

Appendix D – Clinical evidence tables

Full citation	Brahmbhatt Reshma, Gander Jennifer, Duwayri Yazan, Rajani Ravi R, Veeraswamy Ravi, Salam Atef, Dodson Thomas F, and Arya Shipra (2016) Improved trends in patient survival and decreased major complications after emergency ruptured abdominal aortic aneurysm repair. Journal of vascular surgery 63(1), 39-47
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): USA and Canada</p> <p>Aim of the study: to identify risk adjusted predictors of 30-day morbidity and mortality after EVAR or open surgical repair of ruptured AAA</p> <p>Study dates: 2005 to 2011</p> <p>Follow-up: 30-days</p> <p>Sources of funding: the source of funding was not reported; however, authors stated that there were no conflicts of interest</p>
Participants	<p>Sample size: 2,761</p> <p>Inclusion criteria: people who underwent emergency EVAR or open surgical repair of ruptured AAA were included</p> <p>Exclusion criteria: patients under 16 years were excluded</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: 73.1 years • Sex: 75.9% male • Mean aneurysm diameter: not reported • Position of aneurysm: not reported • Comorbidities: not reported
Methods	<p>Data collection: data were obtained from the American College of Surgeons National Surgical Quality Improvement Programme (ACS NSQIP) database. The NSQIP database was made up of clinical information for major inpatient and outpatient surgical procedures performed at more than 200 participating hospitals throughout the United states and Canada. Participation in data collection was optional. Investigators identified the records of patients who underwent emergency aneurysm repair using ICD9 and Current Procedural Terminology and codes and noted in the NSQIP database.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Endpoint: 30-day mortality</p> <p>Risk factors: COPD, functional status, preoperative creatinine, age, intraoperative transfusion, and preoperative haematocrit</p>
Risk of bias assessment	1. Did the study address a clearly focused issue? Yes

Full citation	Brahmbhatt Reshma, Gander Jennifer, Duwayri Yazan, Rajani Ravi R, Veeraswamy Ravi, Salam Atef, Dodson Thomas F, and Arya Shipra (2016) Improved trends in patient survival and decreased major complications after emergency ruptured abdominal aortic aneurysm repair. Journal of vascular surgery 63(1), 39-47
(using CASP tool)	<p>2. Was the cohort recruited in an acceptable way? No – Hospital participation in entering data into the NSQIP database was optional. Furthermore, investigators identified patients who underwent emergency repair of ruptured AAA using ICD 9 and American Current Procedural Terminology codes.</p> <p>3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed patient data (including demographics and comorbidities) from a surgical registry to ascertain the presence/absence of risk factors</p> <p>4. Was the outcome accurately measured to minimise bias? Yes</p> <p>5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear</p> <p>6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes</p> <p>Other considerations: stepwise regression was not performed. Instead, all variables with p-values <0.2 in univariate analyses were included in a logistic regression model.</p> <p>Overall risk of bias: high</p> <p>Directness: directly applicable</p>

Full citation	Dueck Andrew D, Kucey Daryl S, Johnston K Wayne, Alter David, and Laupacis Andreas (2004) Survival after ruptured abdominal aortic aneurysm: effect of patient, surgeon, and hospital factors. Journal of vascular surgery 39(6), 1253-60
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): Canada</p> <p>Aim of the study: to determine the effects of patient, surgeon and hospital factors on survival after repair of ruptured AAA</p> <p>Study dates: April 1992 to March 2001</p> <p>Follow-up: 30 days</p> <p>Sources of funding: the source of funding was not reported; however, authors stated that there were no conflicts of interest</p>
Participants	<p>Sample size: 2,601</p> <p>Inclusion criteria: residents of Ontario who underwent emergency repair (unspecified) of ruptured AAA were included</p> <p>Exclusion criteria: non-residents of Ontario who underwent surgery in the province were excluded</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: 71.9 years • Sex: 81.2% male • Mean aneurysm diameter: not reported • Position of aneurysm: not reported • Comorbidities: not reported
Methods	<p>Data collection: who underwent emergency repair of ruptured AAA were identified using billing codes obtained from the Ontario Health Insurance Plan (OHIP) database, which captures 95% of physician billings in Ontario. Data relating to patient, surgeon and hospital factors were obtained from five data sources: OHIP, the Canadian Institute for Health Information database, the Ontario Physician human resources data centre, and census data.</p> <p>Analysis: multivariate Cox proportional hazards analysis</p>
Outcomes	<p>Endpoint: 30-day mortality (NB: authors described this as “decreased survival”)</p> <p>Risk factors: age and sex</p>
Risk of bias assessment (using CASP tool)	<ol style="list-style-type: none"> 1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? No – Patients were identified using billing codes from a health insurance provider database. 3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed four data sources (including health insurance provider and census data) to ascertain the presence/absence of risk factors 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear

