOTAL

Eisenstein EL, Davidson-Ray L, Edwards R, et al. Economic analysis of endovascular repair versus surveillance for patients with small abdominal aortic aneurysms. Journal of vascular surgery. 2013;58(2):302-10. PMID: 23562339. https://dx.doi.org/10.1016/j.jvs.2013.01.038.

Pharmacotherapy vs. Placebo

Lindholt JS, Henneberg EW, Juul S, et al. Impaired results of a randomised double blinded clinical trial of propranolol versus placebo on the expansion rate of small abdominal aortic aneurysms. International angiology : a journal of the International Union of Angiology. 1999;18(1):52-7. PMID: 10392481.

Surgical Registries

VASCUNET

Budtz-Lilly J, Venermo M, Debus S, et al. Editor's Choice - Assessment of International Outcomes of Intact Abdominal Aortic Aneurysm Repair over 9 Years. Eur J Vasc Endovasc Surg. 2017;54(1):13-20. PMID: 28416191. https://dx.doi.org/10.1016/j.ejvs.2017.03.003

ASERNIP-S

Golledge J, Parr A, Boult M, et al. The outcome of endovascular repair of small abdominal aortic aneurysms. Ann Surg. 2007;245(2):326-33. PMID: 17245188. https://doi.org/10.1097/01.sla.0000253965.95368.52.

VSGNE

Lo RC, Bensley RP, Hamdan AD, et al. Gender differences in abdominal aortic aneurysm presentation, repair, and mortality in the Vascular Study Group of New England. Journal of vascular surgery. 2013;57(5):1261-8, 8.e1-5. PMID: 23384493. https://dx.doi.org/10.1016/j.jvs.2012.11.039

ACS NSQIP

Overbey DM, Glebova NO, Chapman BC, et al. Morbidity of endovascular abdominal aortic aneurysm repair is directly related to diameter. Journal of vascular surgery. 2017;66(4):1037-47. PMID: 28433338. https://dx.doi.org/10.1016/j.jvs.2017.01.058

EUROSTAR

Peppelenbosch N, Buth J, Harris PL, et al. Diameter of abdominal aortic aneurysm and outcome of endovascular aneurysm repair: does size matter? A report from EUROSTAR. Journal of vascular surgery. 2004;39(2):288-97. PMID: 14743127. https://doi.org/10.1016/j.jvs.2003.09.047.

Appendix D. Excluded Studies

Reason for Exclusion*
E1. Study Aim
E2. Setting **E2a.** Non-HDI country **E2b.** Screening and/or intervention is not conducted in, recruited from, or feasible for primary care
E3. Population **E3a.** Patients experience symptoms of AAA **E3b.** Patients with AAAs with an aortic diameter larger than 5.4 cm or smaller than 3.0 cm **E3c.** Patients with known or established CVD
E4. Outcome: No relevant outcomes
E5. Intervention **E5a.** Screening with physical examination, CT, or MRI **E5b.** Non-relevant treatment for small AAA
E6. Comparator: Not an included comparator (e.g., comparison of surveillance interval [KQ2], active intervention [KQ4,5])
E7. Study design: Not an included study design, which includes: KQ1,4= Case-control, cross-sectional, and cohort studies; editorials, letters, and opinions; cost studies; KQ2,3= Case-control and cross-sectional studies; editorials, letters, and opinions; cost studies
E8. Study Quality: Poor
E9. Publication type: Abstract-only, Non-English publication

*Assigned at full-text phase.

Appendix D. Excluded Studies

1. Anonymous. Population-Based Study of Incidence of Acute Abdominal Aortic Aneurysms With Projected Impact of Screening Strategy.[Erratum for J Am Heart Assoc. 2015 Aug;4(8):e001926; PMID: 26289347]. J Am Heart Assoc. 2015;4(10):e001992. PMID: 26486168. https://dx.doi.org/10.1161/JAHA.115.001992 **KQ1E9, KQ2E9, KQ3E9,**
2. Bath MF, Sidloff D, Saratzis A, et al. Impact of abdominal aortic aneurysm screening on quality of life. British Journal of Surgery. 2018;105(3):203-8. PMID: 29405273. https://dx.doi.org/10.1002/bjs.10721 **KQ1E1, KQ2E1, KQ3E7.**
3. Baxter BT, Matsumura J, Curci J, et al. Non-invasive Treatment of Abdominal Aortic Aneurysm Clinical Trial (N-TA(3)CT): Design of a Phase IIb, placebo-controlled, double-blind, randomized clinical trial of doxycycline for the reduction of growth of small abdominal aortic aneurysm. Contemporary clinical trials. 2016;48:91-8. PMID: 27018941. 10.1016/j.cct.2016.03.008 **KQ4E4, KQ5E4.**
4. Bergqvist D, Lindeman JH, Lindholt JS, et al. Antimicrobial treatment to impair expansion of abdominal aortic aneurysm (AAA): a systematic review of the clinical evidence. Current vascular pharmacology. 2013;11(3):288-92. PMID: 22724481. **KQ4E7, KQ5E7.**
5. Candell L, Tucker LY, Goodney P, et al. Early and delayed rupture after endovascular abdominal aortic aneurysm repair in a 10-year multicenter registry. Journal of vascular surgery. 2014;60(5):1146-52. PMID: 24957409. https://dx.doi.org/10.1016/j.jvs.2014.05.046 **KQ4E3b, KQ5E3b.**
6. Chung C, Tadros R, Torres M, et al. Evolution of gender-related differences in outcomes from two decades of endovascular aneurysm repair. Journal of vascular surgery. 2015;61(4):843-52. PMID: 25595407. https://dx.doi.org/10.1016/j.jvs.2014.11.006 **KQ4E3b, KQ5E3b.**
7. Cotter AR, Vuong K, Mustelin L, et al. Do psychological harms result from being labelled with an unexpected diagnosis of abdominal aortic aneurysm or prostate cancer through screening? A systematic review. BMJ open. 2017;7(12):e017565. PMID: 29237653. https://dx.doi.org/10.1136/bmjopen-2017-017565 **KQ1E1, KQ2E1, KQ3E7.**
8. Dahl M, Sogaard R, Frost L, et al. Effectiveness of Screening Postmenopausal Women for Cardiovascular Diseases: A Population Based, Prospective Parallel Cohort Study. European Journal of Vascular & Endovascular Surgery. 2018;55(5):721-9. PMID: 29625727. https://dx.doi.org/10.1016/j.ejvs.2018.02.034 **KQ1E7, KQ2E1, KQ3E1.**
9. Dalman RL, Xuan H, Wang W, et al. Angiotensin Receptor Blockers in Abdominal Aortic Aneurysm Management: Evidence Supporting the TEDY Trial. Journal of vascular surgery. 2016;64(2):539. PMID: 27763287. https://dx.doi.org/10.1016/j.jvs.2016.05.009 **KQ4E1, KQ5E1.**
10. Davenport DL, Xenos ES. Deep venous thrombosis after repair of nonruptured abdominal aneurysm. Journal of vascular surgery. 2013;57(3):678-83.e1. PMID: 23343666. https://dx.doi.org/10.1016/j.jvs.2012.09.048 **KQ4E3b, KQ5E3b.**
11. de Blic R, Alsac JM, Julia P, et al. Elective treatment of abdominal aortic aneurysm is reasonable in patients >85 years of age. Annals of vascular surgery. 2014;28(1):209-16. PMID: 24084274. https://dx.doi.org/10.1016/j.avsg.2013.01.022 **KQ4E3b, KQ5E3b.**
12. Deery SE, O'Donnell TFX, Bodewes TCF, et al. Early reintervention after open and endovascular abdominal aortic aneurysm repair is associated with high mortality. Journal of vascular surgery. 2018;67(2):433-40.e1. PMID: 28943011. https://dx.doi.org/10.1016/j.jvs.2017.06.104 **KQ4E1, KQ5E3b.**
13. Deery SE, Schermerhorn ML. Open versus endovascular abdominal aortic aneurysm repair in Medicare beneficiaries. Surgery. 2017;162(4):721-31. PMID: 28343694. https://dx.doi.org/10.1016/j.surg.2017.01.022 **KQ4E3b, KQ5E3b.**
14. Deery SE, Soden PA, Zettervall SL, et al. Sex differences in mortality and morbidity following repair of intact abdominal aortic aneurysms. Journal of vascular surgery. 2017;65(4):1006-13. PMID: 27986477. https://dx.doi.org/10.1016/j.jvs.2016.08.100 **KQ4E3b, KQ5E3b.**
15. Dua A, Ali F, Traudt E, et al. Utilization of the National Inpatient Sample for abdominal aortic aneurysm research. Surgery. 2017;162(4):699-706. PMID: 28237647. https://dx.doi.org/10.1016/j.surg.2016.12.036 **KQ4E1, KQ5E1.**
16. Dua A, Kuy S, Lee CJ, et al. Epidemiology of aortic aneurysm repair in the United States from 2000 to 2010. Journal of vascular surgery. 2014;59(6):1512-7. PMID: 24560865. https://dx.doi.org/10.1016/j.jvs.2014.01.007 **KQ4E7, KQ5E7.**
17. Dubois L, Novick TV, Harris JR, et al. Outcomes after endovascular abdominal aortic aneurysm repair are equivalent between genders despite anatomic differences in women. Journal of vascular surgery. 2013;57(2):382-9.e1. PMID: 23266281. https://dx.doi.org/10.1016/j.jvs.2012.09.075 **KQ4E3b, KQ5E3b.**
18. Duwayri Y, Goss J, Knechtle W, et al. The Readmission Event after Vascular Surgery: Causes and Costs. Annals of vascular surgery. 2016;36:7-12. PMID: 27321981.

https://dx.doi.org/10.1016/j.avsg.2016.02.024 **KQ4E3b, KQ5E3b.**

19. Ericsson A, Holst J, Gottsater A, et al. Psychosocial consequences in men taking part in a national screening program for abdominal aortic aneurysm. J Vasc Nurs. 2017;35(4):211-20. PMID: 29153229. https://dx.doi.org/10.1016/j.jvn.2017.06.001 **KQ1E1, KQ2E1, KQ3E7.**
20. Flink BJ, Long CA, Duwayri Y, et al. Women undergoing aortic surgery are at higher risk for unplanned readmissions compared with men especially when discharged home. Journal of vascular surgery. 2016;63(6):1496-504.e1. PMID: 27106246. https://dx.doi.org/10.1016/j.jvs.2015.12.054 **KQ4E3b, KQ5E3b.**
21. Hafez H, Druce PS, Ashton HA. Abdominal aortic aneurysm development in men following a "normal" aortic ultrasound scan. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2008;36(5):553-8. PMID: 18718773. **KQ1E4, KQ2E4, KQ3E4,**
22. Hicks CW, Obeid T, Arhuidese I, et al. Abdominal aortic aneurysm repair in octogenarians is associated with higher mortality compared with nonoctogenarians. Journal of vascular surgery. 2016;64(4):956-65.e1. PMID: 27364946. https://dx.doi.org/10.1016/j.jvs.2016.03.440 **KQ4E5b, KQ5E5b.**
23. Hinterseher I, Kuffner H, Berth H, et al. Long-term quality of life of abdominal aortic aneurysm patients under surveillance or after operative treatment. Annals of vascular surgery. 2013;27(5):553-61. PMID: 23540664. **KQ4E6, KQ5E6.**
24. Hoel AW, Faerber AE, Moore KO, et al. A pilot study for long-term outcome assessment after aortic aneurysm repair using Vascular Quality Initiative data matched to Medicare claims. Journal of vascular surgery. 2017;66(3):751-9.e1. PMID: 28222989. https://dx.doi.org/10.1016/j.jvs.2016.12.100 **KQ4E3b, KQ5E3b.**
25. Hughes K, Abdulrahman H, Prendergast T, et al. Abdominal aortic aneurysm repair in nonagenarians. Annals of vascular surgery. 2015;29(2):183-8. PMID: 25461753. https://dx.doi.org/10.1016/j.avsg.2014.07.037 **KQ4E3b, KQ5E3b.**
26. Hultgren R. Commentary on "Five Year Natural History of Screening Detected Sub-Aneurysms and Abdominal Aortic Aneurysms in 70 Year Old Women and Systematic Review of Repair Rate in Women". European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2017;53(6):810. PMID: 28420552. https://dx.doi.org/10.1016/j.ejvs.2017.03.013 **KQ1E7, KQ2E7, KQ3E7,**
27. Hye RJ, Inui TS, Anthony FF, et al. A multiregional registry experience using an electronic medical record to optimize data capture for longitudinal outcomes in endovascular abdominal aortic aneurysm repair. Journal of vascular surgery. 2015;61(5):1160-6. PMID: 25725597. https://dx.doi.org/10.1016/j.jvs.2014.12.055 **KQ4E3b, KQ5E3b.**
28. Jacomelli J, Summers L, Stevenson A, et al. Update on the prevention of death from ruptured abdominal aortic aneurysm. Journal of medical screening. 2017;24(3):166-8. PMID: 28756762. https://dx.doi.org/10.1177/0969141316667409 **KQ1E4, KQ2E4, KQ3E4,**
29. Karthikesalingam A, Bahia SS, Patterson BO, et al. The shortfall in long-term survival of patients with repaired thoracic or abdominal aortic aneurysms: retrospective case-control analysis of hospital episode statistics. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2013;46(5):533-41. PMID: 24091096. https://dx.doi.org/10.1016/j.ejvs.2013.09.008 **KQ4E3b, KQ5E3b.**
30. Khashram M, Thomson IA, Jones GT, et al. Abdominal aortic aneurysm repair in New Zealand: a validation of the Australasian Vascular Audit. ANZ J Surg. 2017;87(5):394-8. PMID: 27492991. https://dx.doi.org/10.1111/ans.13702 **KQ4E3b, KQ5E3b.**
31. Lederle FA. Does Abdominal Aortic Aneurysm Screening Save Lives? JAMA Surgery. 2016;151(8):697-8. PMID: 27119312. https://dx.doi.org/10.1001/jamasurg.2016.0044 **KQ1E7, KQ2E7, KQ3E7,**
32. Lee SY, Peacock MR, Farber A, et al. Perioperative Infections after Open Abdominal Aortic Aneurysm Repair Lead to Increased Risk of Subsequent Complications. Annals of vascular surgery. 2017;4:203-10. PMID: 28483623. https://dx.doi.org/10.1016/j.avsg.2017.04.022 **KQ4E3b, KQ5E3b.**
33. Lijftogt N, Vahl AC, Wilschut ED, et al. Adjusted Hospital Outcomes of Abdominal Aortic Aneurysm Surgery Reported in the Dutch Surgical Aneurysm Audit. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2017;53(4):520-32. PMID: 28256396. https://dx.doi.org/10.1016/j.ejvs.2016.12.037 **KQ4E3b, KQ5E3b.**
34. Lilja F, Mani K, Wanhainen A. Editor's Choice - Trend-break in Abdominal Aortic Aneurysm Repair With Decreasing Surgical Workload. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2017;53(6):811-9. PMID: 28392057. https://dx.doi.org/10.1016/j.ejvs.2017.02.031 **KQ4E3b, KQ5E3b.**

35. Lindholt JS, Vammen S, Fasting H, et al. Psychological consequences of screening for abdominal aortic aneurysm and conservative treatment of small abdominal aortic aneurysms. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2000;20(1):79-83. PMID: 10906303. https://doi.org/10.1053/ejvs.1999.1087 **KQ1E4, KQ2E4, KQ3E6,**
36. Locham S, Lee R, Nejim B, et al. Mortality after endovascular versus open repair of abdominal aortic aneurysm in the elderly. J Surg Res. 2017;215:153-9. PMID: 28688641. https://dx.doi.org/10.1016/j.jss.2017.03.061 **KQ4E3b, KQ5E3b.**
37. Loftus I, Vascular Society of Great B, Ireland. National Vascular Registry Report on surgical outcomes and implications for vascular centres (Br J Surg 2014; 101: 637-642). British Journal of Surgery. 2014;101(6):642. PMID: 24723018. **KQ4E7, KQ5E7.**
38. Makrygiannis G, Labalue P, Erpicum M, et al. Extending Abdominal Aortic Aneurysm Detection to Older Age Groups: Preliminary Results from the Liege Screening Programme. Annals of vascular surgery. 2016;36:55-63. PMID: 27364735. https://dx.doi.org/10.1016/j.avsg.2016.02.034 **KQ1E4, KQ2E4, KQ3E4,**
39. Mani K, Bjorck M, Wanhainen A. Changes in the management of infrarenal abdominal aortic aneurysm disease in Sweden. British Journal of Surgery. 2013;100(5):638-44. PMID: 23334950. https://dx.doi.org/10.1002/bjs.9046 **KQ4E3b, KQ5E3b.**
40. Matyal R, Shakil O, Hess PE, et al. Impact of gender and body surface area on outcome after abdominal aortic aneurysm repair. Am J Surg. 2015;209(2):315-23. PMID: 25457240. https://dx.doi.org/10.1016/j.amjsurg.2014.07.008 **KQ4E3b, KQ5E3b.**
41. Mayor S. Women having surgery for abdominal aortic aneurysm are nearly twice as likely to die as men. BMJ. 2017;357:j2054. PMID: 28446431. https://dx.doi.org/10.1136/bmj.j2054 **KQ4E9, KQ5E9.**
42. Morris DR, Cunningham MA, Ahimastos AA, et al. TElmisartan in the management of abDominal aortic aneurYsm (TEDY): The study protocol for a randomized controlled trial. Trials. 2015;16:274. PMID: 26081587. 10.1186/s13063-015-0793-z **KQ4E4, KQ5E4.**
43. Morris DR, Cunningham MA, Ahimastos AA, et al. Erratum to: 'TElmisartan in the management of abDominal aortic aneurYsm (TEDY): The study protocol for a randomized controlled trial'.[Erratum for Trials. 2015;16:274; PMID: 26081587]. Trials [Electronic Resource]. 2016;17:43. PMID: 26791257. https://dx.doi.org/10.1186/s13063-016-1183-x **KQ4E4, KQ5E4.**
44. Murohara T, Kureishi BY, Nishigami K, et al. Effects of angiotensin-II receptor blocker or calcium channel blocker on abdominal aortic aneurysm growth at presurgical stage. European heart journal. 2015;36:880-1. PMID: None. 10.1093/eurheartj/ehv401 **KQ4E9, KQ5E9.**
45. Myers J, McElrath M, Jaffe A, et al. A randomized trial of exercise training in abdominal aortic aneurysm disease. Med Sci Sports Exerc. 2014;46(1):2-9. PMID: 23793234. https://dx.doi.org/10.1249/MSS.0b013e3182a088b8 **KQ4E5b, KQ5E5b.**
46. Nevidomskyte D, Shalhub S, Niten S, et al., editors. Influence of gender on abdominal aortic aneurysm repair in the community. Annals of vascular surgery. Conference: 25th annual winter meeting vascular and endovascular surgery society. United states; 2015; United States. KQ Search 20170914 - CENTRAL. **KQ4E9, KQ5E9.**
47. Nevidomskyte D, Shalhub S, Singh N, et al. Influence of Gender on Abdominal Aortic Aneurysm Repair in the Community. Annals of vascular surgery. 2017;39:128-36. PMID: 27575306. https://dx.doi.org/10.1016/j.avsg.2016.06.012 **KQ4E3b, KQ5E3b.**
48. Park BD, Azefor NM, Huang CC, et al. Elective endovascular aneurysm repair in the elderly: trends and outcomes from the Nationwide Inpatient Sample. Annals of vascular surgery. 2014;28(4):798-807. PMID: 24189191. https://dx.doi.org/10.1016/j.avsg.2013.07.029 **KQ4E3b, KQ5E3b.**
49. Powell JT. Prophylactic Abdominal Aortic Aneurysm Repair? Open Repair Brings Early Pain but Later Gain. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2016;52(6):719-20. PMID: 27914533. https://dx.doi.org/10.1016/j.ejvs.2016.07.008 **KQ4E7, KQ5E7.**
50. Qadura M, Pervaiz F, Harlock J, et al. Mortality and reintervention following elective abdominal aortic aneurysm repair. Journal of vascular surgery. 2013;57(6):1676-83. PMID: 23719040. **KQ4E3b, KQ5E3b.**
51. Quinn AA, Mehta M, Teymouri MJ, et al. The incidence and fate of endoleaks vary between ruptured and elective endovascular abdominal aortic aneurysm repair. Journal of vascular surgery. 2017;65(6):1617-24. PMID: 28268109. https://dx.doi.org/10.1016/j.jvs.2016.10.092 **KQ4E3b, KQ5E3b.**
52. RESCAN Collaborators, Bown MJ, Sweeting MJ, et al. Surveillance intervals for small abdominal aortic aneurysms: a meta-analysis. JAMA. 2013;309(8):806-13. PMID: 23443444. **KQ1E4, KQ2E4, KQ3E4,**
53. Roddy SP. Abdominal aortic aneurysm screening. Journal of vascular surgery. 2017;65(5):1537. PMID: 28434598.

https://dx.doi.org/10.1016/j.jvs.2017.02.021 **KQ1E7, KQ2E7, KQ3E7,**

54. Schmitz-Rixen T, Steffen M, Grundmann R. Treatment of abdominal aortic aneurysms (AAA) 2015: registry report from the German Institute of Vascular Healthcare Research (DIGG) of the German Society for Vascular Surgery and Vascular Medicine (DGG).Gerasschirurgie. 2017:1-9. PMID: None. 10.1007/s00772-017-0253-z **KQ4E9, KQ5E9.**
55. Sillesen H, Eldrup N, Hultgren R, et al. Randomized clinical trial of mast cell inhibition in patients with a medium-sized abdominal aortic aneurysm.[Erratum for Br J Surg. 2015 Jul;102(8):894-901; PMID: 25963302]. British Journal of Surgery. 2015;102(10):1295. PMID: 26267607. https://dx.doi.org/10.1002/bjs.9917 **KQ4E9, KQ5E9.**
56. Sillesen H, Eldrup N, Hultgren R, et al. Randomized clinical trial of mast cell inhibition in patients with a medium-sized abdominal aortic aneurysm.[Erratum appears in Br J Surg. 2015 Sep;102(10):1295; PMID: 26267607], [Erratum appears in Br J Surg. 2016 Feb;103(3):308; PMID: 26785648]. British Journal of Surgery. 2015;102(8):894-901. PMID: 25963302. https://dx.doi.org/10.1002/bjs.9824 **KQ4E9, KQ5E9.**
57. Stather P, Sidloff D, Dattani N, et al. Systematic review and meta-analysis of the early and late outcomes of open and endovascular repair of abdominal aortic aneurysm (Provisional abstract). British Journal of Surgery. 2013;100(7):863-72. PMID: None. **KQ4E7, KQ5E7.**
58. Takagi H, Umemoto T, Group A. A meta-analysis pooling survival curves in randomized controlled trials and propensity-score matched studies of endovascular versus open abdominal aortic aneurysm repair. International journal of cardiology. 2014;174(3):785-8. PMID: 24798785. **KQ4E3b, KQ5E3b.**
59. Tan TW, Eslami M, Rybin D, et al. Outcomes of endovascular and open surgical repair of ruptured abdominal aortic aneurysms in elderly patients. Journal of vascular surgery. 2017;66(1):64-70. PMID: 28216354. https://dx.doi.org/10.1016/j.jvs.2016.10.119 **KQ4E3a, KQ5E3a.**
60. Tomee SM, Lijftogt N, Vahl A, et al. A registry-based rationale for discrete intervention thresholds for open and endovascular elective abdominal aortic aneurysm repair in female patients. Journal of vascular surgery. 2017;27:27. PMID: 28964619. **KQ4E3b, KQ5E3b.**
61. Trenner M, Haller B, Storck M, et al. Trends in Patient Safety of Intact Abdominal Aortic Aneurysm Repair: German Registry Data on 36,594 Procedures. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2017;53(5):641-7. PMID: 28110907. https://dx.doi.org/10.1016/j.ejvs.2016.12.024 **KQ4E3b, KQ5E3b.**
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Appendix E Table 1. Methodological and Intervention Characteristics of Included One-Time Screening Studies (KQs 1 and 3)

Comparison	Author, Year Trial name	Study Quality	N Randomized	Country	Mean Length of FU, y	Intervention	Control
Screening vs. no screening	Ashton, 2007[113] (Men only) & Scott, 2002[36] (Women only) Chichester	Fair	15,382 Men: 6,040 Women: 9,342	UK	15.0 (Men only) 10 (Women only)	Ultrasound screening; patients with an aneurysm of 3.0–4.4 cm diameter were rescanned annually and those with an aneurysm of 4.5–5.9 cm diameter were rescanned every 3 months. This was continued until February 1994 or until the patient died, underwent surgical intervention, or declined followup.	Surveillance
	Thompson, 2012[12, 170] MASS	Good	67,770	UK	13.1	Ultrasound screening; patients with an aortic diameter of 3.0–4.4 cm were rescanned yearly. Those with an aortic diameter of 4.5–5.4 cm were rescanned at 3-month intervals. Urgent referral to a vascular surgeon was recommended for patients with aortic diameter ≥5.5 cm. QOL was assessed in patients with screen-detected AAA and those with normal scans at 1.5, 3, and 12 months (n=1,956).[12]	Surveillance
	Lindholt, 2010[147] Viborg	Good	12,639	Denmark	13	Ultrasound screening; participants with aneurysms ≥5 cm were referred to a vascular surgeon; those with AAAs 3–4.9 cm were offered annual scans to check for expansion. After 5 years those with initial ectatic aorta (diameter 2.5–2.9 cm) were offered rescreening.	Surveillance
	Lindholt, 2017[146] VIVA	Fair	50,156 (Screening group n=25,078)	Denmark	4.4*	Ultrasound screening; patients with aneurysms ≥5 cm were referred to CT scanning and assessment by a vascular surgeon for repair. Participants were invited to one annual clinical followup, which consisted of ultrasound screening. Person identification numbers were used to search the Danish Vascular Registry for vascular procedures. ABI screening; participants with possible hypertension alone encouraged to consult with general practitioner for confirmation of	Surveillance

Comparison	Author, Year Trial name	Study Quality	N Randomized	Country	Mean Length of FU, y	Intervention	Control
						diagnosis, initiation of prophylactic activities, or both. Blood total cholesterol measurement if diagnosis of AAA or PAD was confirmed with repeated ultrasonography and ABI measurement. If total serum cholesterol concentration exceeded 4.0 mmol/L, participant prescribed statin therapy (40 mg/day simvastatin) and aspirin (75 mg/day). All positive findings and initiated medications communicated to general practitioner to ensure medication continuation and followup.	
	McCaul, 2016[15, 168] Western Australia	Fair	38,480	Australia	12.8*	Ultrasound screening†; QOL (SF-36, EuroQOL EQ-5D) was assessed 12 months after screening (n=365).	Surveillance
Screening harms	Lesjak, 2012[141]	Fair	NR‡	Australia	6 mo	At the time of time of screening, self-administered questionnaires were completed including the Medical Outcomes Short Form 36v.2 (MOSF36). Six months after screening, all participants who had an abnormal aortic diameter (≥2.6 cm) were followed up and completed MOSF36 questionnaires (n=53).	A random sample of men with normal scans were followed up 6 months after screening (n=130).
	Lucarotti, 1997[150]	Fair	NR	UK	1 mo	Men invited to screening filled out the QOL questionnaire (General Health Questionnaire; linear analogue scale) prior to screening. One month after initial screening, the first 61 men with diagnosed AAA (definition NR) were asked to complete the QOL assessment again (n=61).	Men invited to screening filled out the QOL questionnaire (General Health Questionnaire; linear analogue scale) prior to screening. One month after initial screening, the first 100 men with normal scans were asked to complete the QOL assessment again (n=100).

Comparison	Author, Year Trial name	Study Quality	N Randomized	Country	Mean Length of FU, y	Intervention	Control
	Wanhainen, 2004[174]	Fair	NR	Sweden	1.0	Participants were given a QOL assessment questionnaire (SF-36) at baseline and then 12 months after screening. A cohort of participants with screen-detected AAA were followed (n=24).	Participants were given a QOL assessment questionnaire (SF-36) at baseline and 12 months after screening. A cohort of age-/sex-matched controls with normal AAA scans were followed (n=45).

*Median.
†After screening, participants were given a letter containing the results of their scan and a copy for their primary care physician. Any followup investigations or referral to a surgeon were arranged by the primary care physician. No attempt was made by investigators to influence clinical management with regards to threshold for intervention or method of repair.
‡53 men completed the questionnaire (out of 516).

Abbreviations: AAA = abdominal aortic aneurysm; EQ-5D = EuroQOL-5D; MASS = Multicenter Aneurysm Screening Study; QOL = quality of life; SF-36 = Short-form 36-item Health Survey; NR = not reported.

Appendix E Table 2. Patient Characteristics of Included One-Time Screening Studies (KQs 1 and 3)

Comparison	Author, Year Trial Name	Major Inclusion Criteria	Mean Age % Female	% Current Smoking	% Family History	% Diabetes	% CVD Risk Factors
Screening vs. no screening	Ashton, 2007[113] (Men only) & Scott, 2002[36] (Women only) Chichester	Patients ages 65–80 years	72.0* 59.2	NR	NR	NR	NR
	Thompson, 2012[170] MASS	Men ages 65–74 years	69.2 0	NR	NR	NR	NR
	Lindholt, 2010[147] Viborg	Men ages 64–73 years who lived in Viborg County	67.7 0	NR	NR	NR	NR
	Lindholt, 2017[146] VIVA	Men ages 65-74 years living in Central Denmark	69.0* 0	NR	NR	NR	History of, %: Stroke: 3.0 MI: 2.7 Ischemic heart disease: 6.6 Peripheral occlusive arterial disease: 1.1
	McCaul, 2016[15] Western Australia	Men ages 64–83 years living in Perth and surrounding towns	72.6 0	NR	NR	NR	NR
Screening harms	Lesjak, 2012[141]	Rural men ages 65-74 years who attended a community-based screening for AAA	NR 0	NR	NR	NR	NR
	Lucarotti, 1997[150]	Men born between 1925 and 1928 living in Gloucestershire and participating in the AAA screening program	NR 0	NR	NR	NR	NR
	Wanhainen, 2004[174]	Men and women ages 65–75 years with screen-detected AAA (≥3.0 cm) along with a group of adults with a normal scan to act as controls	71.0 19.4	NR	NR	NR	NR

*Median.

Abbreviations: AAA = abdominal aortic aneurysm; MASS = Multicenter Aneurysm Screening Study; NR = not reported.

Appendix E Table 3. Percent of Screened Population With AAA of the Specified Size

Author, Year Trial Name	Total Scanned	Total AAA (Prevalence), n (%)	≥5.5 cm, n (%)	5.0 to 5.9 cm, n (%)	4.5 to 5.4 cm, n (%)	3.0 to 4.4 cm, n (%)
Scott, 1995[13] Chichester	5,394 (men and women)*	218 (4.0)	19 (0.4)†	20 (0.4)†	NR	179 (3.3)†,‡
Thompson, 2012[12, 170] MASS	27,147 (men)	1,334 (4.9)	166 (0.6)	NR	223 (0.8)	944 (3.5)
Lindholt, 2010[14, 143, 147] Viborg	4,860 (men)	191 (3.9)§	24 (0.5)	NR	NR	NR
Lindholt, 2017[146] VIVA	25,078 (men)	619 (3.3)	61 (0.3)	NR	NR	558 (3.0)‖
McCaul, 2016[15, 155] Western Australia	12,203 (men)	879 (7.2)	61 (0.5)	NR	115 (0.9)¶	699 (5.7)¶

* From 5-year followup (Scott, 1995).[13]
† Estimated.
‡ AAA of 3.0 to 4.0 cm.
§ N analyzed for prevalence: 4,816.
‖ AAA of 3.0 to 4.9 cm.
¶ From 3.6-year followup (Norman, 2004).[155]

Abbreviations: AAA = abdominal aortic aneurysm; MASS = Multicenter Aneurysm Screening Study; NR = not reported.

Appendix E Table 4. Methodological and Intervention Characteristics of Included Rescreening Studies (KQ 2)

Study, Year Quality	Trial	N	N Analyzed	Country	Mean length of follow up (yrs)	Measurement technique	Rescreening intervals; number of times rescreened
D'Audiffret, 2002[121] Fair	Patients from the ADAM trial	223	223	US	5.9 Range: NR	Aortic measurements were made in both the anteriorposterior and transverse planes and the greatest diameter was recorded.	Rescreening annually after aortic diameters of 2.5–2.9 cm were identified 5 repeat scans
Deveraj, 2008[123] Fair	Patients from the Good Hope Hospital Screening Program	999	358	UK	5.4 Range: 1–14 years	Assessed anterioposterior diameter	Rescreening of abnormal aortas (2.6–2.9 cm) annually NR
Oliver-Williams, 2018[156] Good	Patients from the Gloucestershire Aneurysm Screening Study	80,150	1,233	UK	7.8 Range: 2.7–11 years†	Maximum anteroposterior diameter assessed by measurement from the inner wall to the inner wall of the aorta.	Men with small AAA (2.4–4.4 cm had annual ultrasound followup. 6 (3–11)‡ repeat scans
Lederle, 2000[138] Good	Patients from the ADAM trial	15,098	2,622	US	4 Range: NR	Assessed infrarenal and suprarenal aortic diameter	Rescreening in those found to have no AAA 4 years after initial screening 1 repeat scan
Lindholt, 2000[148] Fair	Case/control study of the Viborg Trial	6,339	248 for 2.5–2.9 group 275 Control group	Denmark	5 Range: 3–5 yrs	Infrarenal aorta was first visualized anteroposteriorly in its entire length. Its anteroposteriorly and transversely diameters were measured and recorded at their maximal sizes.	Those with aortas 2.5–2.9 cm were offered rescreening 3 to 5 years after initial screen; control group were those with no AAA
Scott, 2001[165] Fair	Cohort of 65-year-old men found to have normal aorta	1,011	649	UK	10 Range: NR	Both anteroposterior and transverse measurements of aortic diameter were taken and the maximum of the two measurements was used as the defining diameter.	Individuals with normal-sized aortas at initial scan were rescreened every 2 years. (These patients were NOT Chichester trial participants.) 5 repeat scans

Study, Year Quality	Trial	N	N Analyzed	Country	Mean length of follow up (yrs)	Measurement technique	Rescreening intervals; number of times rescreened
Soderberg, 2017[167] Fair	Population-based cohort of 70-year-old women	5,140	2.5–2.9 cm group: 33; 26 rescanned ≥3.0 cm group: 19	Sweden	5 Range: NR	The maximum anteroposterior diameter was registered according to the leading edge to leading edge principle.	All women with screen-detected subaneurysms with a diameter of 2.5–2.9 cm were rescanned at 5 years. 1 repeat scan
Svensjo, 2014[169] Fair	Population-based cohort of 65-year-old men	3,270	<2.5 cm group: 2,652 2.5–2.9 cm group: 40 ≥3.0 cm group: 44	Sweden	5 Range: 5 yrs	The maximum anteroposterior diameter of the infrarenal aorta was recorded using the leading edge to leading edge principle.	Individuals with an infrarenal aortic diameter of 2.5–2.9 cm were rescanned after 5 years. 1 repeat scan

*Median.
† Duration of followup was calculated for each man as the time from the initial scan to death, or to most recent scan if the individual had not died.
‡ Median (IQR) within.

Abbreviations: AAA = abdominal aortic aneurysm; ADAM = Abdominal Aortic Aneurysm Detection and Management Study; IQR = interquartile range; NR = not reported.

Appendix E Table 5. Baseline Characteristics of Included Rescreening Studies for Small AAA (KQ 2)

Author, Year Quality	Major Inclusion Criteria	Mean AAA Size	Mean Age % Female	% Current Smoking	% Family History	% Diabetes	% CVD Risk Factors
D'Audiffret, 2002[121] Fair	Those with aortic diameters of 2.5–2.9 cm	2.7 cm	68.4 NR	81.6*	13.9	11.2	PAD: 12.5 HTN: 49.8 Hypercholesterolemia: 17.5
Deveraj, 2008[123] Fair	Men found to have ectatic aortas (2.6–2.9 cm in diameter) at first scan with a minimum of 1-year followup	2.8 cm	NR 0	NR	NR	NR	NR
Oliver-Williams, 2018[156] Good	Men ages 65–66 years at the time of original study who had aortic diameters <2.6 cm	1.7 cm (initial screening in years 2010–2015) 2.1 cm (initial screening in early 1990s)	65.3† 0	NR	NR	NR	NR
Lederle, 2000[138] Good	VA patients ages 50–79 years without AAA (aortic diameters of ≤3.0 cm) who were part of the ADAM trial	2.0 cm	66.0 2.4	14.6	6.0	17.6	HTN: 55.2 High cholesterol: 38.9 CAD: 36.6 Any atherosclerosis: 42.3
Lindholt, 2000[148] Fair	Men ages 65–73 years with either identified small AAA (2.5–2.9 cm) or those with a normal initial scan (along with 380 controls)	NR	65.6 0	NR	NR	NR	NR
Scott, 2001[165] Fair	Male patients with a normal aorta on their initial scan at age 65 years	NR	65 0	NR	NR	NR	NR

Author, Year Quality	Major Inclusion Criteria	Mean AAA Size	Mean Age % Female	% Current Smoking	% Family History	% Diabetes	% CVD Risk Factors
Soderberg, 2017[167] Fair	All 70-year-old women identified through the National Population Registry, in two neighboring counties in Sweden. Women diagnosed with subaneurysmal aortas (2.5–2.9 cm) were followed.	2.64 for 2.5–2.9 cm group	70 100	36	21‡	NR	Coronary disease: 12 HTN: 39 Hyperlipidemia: 36 Claudication: 9
		3.52 cm for ≥3.0 cm group	70 100	63	5‡	NR	Coronary disease: 16 HTN: 68 Hyperlipidemia: 47 Claudication: 11
Svensjo, 2014[169] Fair	2006–2007 All men age 65 years identified in the National Population Registry in Uppsala County. Rescanned 2011–2012. Men with a history of AAA repair were excluded from invitation.	1.85	70 0	NR	NR	NR	NR

* Defined as smoking history.
† Median.
‡ Family history defined as first-degree relative.

Abbreviations: AAA = abdominal aortic aneurysm; CAD = coronary artery disease; CVD = cardiovascular disease; HTN = hypertension; NR = not reported; PAD = peripheral artery disease; VA = Department of Veterans Affairs.

Appendix E Table 6. Quality of Life Results of Included One-Time Screening Studies (KQs 1 and 3)

Comparison	Author, Year Trial Name	Study Quality	N Randomized	Country	Mean Length of FU, years	Instrument	Group	Quality of Life Data
Screening vs. no screening	Ashton, 2007[113] (Men only) & Scott, 2002[36] (Women only) Chichester	Fair	15,382 Men: 6,040 Women: 9,342	UK	15.0 (Men only) 10 (Women only)	--	--	--
	Thompson, 2012[12, 170] MASS	Good	67,770	UK	13.1	SF-36, HADS, EQ-5D	Surgery	3 months Physical Health, mean: 50.0[‡] Mental Health, mean: 48.4[‖] Depression, mean: 3.0[‡] Anxiety, mean: 29.1[‡] Weighted Health Index, mean: 0.85[‡] 12 months Physical Health. mean: 51.1[‡] Mental Health, mean: 50.6[‡] Depression, mean: 3.1[‡] Anxiety, mean: 28.6[‡] Weighted Health Index, mean: 0.85[‡]
							Surveillance	3 months Physical Health, mean: 51.0[‡] Mental Health, mean: 51.7[‖] Depression, mean: 3.0[‡] Anxiety, mean: 28.9[‡] Weighted Health Index, mean: 0.83[‡] 12 months Physical Health, mean: 49.8[‡] Mental Health, mean: 50.1[‡] Depression, mean: 3.2[‡] Anxiety, mean: 29.6[‡] Weighted Health Index, mean: 0.83[‡]
	Lindholt, 2010[147] Viborg	Good	12,639	Denmark	13	--	--	--

Comparison	Author, Year Trial Name	Study Quality	N Randomized	Country	Mean Length of FU, years	Instrument	Group	Quality of Life Data
	Lindholt, 2017[146] VIVA	Fair	50,156 (Screening group n=25,078)	Denmark	4.4*	--	--	--
	McCaul, 2016[15, 168] Western Australia	Fair	38,480	Australia	12.8*	MOS SF-36; HADS, EQ-5D	AAA Group	12 months Physical Functioning, mean (SD): 62.9 (27.4)‖ Mental Health, mean (SD): 81.3 (15.9) Anxiety/Depression, mean (SD): 3.6 (3.0) Health States Score, mean (SD): 0.83 (0.18)
							CG	12 months Physical Functioning, mean (SD): 68.9 (25.8)‖ Mental Health, mean (SD): 78.3 (17.7) Anxiety/Depression, mean (SD): 3.6 (3.2) Health States Score, mean (SD): 0.80 (0.21)
Screening harms	Lesjak, 2012[141]	Fair	NR‡	Australia	6 month	MOS SF-36, HADS	AAA Group	*Physical Functioning* Prescreening score, mean (SD): 40.4 (10.7) Postscreening score, mean (SD): 41.1 (11.7) *Mental Health* Prescreening score, mean (SD): 49.6 (11.1) Postscreening score, mean (SD): 49.8 (11.9) *Depression* Prescreening score, mean (SD): 5.1 (4.1) Postscreening score, mean (SD): 5.5 (4.6)

Comparison	Author, Year Trial Name	Study Quality	N Randomized	Country	Mean Length of FU, years	Instrument	Group	Quality of Life Data
								Anxiety Prescreening score, mean (SD): 5.1 (3.9) Postscreening score, mean (SD): 5.9 (4.9)
							CG	*Physical Functioning* Prescreening score, mean (SD): 41.3 (11.7) Postscreening score, mean (SD): 44.3 (10.2) *Mental Health* Prescreening score, mean (SD): 51.6 (10.5) Postscreening score, mean (SD): 51.8 (10.7) *Depression* Prescreening score, mean (SD): 4.2 (3.3) Postscreening score, mean (SD): 4.1 (3.6) *Anxiety* Prescreening score, mean (SD): 5.3 (3.8) Postscreening score, mean (SD): 4.8 (3.7)
	Lucarotti, 1997[150]	Fair	NR	UK	1 month	GHQ	AAA Group	Prescreening score, mean (SD): 15.71 (9.13)‡ Postscreening score, mean (SD): 14.25 (7.68)‡
							CG	Prescreening score, mean (SD): 15.51 (9.17)‡ Postscreening score, mean (SD): 14.36 (7.28)‡
	Wanhainen, 2004[174]	Fair	NR	Sweden	1.0	SF-36	AAA Group	*Physical Health Cluster* Mean score before screening: 43‡ Mean score after screening: 43‡

Comparison	Author, Year Trial Name	Study Quality	N Randomized	Country	Mean Length of FU, years	Instrument	Group	Quality of Life Data
								Mental Health Cluster Mean score before screening: 52‖ Mean score after screening: 49‖
							CG	*Physical Health Cluster* Mean score before screening: 46‡ Mean score after screening: 44‡ *Mental Health Cluster* Mean score before screening: 51‡ Mean score after screening: 52‡

* Median.
† 53 men completed the questionnaire (out of 516).
‡ Between group: p = NS.
§ Within group: p = NS.
‖ $p<0.05$.

Abbreviations: AAA = abdominal aortic aneurysm; CG = Control group; EQ-5D = European Quality of Life; GHQ = General Health Questionnaire; HADS = Hospital Anxiety & Depression Scale; MASS = Multicenter Aneurysm Screening Study; MOS SF-36 = Medical Outcomes Short Form-36; NR = not reported; SD = standard deviation; SF-36 = Short Form-36; UK = United Kingdom.

Appendix E Table 7. Methodological and Intervention Characteristics of Included Treatment Studies (KQs 4 and 5)

Intervention	Study, Year	Quality	N randomized	Country	Mean followup, years	Intervention	Control
Open surgery vs. surveillance	Lederle, 2002[140] ADAM	Good	1,136	United States	4.9	Elective open surgery within 6 weeks of AAA identification	Surveillance until AAA reached 5.5 cm, enlarged by at least 0.7 cm in 6 months/1.0 cm in 1 year, or symptoms developed
	Powell, 2007[161-163] UKSAT	Good	1,090	United Kingdom	12	Elective open surgery within 3 months of AAA identification	Surveillance until AAA reached 5.5 cm, rapidly increased in diameter (>1 cm/year) or developed symptoms
EVAR vs. surveillance	Cao, 2011[118] CAESAR	Fair	360	20 European/Western Asian hospitals	2.6‡	Patients received surgery via EVAR as soon as possible	Surveillance until AAA reached 5.5 cm in diameter, a rapid increase of >1 cm/year was found, or the aneurysm became symptomatic
	Ouriel, 2010[158] PIVOTAL	Fair	728	United States	1.7	Patients underwent EVAR ≤30 days of randomization	Surveillance until AAA reached 5.5 cm or enlarged ≥0.5 cm between any two 6-month assessments
Pharmacotherapy vs. placebo	Bicknell, 2016[114] AARDVARK	Good	227	United Kingdom	2	10 mg perindopril (IG1) or 5 mg amlodipine (IG2) daily for 2 years	Placebo
	Hogh 2009[132]	Good	92	Denmark	5	300 mg oral roxithromycin once daily for 28 days	Placebo
	Karlsson, 2009[133]	Fair	247	Sweden	1.5	600 mg azithromycin once daily for 3 days, followed by 600 mg once a week for 15 weeks	Placebo
	Lindholt, 1999[142]‖	Fair	54	Denmark	2	40 mg propranolol twice a day for 2 years	Placebo
	Meijer, 2013[152]	Fair	286	The Netherlands	1.5	100 mg doxycycline daily for 18 months	Placebo

Intervention	Study, Year	Quality	N randomized	Country	Mean followup, years	Intervention	Control
	Mosorin, 2001[153]	Fair	32	Finland	1.5	150 mg doxycycline daily for 3 months	Placebo
	PAT Investigators, 2002[164] PAT	Good	552	Canada	2.5	20 mg propranolol twice a day; increased to 40 mg after 1 week, 80 mg after 2 weeks, and 120 mg at 4 weeks. Target dose was 80–120 mg twice a day. Patients observed for mean of 2.5 years	Placebo
	Sillensen, 2015[166] AORTA	Fair	168	Multisite[¶]	1	40 mg pemirolast twice a day[#] for 52 weeks	Placebo

* No AAA-related death was found in both groups.
† This study also reported 5-year followup data on growth rate.
‡ Median.
§ Due to a large loss to followup, efficacy data were not usable. However, these losses were due to adverse events so the harms data are included.
‖ This study is included for KQ5 (harms) only.
¶ 15 sites participated from Sweden, Denmark, and the United Kingdom.
\# Study also reports 10 mg twice a day and 25 mg twice a day.

Abbreviations: AAA = abdominal aortic aneurysm; ADAM = Abdominal Aortic Aneurysm Detection and Management Study; AORTA: the Anti-inflammatory Oral Treatment of AAA; CAESAR = Comparison of Surveillance vs. Aortic Endografting for Small Aneurysm Repair; N = sample size; NA = not applicable; EUROSTAR = European Collaborators on Stent-Graft Techniques for aAbdominal Aortic Aneurysm Repair; PAT = Propanolol Aneurysm Trial; PIVOTAL = Positive Impact of Endovascular Options for Treating Aneurysms Early; UKSAT = UK Small Aneurysm Trial.

Appendix E Table 8. Patient Characteristics of Included Treatment Studies (KQs 4 and 5)

Intervention	Study, Year	Major Inclusion Criteria	Mean Age % Female	AAA Diameter at Baseline, cm	% Current Smoking	% Family History	% CVD Risk Factors
Open surgery vs. surveillance	Lederle, 2002[140] ADAM	Patients ages 50–79 years with AAA 4.0–5.4 cm identified via CT within the previous 12 weeks	68.1 0.8	4.7	39.2	12.9	Coronary disease: 41.9 Cerebrovascular disease: 12.4 Hypertension: 56.4
	Powell, 2007[161-163] UKSAT	Patients ages 60–76 years with asymptomatic, small AAA (4.0–5.5 cm)	69.3 17.5	4.6	37.1	NR	Hypertension: 39 Probable ischemic heart disease: 14
EVAR vs. surveillance	Cao, 2011[118] CAESAR	Patients ages 50–79 years; nonsymptomatic AAA 4.1–5.4 cm in diameter measured by CT within the previous 3 months	68.9 4.2	4.7	55.3	NR	Coronary disease: 39.2 Hypertension: 75.3
	Ouriel, 2010[158] PIVOTAL	Patients ages 40–90 years with AAA between 4.0 and 5.0 cm found by CT performed ≤3 months prior; eligible for EVAR	70.5 13.4	4.4	91.0	23.5	MI: 31.3 CHF: 6.2 CAD: 55.4 PVD: 28.2 Hypertension: 77.8
Pharmacotherapy vs. surveillance	Hogh 2009[132]	AAA ≥3.0 cm detected by ultrasound the day of study entry; exclusively men	72.5 0	3.8	59.5	NR	NR
	Karlsson, 2009[133]	Patents aged ≤80 years with AAA 3.5–4.9 cm	71[†] 18.5	NR	40	14	MI: 31.0 Stroke: 14.1 Hypertension: 62.5
	Lindholt, 1999[142]	Men with AAA 3.0–4.9 cm	69.2 0	3.4	NR	NR	NR
	Meijer, 2013[152]	Aneurysm diameter 3.5–5.0 cm, or a larger aneurysm unfit for repair, or declined repair	70.0 18.2	4.3	35.0	25.2	History of CVD: 52.1
	Mosorin, 2001[153]	Aneurysm diameter perpendicular to the aortic axis of ≥3.0 cm in size or a ratio of	68.4 9.4	3.3	35.4	NR	Hypertension: 40.2

Intervention	Study, Year	Major Inclusion Criteria	Mean Age % Female	AAA Diameter at Baseline, cm	% Current Smoking	% Family History	% CVD Risk Factors
		infrarenal to suprarenal aortic diameter of ≥1.2 and a diameter <5.5 cm; followup of at least 6 months with two or more ultrasound examinations					
	PAT Investigators, 2002[164] PAT	Asymptomatic small AAA (3.0–5.0 cm; some centers only, 3.0–4.5 cm) measured by ultrasound; no contraindications to study drug	68.9 16	3.8	34.7	NR	Angina: 14.8 Heart failure: 2.0 Claudication: 19.2 Hyperlipidemia: 33.6 Hypertension: 35.8 MI: 16.9 Stroke: 6.3
	Bicknell, 2016[114] AARDVARK	Men or women age ≥55 years, with AAA 3.0–5.4 cm, and an SBP <150 mm Hg	71.3 5.8	4.0	25.0	NR	Hypertension: 0
	Sillensen, 2015[166] AORTA	Patients age ≥50 years with AAA 3.9–4.9 cm	70.9 8.9	4.4	41.1	NR	History of cardiac disorders: IG: 38.0 CG: 42.0

*Defined as angina, MI, arrhythmia, or heart failure.
†Median.
‡Mean.

Abbreviations: AAA = abdominal aortic aneurysm; ADAM = Abdominal Aortic Aneurysm Detection and Management Study; AORTA: the Anti-inflammatory Oral Treatment of AAA; CAD = coronary artery disease; CAESAR = Comparison of Surveillance Versus Aortic Endografting for Small Aneurysm Repair; CHF = congestive heart failure; CT = computed tomography; CVD = cardiovascular disease; EUROSTAR = European Collaborators on Stent-Graft Techniques for Abdominal Aortic Aneurysm Repair; EVAR = endovascular aneurysm repair; MI = myocardial infarction; NR = not reported; PAT = Propranolol Aneurysm Trial; PIVOTAL = Positive Impact of Endovascular Options for Treating Aneurysms Early; PVD = peripheral vascular disease; UKSAT = UK Small Aneurysm Trial.

Appendix E Table 9. Methodological Characteristics of Included Registry Studies (KQ5)

Author, Year Quality	Registry	Country	Recruitment	Mean Followup, years	Surgical Technique(s) Included	Population Characteristics in Patients With Small AAA	N (%) of Small AAA	Definition of Small AAA
Budtz-Lilly, 2017[116] Fair	Vascunet	International*	Data on primary intact AAA repairs were collected from vascular registries for the time period of 2005–2013. Data on small AAA <5.5 cm available for 2010–2013 time period. It was estimated that coverage of participating registries was >90% for the majority, 80% in Norway, and 62% in Australia.	NR	EVAR, open	Mean age (range): NR % Female: NR % Smokers: NR	12,610 (25.6)	<5.5 cm
Golledge, 2007[129] Fair	ASERNIP-S	Australia	Surgeries performed from November 1999 to May 2001 were recorded in the registry. Participation by vascular surgeons was initially enforced. An audit cross checking Health Insurance Commission data found >90% of procedures were included.	3.2 (Median)	EVAR	Mean age (range): 75 (NR) % Female: 15.9 % Current smokers: 11.0	478 (49.7)	≤5.5 cm

Author, Year Quality	Registry	Country	Recruitment	Mean Followup, years	Surgical Technique(s) Included	Population Characteristics in Patients With Small AAA	N (%) of Small AAA	Definition of Small AAA
Lo, 2013[149] Fair	VSGNE	US	Voluntary collaboration among vascular surgeons, cardiologists, and radiologists from 30 academic and community hospitals in New England. The data are validated periodically to ensure that all procedures are included in the registry. This publication analyzed 2003–2011 data.	1.0	EVAR, open	Mean age (range): 71 (NR) % Female: 26.2 % Smokers (past or current): 88.5	1,336 (37.1)	<5.5 cm
Overbey, 2017[159] Fair	ACS NSQIP	US	A nationally validated, risk-adjusted dataset comprising major surgical procedures and 30-day outcomes. Data are collected from medical charts by a trained Surgical Clinical Reviewer. This article is analysis of 2011–2015 data.	NR	EVAR, open	Mean age (range): 72.3 (NR) % Female: 21.9 % Current smokers: 33.6	5,126 (51.1)	Smallest quartile: 3.5–5 cm Second quartile: 5.01–5.5 cm

Author, Year Quality	Registry	Country	Recruitment	Mean Followup, years	Surgical Technique(s) Included	Population Characteristics in Patients With Small AAA	N (%) of Small AAA	Definition of Small AAA
Peppelenbosch, 2004[160] Fair	EUROSTAR	International†	110 European institutions participate in the registry. Patient data are recorded on case record forms and submitted. Only elective treatments are tracked. This article is an analysis of 1997–2002 data.	1.7	EVAR	Mean age (range): 69.7 (43–94) % Female: 7.0 % Smokers: NR	1,962 (44.7)	4.0–5.4 cm

* Eleven countries: Australia, Denmark, Hungary, Iceland, New Zealand, Norway, Sweden, Switzerland, United Kingdom, Finland (Helsinki region only), and Germany.
†Austria, Belgium, Denmark, United Kingdom, France, Germany, Greece, Israel, Italy, Luxembourg, Monaco, the Netherlands, Norway, Poland, Spain, Sweden, and Switzerland.

Abbreviations: AAA = abdominal aortic aneurysm; CAD = coronary artery disease; CT = computed tomography; CVD = cardiovascular disease; EUROSTAR = European Collaborators on Stent-Graft Techniques for Abdominal Aortic Aneurysm Repair; EVAR = endovascular aneurysm repair; MI = myocardial infarction; NR = not reported; PAT = Propranolol Aneurysm Trial; PIVOTAL = Positive Impact of Endovascular Options for Treating Aneurysms Early; PVD = peripheral vascular disease; US = United States.

Appendix E Table 10. Quality of Life Results in Studies of Treatment for Small AAA (KQs 4 and 5)

Intervention	Study	QOL Screening	Time Period	Treatment Group	N Analyzed	QOL Scores, Mean (SD)¶	Mean Difference (95% CI), P-Value
Open surgery vs. surveillance	Forbes 1998[127] UKSAT	MOS subscale*	Baseline	IG	480	Physical function: 64.2 (30.7) Mental health: 80.2 (17.2)	Physical function: -2.3 (-6.0 to 1.5); NR Mental health: 0.7 (-1.5 to 2.8); NR
				CG	512	Physical function: 66.5 (29.3) Mental health: 79.5 (17.0)	
			12 months post-randomization	IG	429	Physical function: 62.1 (29.9) Mental health: 81.7 (17.9) *Mean difference from BL:* Physical function: -3.5 (-6.1 to -0.8) Mental health: 0 (-1.5 to 1.5)	Physical function: 1.7 (-2.3 to 5.7) Mental health: 2.1 (-0.4 to 4.5)
				CG	436	Physical function: 60.3 (30.2) Mental health: 79.6 (18.6) *Mean difference from BL:* Physical function: -6.2 (-8.8 to -3.7) Mental health: 0 (1.7 to 1.8)	
EVAR vs. surveillance	De Rango 2011[122] CAESAR	SF-36*	Baseline through 6 months post-randomization	IG	173	*Mean difference (95% CI) from BL:* Overall QOL: 4.6 (2.3 to 7) Physical functioning: -0.6 (-3.7 to 2.4) Mental health: 5.2 (2.8 to 7.5)	*IG vs. CG* Overall QOL: 5.4 (2.1 to 8.8); p=0.002 Physical function: 3.8 (0.5 to 7.2); p=0.02 Mental health: 6.0 (2.7 to 9.3); p=0.0005
				CG	166	*Mean difference (95% CI) from BL:* Overall QOL: -0.8 (-3.2 to 1.6) Physical functioning: -4.3 (-7.3 to -1.2) Mental health: -0.8 (-3.2 to 1.5)	
			Baseline through end of followup[§]	IG	173	*Mean difference (95% CI) from BL:* Overall QOL: 4.6 (2.3 to 7) Physical functioning: -0.6 (-3.7 to 2.4) Mental health: 5.2 (2.8 to 7.5)	*IG vs. CG* Overall QOL: 2.4 (-1.7 to 6.6); p=0.25 Physical function: 1.5 (-2.6 to 5.5); p=0.48 Mental health: 2.0 (-2.4 to 6.4); p=0.38
				CG	166	*Mean difference (95% CI) from BL:* Overall QOL: -6.3 (-9.3 to -3.4)[‖] Physical functioning: -8.2 (-12.0 to -4.4) Mental health: 4.8 (-7.9 to -1.7)[‖]	
	Eisenstein, 2013[124] PIVOTAL	EQ-5D[#]	Baseline	IG	351	*Utility score: 0.805 (0.1)*** *Visual analog scale: 77.8 (14)*	NR
				CG	350	*Utility score: 0.783 (0.2)*** *Visual analog scale: 78.2 (15)*	
			24 months post-baseline	IG	205	*Utility score: 0.797 (0.2)*** *Visual analog scale: 76.2 (17)*	
				CG	197	*Utility score: 0.817 (0.2)*** *Visual analog scale: 76.5 (18)*	

Intervention	Study	QOL Screening	Time Period	Treatment Group	N Analyzed	QOL Scores, Mean (SD)¶	Mean Difference (95% CI), P-Value
Pharmacotherapy vs. surveillance	Lindholt 1999[142]	ScreenQL*†	Baseline through 2 y	IG	30	NR	Overall QOL: -5.83 (6.2)‡; p=0.05 Emotional domain: -0.35 (2.1)‡; p=0.59 Health perception: -1.39 (2.98)‡; p=0.13
				CG	24	NR	Overall QOL: -1.70 (5.5)‡; p=0.07 Emotional domain: 0.00 (2.0)‡; p=0.69 Health perception: -0.38 (2.10)‡; p=0.30
	PAT Investigators, 2002[164] PAT	SF-36*	Baseline	IG	276	Physical function: 70.8 (23.9) Mental health: 78.9 (17.3)	Physical function: p=0.11 Mental health: p=0.45
				CG	272	Physical function: 74.1 (24.0) Mental health: 77.8 (17.9)	
			1 month post-randomization	IG	276	Physical function: 68.9 (18.9) Mental health: 78.9 (17.6)	Physical function: p=0.006 Mental health: p=0.58
				CG	272	Physical function: 74.4 (23.8) Mental health: 78.3 (17.5)	

*Lower score denotes poorer status.
†A validated generic and global QOL questionnaire with 24 items evaluating six categories: general QOL, emotional health, physical health, psychosomatic distress, social and family functions, and marriage.
‡Mean (SD); change from baseline in each group, not IG vs. CG.
§Mean, 3 years from baseline (SD, 1.2 years).
‖p<0.01.
¶Only summary scores reported here. For complete subscales please see full text.
Utility score uses responses to the five dimensions (Mobility, Self-care, Usual activity, Pain/discomfort, Anxious/depressed) to compute a value on a scale of -0.54 to 1.00; higher utility score indicates a better quality of life and a negative value indicates a health state worse than death that can be used to quality-adjust study patient survival time. The final EQ-5D element, visual analog score (VAS), provides a one-question assessment of an individual's quality of life and ranges from 0 to 100, with a higher score indicating a better quality of life.
**Utility score N analyzed by group and followup: Baseline IG n = 348, CG n = 349; 24-month postbaseline IG n = 203, CG n = 191.

Abbreviations: BL = baseline; CAESAR = Comparison of Surveillance Versus Aortic Endografting for Small Aneurysm Repair; CG = control group; EVAR = endovascular aneurysm repair; IG = intervention group; MOS = Medical Outcomes Study; NR = not reported; PAT = Propanolol Aneurysm Trial; QOL = quality of life; SF-36 = Short-Form 36-Item Health Survey; UKSAT = UK Small Aneurysm Trial.

Appendix F. Subpopulation Evidence Tables

Appendix F Table 1. Mortality Data for Age Subpopulation in One-Time Screening Trials (KQ1a)

Author, Year Trial Name Quality	Mean Followup, years	Age Description	Group	N Analyzed	All-Cause Mortality, n (%)*	HR (95% CI)	AAA-Related Mortality, n (%)*	HR (95% CI)	30-Day Mortality, n (%)*	30-Day Mortality for Elective Repairs, n (%)*	30-Day Mortality For Emergency Repairs, n (%)*
Lindholt, 2010[147] Viborg Good	13	≤65 years	IG	2,742	NR	NA	6 (0.2)	0.36 (0.14–0.93)	NR	NR	NR
			CG	2,687	NR		16 (0.6)		NR	NR	NR
		66–73 years	IG	3,591	NR	NA	13 (0.4)	0.33 (0.18–0.62)	NR	NR	NR
			CG	3,619	NR		39 (1.1)		NR	NR	NR
		64–73 years Main trial results (see Table 2)	IG	-	-	-	19 (0.3)	0.34 (0.20–0.57)	-	-	-
			CG	-	-	-	55 (0.9)		-	-	-
McCaul, 2016[15] Western Australia Fair	12.8	65–74 years	IG	13,266	5,456 (41.1)	NR†	48 (0.4)	0.92 (0.62–1.36) †	14 (3.7)‡	6 (1.6)§	8 (57.1)‖
			CG	13,239	5,501 (41.6)		52 (0.4)		21 (6.9)‡	11 (4.0)§	10 (37.0)‖
		64-83 years Main trial results (see Table 2)	IG	19,249	9,739 (50.6)	NR†	90 (0.46)	0.91 (0.68–1.21)†	34 (6.0)#	18 (3.4)**	16 (61.5)††
			CG	19,231	9,832 (51.1)		98 (0.51)		36 (7.9)#	17 (4.1)**	19 (43.2)††

* P value for interaction NR.
† Rate ratio (95% CI). Rate ratios reported as AAA-related and non-AAA deaths, not available for all-cause mortality.
‡ N analyzed, IG: 382, CG: 303.
§ N analyzed for IG: 368, CG: 276.
‖ N analyzed for IG: 14, CG: 27.
\# N analyzed for IG: 562, CG: 458.
** N Analyzed for IG: 536, CG: 414.
†† N Analyzed for IG: 26, CG: 44.

Abbreviations: AAA = abdominal aortic aneurysm; CG = control group; CI = confidence intervals; HR = hazard ratio; IG = intervention group; N = population size; n = sample size; NA = not applicable; NR = not reported.

Appendix F. Subpopulation Evidence Tables

Appendix F Table 2. All-Cause and AAA-Related Mortality Data for Smoking Subpopulation in One-Time Screening Trials (KQ1a)*

Author, Year Trial Name Quality	Age	Outcome	Never Smoked, n (%)	Ever Smoked, n (%)	OR (95% CI)	P-Value for Interaction
McCaul, 2016[15] Western Australia Fair	64–83 years (screened)	AAA Mortality	4 (0.11)	28 (0.3)	2.95 (1.04–8.43)	NR
		All-cause Mortality	1,310 (36.2)	4,072 (47.4)	1.59 (1.47–1.72)	
	65–74 years (screened)	AAA Mortality	1 (0.04)	15 (0.2)	6.31 (0.83–47.81)	
		All-cause Mortality	707 (26.7)	2,502 (39.7)	1.81 (1.63–2.00)	

* These outcomes reflect rates in the screened group; there was no outcome reporting by smoking status in the unscreened group for comparison. This subgroup analysis does not address whether screening has a differential benefit in smokers.

Abbreviations: AAA = abdominal aortic aneurysm; CG = control group; CI = confidence intervals; IG = intervention group; N = population size; n = sample size; NA = not applicable; NR = not reported; OR = odds ratio.

Appendix F. Subpopulation Evidence Tables

Appendix F Table 3. AAA Prevalence, Rupture, and Surgery Data for Age Subpopulations in One-Time Screening Trials (KQ3a)

Author, Year Trial Name Quality	Mean Followup, years	Description	Group	N Analyzed	AAA Prevalence, n (%)	AAA Rupture, n (%)	HR (95% CI) for AAA Rupture	All AAA Procedures, n (%)	Elective Surgery, n (%)	Emergency Surgery, n (%)	P-Value for Interaction	HR (95% CI) for Emergency Surgery
McCaul, 2016[15] Western Australia Fair	12.8	Age 65–74 years	IG	13,266	785.6 (6.6)	NR	NR	382 (2.9)	368 (2.77)	14 (0.11)*	NR	NR
			CG	13,239	NR	NR		303 (2.3)	276 (2.08)	27 (0.20)*		
		Age 64–83 years Main trial results (see Table 1)	IG	19,249	879 (7.2)†	72‡	NR	562 (2.9)	536 (2.78)§	26 (0.14)*	NR	NR
			CG	19,231	NR	99		458 (2.4)	414 (2.15)	44 (0.23)*	NR	

* Total surgery for rupture.
† N analyzed for prevalence: 12,203.
‡ p=0.04.
§ p<0.001.

Abbreviations: AAA = abdominal aortic aneurysm; CG = control group; CI = confidence intervals; HR = hazard ratio; IG = intervention group; N = population size; n = sample size; NA = not applicable; NR = not reported.

Appendix F Table 4. AAA diameter, rupture, and surgery data for smoking subpopulations in one-time screening trials (KQ3a)

Author, Year Trial name Quality	Age	Outcome	Never Smoked, n (%)	Ever Smoked, n (%)	OR (95% CI)	P-Value for Interaction
McCaul, 2016[15] Western Australia Fair	64–83 years	AAA Diameter ≥3.0 cm	117 (3.24)	758 (8.83)	2.90 (2.37 to 3.53)	NR
		AAA Elective operations	45 (1.24)	360 (4.19)	3.47 (2.54 to 4.75)	
		AAA Ruptures	2 (0.06)	16 (0.19)	3.37 (0.78 to 14.68)	
	65–74 years	AAA Diameter ≥3.0 cm	55 (2.08)	496 (7.87)	4.03 (3.04 to 5.34)	
		AAA Elective operations	26 (0.98)	253 (4.01)	4.22 (2.81 to 6.33)	
		AAA Ruptures	1 (0.04)	11 (0.17)	4.63 (0.60 to 35.85)	

Abbreviations: AAA = abdominal aortic aneurysm; CG = control group; CI = confidence intervals; IG = intervention group; N = population size; n = sample size; NA = not applicable; NR = not reported; OR = odds ratio.

Appendix F Table 5. All-Cause and AAA Mortality Data for Age Subpopulations in Open vs. Surveillance Trials (KQ4a)

Study, Year Quality	Mean Followup, years	Description	Treatment Group	N Subgroup	All-Cause Mortality, n (%)	HR (95% CI)	P-Value for Interaction	AAA-Related Mortality, n (%)	HR (95% CI)
Lederle, 2002[140] ADAM Good	4.9	50–59 years	IG	47	8 (17.0)	1.02 (0.38–2.73)*	NR	NR	NR
			CG	51	8 (15.7)			NR	
		60–69 years	IG	251	61 (24.3)	1.34 (0.93–1.93)*		-	-
			CG	279	55 (19.7)			NR	NR
		70–79 years	IG	271	74 (27.3)	1.10 (0.78–1.55)*		NR	NR
			CG	237	59 (24.9)			NR	NR
Powell, 2007[161-163] UKSAT Good	12	60–66 years	IG	176	89 (50.6)	0.73 (0.55–0.99)	0.152	NR	NA
			CG	171	102 (59.6)			NR	
		67–71 years	IG	191	120 (62.8)	0.86 (0.66–1.11)		NR	NA
			CG	190	125 (65.8)			NR	
		72–76 years	IG	196	153 (78.1)	1.08 (0.79–1.38)†		NR	NA
			CG	166	125 (75.3)			NR	

* Relative risk.

† Primary adjustments made for age, sex, initial AAA diameter, smoking status, mean of left and right ankle-brachial pressure indexes, forced expiratory volume in 1 sec, and aspirin use.

Abbreviations: AAA = abdominal aortic aneurysm; ADAM = Abdominal aortic aneurysm Detection and Management study; CG = control group; CI = confidence interval; HR = hazard ratio; IG = intervention group; N = population size; n = sample size; NR = not reported; RR = relative risk; UKSAT = the UK Small Aneurysm Trial.

Appendix F. Subpopulation Evidence Tables

Appendix F Table 6. All-Cause and AAA Mortality Data for Sex Subpopulations in Open vs. Surveillance Trials (KQ4a)

Study, Year Quality	Mean Followup, years	Description	Treatment Group	N Subgroup	All-Cause Mortality, n (%)	HR (95% CI)	P-Value for Interaction	AAA-Related Mortality, n (%)	HR (95% CI)
Powell, 2007[161-163] UKSAT Good	12	Men	IG	468	299 (63.8)	0.90 (0.76–1.06)*	0.756	NR	NR
			CG	434	284 (65.4)			NR	
		Women	IG	95	63 (66.3)	0.89 (0.62–1.28)		NR	NR
			CG	93	68 (73.1)			NR	

***** Primary adjustments made for age, sex, initial AAA diameter, smoking status, mean of left and right ankle-brachial pressure indexes, forced expiratory volume in 1 sec, and aspirin use.

Abbreviations: AAA = abdominal aortic aneurysm; CG = control group; CI = confidence interval; HR = hazard ratio; IG = intervention group; N = population size; n = sample size; NR = not reported; RR = relative risk; UKSAT = the UK Small Aneurysm Trial.

Appendix F. Subpopulation Evidence Tables

Appendix F Table 7. All-Cause Mortality Data for Smoking Subpopulations in Open vs. Surveillance Trials (KQ4a)

Study, Year Quality	Mean Followup, years	Description	N Subgroup	All-Cause Mortality, n (%)	HR (95% CI)†, ‡	P-Value for Interaction
Powell, 2007[161-163] UKSAT Good	10*	Current Smoker (at baseline)	404	204 (50.5)	1.25 (1.03–1.53)	NR
		Former Smoker	620	259 (41.8)	1.00	
		Never Smoker	64	32 (50.0)	1.30 (0.88–1.92)	

*Data are from Powell 2002.[161]

† HRs and P-values determined by Cox proportional hazards regression analysis and adjusted for baseline age, sex, smoking status, aneurysm diameter, average of left and right ankle-brachial pressure indexes, forced expiratory volume in 1 sec, and use or nonuse of aspirin.

‡ This subgroup analysis reports all-cause mortality HRs by smoking status in the entire study population. It does not provide outcomes by IG and CG in smokers and nonsmokers so does not provide comparisons to determine if there is a differential treatment effect of early surgery by smoking status.

Abbreviations: AAA = abdominal aortic aneurysm; CG = control group; CI = confidence interval; HR = hazard ratio; IG = intervention group; N = population size; n = sample size; NR = not reported; RR = relative risk; UKSAT = the UK Small Aneurysm Trial.

Appendix G Box 1. Overall Summary (Contextual Question 2)

- Major risk factors confirmed to be: older age, male sex, smoking, family history.
- Older adults have higher prevalence and risk of rupture but also higher surgical mortality and competing causes of mortality compared to younger adults. Screening is only rational for surgical candidates. Validated surgical prognostic models are available for decision-making although some issues around predictive accuracy have been raised.
- Women have lower prevalence, higher rupture risk at same diameter but at older age than men. Women have higher surgical morbidity and mortality compared to men. While women female smokers have prevalence approaching that of men in the trials, their surgical morbidity and mortality remain higher than men. A 2018 DA estimated NNIS for 65-70 year old women 1800-3900 (compared to 700 for men).
- With declining prevalence of AAA, male smokers and those with family history have AAA prevalence that approach that of men in the landmark screening trials. There is no available evidence to suggest that smokers or those with family history have different surgical outcomes.

Overall Risk by Demographic Characteristics and Smoking Status: Large Cohort Studies and Contemporary Trial

These cohorts and one contemporary screening trial confirm that older age, male sex, smoking and family history are the strongest risk factors for AAA development.

Lifetime AAA prevalence from contemporary US cohort for age, sex, smoking, race[30]
ARIC Cohort: This cohort reported women have half to one-third the prevalence of AAA as men. Female current smokers have a similar risk as male former smokers. This study is a prospective, community cohort of 15,792 individuals recruited in the U.S. between 1987-1989 and followed through 2013. It reported an overall lifetime risk of developing a clinically significant AAA was 5.6% (95% CI 4.8-6.1). Risk was higher for men (8.2%), whites (6.5%), current smokers (10.5%) and those in the top 2 tertiles of smoking pack-years (9.0% and 11.1%). There was a gradient effect identified for the length of smoking years.

AAA prevalence risk from US self-referred, self-pay screening cohort[29, 179]
Life Line Screening Cohort: A self-referred, retrospective cohort of 3.1 million participants was analyzed to assess risk factors for developing AAA (US, 2003-2008). This population was fairly young (20% <50 yrs), 65% female, and predominantly white (87%). This analysis confirmed that male, smoking, increasing age, family history, and cardiovascular disease are factors that increase risk for developing AAAs. Protective factors were frequent exercise and consumption of nuts, fruits and vegetables. Smoking cessation also reduced risk. This pattern of risk factors mirrors the analysis done on this same dataset examining predictors of large AAA (size ≥5.0cm)

Risk factors in contemporary Danish screening population[22]
VIVA trial: The VIVA trial is a contemporary RCT in Denmark which randomizes male participants aged 65-74 yrs to screening for AAA, PAD, and hypertension or to usual practice of no systematic screening. 18,749 men attended screening and AAA was identified in 619 men (3.3%). Current smoking and family history were strong risk factors for identification of AAA. Current smoker n=258/619 OR 3.25 (2.76 - 3.84). First-degree relative with AAA n=41/619 OR 2.45 (1.76 - 3.41).

Prevalence

Women

The best available evidence estimating AAA prevalence in women is derived from a new meta-analysis by the SWANN collaborative. There is an additional large UK Lifeline cohort that was published subsequent to the meta-analysis.

AAA prevalence in women from meta-analysis of screening cohorts[23]
Overall pooled prevalence of AAA > 3.0 cm estimated to be 0.74% (95% CI 0.53, 1.03) with a higher prevalence in ever-smokers 1.34% (95% CI 0.82, 2.19) and a lower prevalence in never smoking women of 0.28% (95% CI 0.09, 0.93). These estimates are far lower than reported prevalence in men. This is a systematic review and meta-analysis of eight cohort studies (population-based, self-referral, and physician-initiated screening) of AAA screening of 1.5 million women age 60 years and older in Ireland, Italy, Norway, Sweden, UK, US. The range of prevalence reported in these studies was 0.31 to 1.46%.

AAA prevalence in UK self-referred, self-pay screening cohort[247]
Life Line Screening Cohort: The first 50,000 women self-referring and self-paying to attend the Life Line Screening program in the UK and Ireland (2012-2013) were included. The prevalence of AAA in women 66 to 85 yrs was 0.29% (72/25,170). The prevalence in nonsmoking women was 0.26%. In women younger than 66 years of age, the prevalence was 0.02%. In women 66-85 years with a 40-pack year history of smoking, prevalence was 2.14% but there were few women in this category (3/140) so this estimate lacks precision.

Smokers

With declining overall prevalence of AAA over the past 2 decades, one VA study suggests that contemporary male smokers have similar AAA prevalence to those of participants in the 4 landmark screening trials.

AAA prevalence male smokers in a contemporary cohort[212]
This study shows that the prevalence of male ever smokers reaches the prevalence seen in the major screening trials even though overall prevalence is decreasing. A regional VA health care network identified male smokers 65 to 75 yrs of age who had smoked at least 100 cigarettes in their lifetime and screened them for AAA between 2007 and 2011 (n=8,751). The prevalence of for any aneurysm ≥ 3.0 cm was 7.2% with 77.9% of the aneurysms identified measuring between 3.0 – 4.4 cm.

Family history

New evidence from a contemporary Danish screening trial reports that men with a family history of AAA have prevalence similar to those of participants in the 4 landmark screening trials.

AAA prevalence in those with a family history
Reported estimates of prevalence of AAA in those with a family history vary widely and are obtained using a variety of methodology.

The prevalence of AAA in 65 to 74 year old men with at least one first-degree relative with AAA was 6.7%.[217] This is double the prevalence of those without a family history reported in VIVA (3.0%) and having a female relative with the disease had a higher association with AAA risk (OR

4.32 if female first degree relative; OR 1.61 if male relative). The screened arm of the Danish VIVA trial is the only analysis we identified estimating the prevalence of familial AAA based on population-based screening (N=18,614 screened; 569 with a positive family history based on a questionnaire).

The prevalence of AAA in women with a positive family history in the Life Line Screening cohort (self-referred, self-pay US), was reported to be 1%.[11] This is still much lower than the prevalence of men in the screening trials.

AAA Rupture Risk for Subgroups

An IPDMA and large UK population cohort demonstrate that older adults, women, current smokers and those with high MAP have higher risk of rupture when controlled for other risk factors.

Small AAA rupture risk from meta-analysis of international studies[69]
Women and current smokers have the highest risk of rupture when controlling for the diameter of the AAA. Individuals under surveillance for small AAAs (n=15,475; k=18; Australia, Canada, Denmark, Norway, Spain, UK, US) were monitored for AAA growth and rupture. The influence of risk factors on rupture was evaluated in an individual patient meta-analysis. Authors found higher rupture rates for women (HR 3.76 [95% CI 2.58, 5.47]), current smokers (HR 2.02 [95% CI 1.33, 3.06]), and those with higher mean arterial blood pressure HR 1.32 [95% CI 1.11, 1.56]).

Large UK population cohort AAA rupture risk[38]
The Oxford Vascular Study was a prospective, population-based cohort in the UK (n=92,728, 2002-2014) that looked at the effect of patient characteristics on acute AAA events (AAA rupture or the symptomatic AAA). Men accounted for 72.8% of the acute events and incidence per 100,000 population per year greatly increased with age although current smokers incurred events at younger ages than ex-smokers or never-smokers. Wide confidence intervals make comparing rates in current female smokers and past male smokers difficult.

Operative Mortality and Complications

Women

A new meta-analysis reports consistent evidence showing that women have higher post-operative complication rates following EVAR and open repair.

A systematic review (k= 8, n=19,247)[202] found women had higher 30-day mortality compared to men in both EVAR and open repairs. Women had higher 30-day mortality (2.31%) than men (1.37%) after EVAR procedures OR 1.67 (95%CI 1.38, 2.04) and open repair (5.37% vs 2.82%) OR 1.76 (95% CI 1.35, 2.30).

Age

A new meta-analysis reports consistent evidence showing that octagenarians have higher post-operative complication rates following EVAR compared to younger adults.

Meta-analysis comparing surgical outcomes in ≥80 yr olds to <80 yr olds[180]
A systematic review and meta-analysis (k=9, n=25,723) of surgical outcomes in EVAR procedures

in patients ≥ 80 yrs compared to younger patients. Octogenarians had a higher 30-day mortality (3.7% vs 1.7%; OR 2.372 [1.992, 2.825]) and a higher rate of 30-day endoleak (25.83% vs 21.31%; OR 1.281 [1.183, 1.388]). Although, octogenarians had higher harms, the authors state that the absolute rates are acceptable.

Family History

A retrospective review of a large US surgical registry did not indicate that individuals with a family history have worse surgical outcomes than individuals without a family history.

Vascular Quality Initiative registry comparing surgical outcomes for those with and without a family history of AAA. [248]

Surgical outcomes were compared for patients with or without a family history of AAA in the VQI registry from 2003-2017. 1997 individuals were identified to have a family history and 18,815 were without a family history. Procedures included open repair and EVAR. No differences were identified in postoperative complications (p=0.510), 30-day mortality (p=0.177), or long-term mortality (p=0.259).

Current Clinical Practice: Surgical Threshold

New data from national registries demonstrate that AAA repair thresholds are lower in clinical practice for both men and women in the US compared to the UK; the US has lower AAA related deaths compared to the UK.

UK v US comparative data of contemporary surgical practice comparing surgical approaches and threshold for intervention in men and women[104]

It is much more common for men and women in the US to undergo repair prior to reaching the indicated surgical thresholds of 5.5 cm for men (39.21% vs 8.82%) and 5.0 cm for women (17.19% vs. 4.72%) compared to the UK. A review of registry data in England and US was undertaken to identify the frequency of AAA repair along with the aortic diameter at the time of repair (2005-2012; n=29,300 in England; n=278,921 in US). Repairs in the US were undertaken at a smaller diameter (5.83 cm vs 6.37 cm, p<0.001) although AAA-related death and hospitalization due to AAA rupture were more common in England.

Outcomes Table for Screening Women

A new decision-analysis with CEA reports that screening women is not cost effective and estimates NNIS of 3,900 to prevent 1 AAA death in women.

Decision-analysis of screening women (outcomes table)[210]

A decision analysis assessing AAA screening in women. If women were screened at age 65 years, 3,900 women would need to be invited to be screened to prevent one AAA-related death with an overdiagnosis rate of 33%. A second strategy of screening women at age 70 years would require 1,800 invitations to screen to prevent one AAA-death with an overdiagnosis rate of 55%. Uncertainty around the AAA prevalence in women makes it difficult to accurately estimate the effects of screening.

Appendix G. Additional Contextual Question 2 Evidence

Appendix G Table 1. Odds ratios of risk factors associated with developing AAAs (based on adjusted multivariate analyses)

Factors Associated With AAA	Any AAA ≥3 cm[29]	Any AAA ≥5 cm[179]
Male sex (vs. female sex)	5.71	7.70
Female sex (vs. male sex)	NR	NR
Age (vs. <55 years)		
55–59	2.76	3.20
60–64	5.35	8.10
65–69	9.41	13.20
70–74	14.46	20.70
75–79	20.43	32.0
≥80	28.37	53.10
Hispanic/black/Asian (vs. white)	0.69 to 0.72	0.70
Family history of AAA	3.80	3.20
Smoking: years (<10 years, 10 to 35 years, or >35 years) + PPD (≤0.5, 0.5 to 1, >1)	2.61 to 12.13	2.60 to 14.50
Smoking cessation (5 to 10 years, >10 years)	0.42 to 0.87	0.50 to 0.80
Diabetes	0.75	0.70
CVD morbidities	1.1 to 1.7	1.10 to 1.70

Abbreviations: AAA = abdominal aortic aneurysm; CVD = cardiovascular disease; NR = Not reported; PPD = packs per day.

Appendix G. Additional Contextual Question 2 Evidence

Trial Identifier	Study Name	Location	Participants N	Intervention	Outcome Measures	Status Aug 2018
NCT01756833	Non-Invasive Treatment of Abdominal Aortic Aneurysm Clinical Trial (N-TA^3CT) Michael Terrin	US	Men and women age 55 years and older N=261	Doxycycline 100 mg po bid for 2 years vs. placebo	AAA growth	Active, expected completion 2019. Protocol published 2016
NCT01683084	Study of the Effectiveness of Telmisartan in Slowing the Progression of Abdominal Aortic Aneurysms (TEDY) (Ronald L Dalman)	US	Adults ages 50 to 85 years N=22	Telmisartan 40 mg daily for 24 mo vs. placebo	Rate of AAA growth, AAA diameter, AAA biomarkers, QoL	Completed 2016. No result publication found. Protocol published 2015
NCT02717481	Using US to Evaluate Aortic Aneurysm Size Based on 3D Co-registration to Previous CT Scan (Diana Gaitini)	Israel	Men and women age 18 years and older diagnosed with AAA or following invasive repair N=120	Ultrasound	Primary: Exact and reliable evaluation of the aneurysm size Secondary: The size difference between systolic and diastolic aneurysm; aneurysm neck size and changes following an invasive procedure to repair it (EVAR); evaluation of the pressure on the aneurysmal wall	Not yet recruiting, expected completion 2018
NCT01205945	The Effect of Abdominal Aortic Aneurysm Screening on Mortality in Asian Population (Jin Hyun Joh)	South Korea	Men and women ages 50 to 85 years with CVD risk factors, family history of AAA N=12,000	Ultrasound	Benefits of screening older population	Ongoing, estimated completion 2017. No publications found.
NCT02345590	Eplerenone in the Management of Abdominal Aortic Aneurysms (Leah Isles)	Australia	Men and women ages 60 to 90 years with AAA 30 to 49 mm N=172	Eplerenone 25mg/day vs. placebo	AAA maximum orthogonal diameter	Ongoing, estimated completion 2019.
NCT02229006	Sodium Fluoride Imaging of Abdominal Aortic Aneurysms (SoFIA3) (Rachael O Forsythe)	UK	Men and women age 50 years and older in MA3RS study with AAA >40 mm N=100	Radiation: 18F-NaF PET-CT	Primary: Change in AAA anteroposterior diameter at 6 and 12 months measured with CTA Secondary: Co-localization of 18F-NaF with USPIO uptake on MRI scanning	Completed 2017. No publications found.

Appendix G. Additional Contextual Question 2 Evidence

Trial Identifier	Study Name	Location	Participants N	Intervention	Outcome Measures	Status Aug 2018
NCT02604303	A Prospective Analysis on the Expansion Rates of Abdominal Aortic Aneurysms (Eugene S. Lee)	US	Veteran men and women age 21 years and older screened for AAA by VA N=200	Observational using screening	Primary: aortic expansion rate measured with ultrasound Secondary: RhoA levels	Ongoing, expected completion Nov 2018.
NCT02070653	The Efficacy of Ticagrelor on Abdominal Aortic Aneurysm (AAA) Expansion (TicAAA) (Anders Wanhainen)	Sweden	Men and women ages 50 to 85 years with AAA 35 to 49 mm N=145	Ticagrelor 180 mg/day vs. placebo	Primary: AAA volume growth measured with MRI Secondary: AAA diameter growth measured with ultrasound and MRI; need for surgery; rupture	Completed 2018. No publications found.
NCT02548546	Estimation of Biomechanical Aortic Wall Properties in Healthy and Aneurysmal Aortas Using Novel Imaging Techniques (Houssam Farres)	US	Men and women age 21 years and older with AAA ≥1.5x normal diameter N=30	Surveillance vs. open repair vs. EVAR	Primary: ECHO imaging Secondary: ECG-gated MRA imaging	Ongoing (recruiting), expected completion Aug 2018.
NCT02225756	Cyclosporine A in Patients With Small Diameter Abdominal Aortic Aneurysms (ACA4) (Eric Allaire)	France	Men with AAA 30 to 49 mm, women with AAA 25 to 44 mm, 50 to 85 years N=360	Cyclosporine vs. placebo	Primary: AAA diameter evolution on CT-scanner 12 months after treatment interruption Secondary: AAA diameter evolution on duplex-scanner 12 months after treatment interruption; all-cause CV mortality/morbidity	Ongoing (recruiting), expected completion Sep 2018.
NCT02022436	Evaluation of Predictors of Aortic Aneurysm Growth and Rupture (Rabih Chaer)	US	Men and women age 21 years and older diagnosed with AAA N=148	Contrast ultrasound	Primary: time to growth and/or rupture of abdominal aortic aneurysm Secondary: AAA biomarkers	Ongoing (recruiting), expected completion Jul 2020.
NCT02179801	Screening Cardiovascular Patients for Aortic aNeurysms (SCAN) (Hans-Henning Eckstein, Karl-Ludwig Laugwitz)	Germany	Men any age with 1 or more risk factors for AAA and coronary artery intervention N=1,000	Ultrasound screening	Primary: prevalence of AAA Secondary: prevalence of AAA in the cohort requiring treatment; correlation of risk factors for AAA with risk factors for CAD; distribution of risk factors	Ongoing (recruiting), expected completion Apr 2018. No publications found.

Appendix G. Additional Contextual Question 2 Evidence

Trial Identifier	Study Name	Location	Participants N	Intervention	Outcome Measures	Status Aug 2018
NCT02846883	Safety and Efficacy of Allogeneic MSCs in Promoting T-regulatory Cells in Patients With Small Abdominal Aortic Aneurysms (VIVAAA) (Michael Patrick Murphy, Richard L. Roudebush)	US	Men and women ages 40 to 80 years diagnosed with AAA 35 to 45 mm	Intravenous infusion of 1 or 3 million allogeneic MSCs/kg vs. placebo	Primary: incidence of treatment-related adverse events at 12 months Secondary: changes in inflammatory AAA biomarkers; change in aortic inflammation measured by 18-FDG PET/CT	Ongoing (recruiting), expected completion 2021.
ISRCTN10945166	Abdominal Aortic Aneurysm Screening by Ultrasonography in Primary Care (Ana Claveria)	Spain	Men ages 65 to 74 years N=3,348	Screening	Primary: impact of early diagnosis on overall/CV mortality with incidental AAA Secondary: CV mortality; surgery for AAA; type of hospital discharge	Ongoing, expected completion 2021.
NCT01420991	Brain and Abdominal Aneurysm Study (BAAS) (James Meschia)	US	Men and women age 18 years and older diagnosed with intracranial aneurysm N=81	Opportunistic screening	Primary: prevalence of AAA Secondary: functional outcomes at 30 days	Ongoing, expected completion 2024.
NCT00662480	Randomized Preventive Vascular Screening Trial of 65-74 Year Old Men in the Central Region of Denmark (VIVA)	Denmark	40,000	Screening for hypertension, lower limb atherosclerosis, and abdominal aortic aneurysm	All-cause mortality, cardiovascular events	Active, expected completion Dec 2023. Median (4.4 year) results published in 2017.[146]
ISRCTN12157806	The Danish Cardiovascular Screening Trial (DANCAVAS) (Jes Lindholt)	Denmark	45,000	Large population-based, randomized, clinical multicenter trial testing combination cardiovascular screening in men ages 65 to 74 years	All-cause mortality, costs, and cost-effectiveness after 3, 5, and 10 years to assess possible health and/or societal benefits of the screening; nationwide registry-based information on health care consumption	Ongoing, expected completion Jan 2026. Protocol published 2015.