Full citation	Dueck Andrew D, Kucey Daryl S, Johnston K Wayne, Alter David, and Laupacis Andreas (2004) Survival after ruptured abdominal aortic aneurysm: effect of patient, surgeon, and hospital factors. Journal of vascular surgery 39(6), 1253-60
	<p>6 (a) Was the follow up of subjects complete enough? Yes</p> <p>(b) Was the follow up of subjects long enough? Yes</p> <p>Other considerations: factors associated with survival were identified with a proportional hazards multivariate backward selection process</p> <p>Overall risk of bias: high</p> <p>Directness: directly applicable</p>
Full citation	Giles K A, Hamdan A D, Pomposelli F B, Wyers M C, Dahlberg S E, and Schermerhorn M L (2009) Population-based outcomes following endovascular and open repair of ruptured abdominal aortic aneurysms. Journal of Endovascular Therapy 16(5), 554-564
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): USA</p> <p>Aim of the study: to evaluate national outcomes after EVAR and open surgical repair of ruptured AAA</p> <p>Study dates: 2000 to 2005</p> <p>Follow-up: not reported</p> <p>Sources of funding: this study was supported by a grant from the American National Institutes of Health (NIH)</p>
Participants	<p>Sample size: 28,429</p> <p>Inclusion criteria: people who underwent emergency EVAR or open surgical repair of ruptured AAA were included</p> <p>Exclusion criteria: people younger than 18 years, people with a concomitant diagnosis of intact AAA, and people with thoracic or thoracoabdominal aneurysms were excluded</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: EVAR group, 75 years; open repair group, 73 years • Sex: EVAR group, 78% male; open repair group, 78% male • Mean aneurysm diameter: not reported • Position of aneurysm: Not specified • Hypertension: EVAR group, 51.6%; open repair group, 43.5% • Coronary artery disease: EVAR group, 28.1%; open repair group, 21.6% • Congestive heart failure: EVAR group, 17.8%; open repair group, 16.4% • Diabetes: EVAR group, 9.6%; open repair group, 8.8% • Chronic renal failure: EVAR group, 1.6%; open repair group, 1.2% • Cerebrovascular disease: EVAR group, 4.1%; open repair group, 3.8%

Full citation	Giles K A, Hamdan A D, Pomposelli F B, Wyers M C, Dahlberg S E, and Schermerhorn M L (2009) Population-based outcomes following endovascular and open repair of ruptured abdominal aortic aneurysms. Journal of Endovascular Therapy 16(5), 554-564
	<ul style="list-style-type: none"> • COPD: EVAR group, 29.9%; open repair group, 32.4%
Methods	<p>Data collection: data were obtained from the American Nationwide Inpatient Sample database; which covers approximately 20% of non-federal hospitalisations from 38 American states. Investigators identified patients with ruptured AAA using ICD9 procedure codes as well as Clinical Modification System codes. After identification of the sample, ICD9 diagnosis codes were used to identify comorbid conditions and complications.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Endpoint: in-hospital mortality</p> <p>Risk factors: age and sex</p>
Risk of bias assessment (using CASP tool)	<ol style="list-style-type: none"> 1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? No – investigators identified patients who underwent emergency repair of ruptured AAA using ICD 9 diagnosis/procedure codes and Clinical Modification System codes. 3. Was the exposure accurately measured to minimise bias? Yes – although investigators retrospectively reviewed patient diagnosis codes, the risk factors (age and sex) assessed in the multivariate regression are considered to be accurately measured. 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear 6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes <p>Other considerations: Multivariate analysis was performed by backwards selection of variables obtaining significance on univariate analysis</p> <p>Overall risk of bias: moderate</p> <p>Directness: directly applicable</p>
Full citation	Heller J A, Weinberg A, Arons R, Krishnasastri K V, Lyon R T, Deitch J S, Schulick A H, Bush H L, Jr , and Kent K C (2000) Two decades of abdominal aortic aneurysm repair: have we made any progress?. Journal of vascular surgery 32(6), 1091-100
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): USA</p> <p>Aim of the study: to investigate the incidence and outcome of AAA repair in America, over a 19-year period using a well-established national database</p>

Full citation	Heller J A, Weinberg A, Arons R, Krishnasastri K V, Lyon R T, Deitch J S, Schulick A H, Bush H L, Jr , and Kent K C (2000) Two decades of abdominal aortic aneurysm repair: have we made any progress?. Journal of vascular surgery 32(6), 1091-100
	Study dates: 1979 to 1997 Follow-up: not reported Sources of funding: the source of funding was not reported; however, authors stated that there were no conflicts of interest
Participants	Sample size: 67,751 Inclusion criteria: people who underwent emergency repair (unspecified) of ruptured AAA were included Exclusion criteria: not reported Baseline characteristics: <ul style="list-style-type: none"> • Median age: men, 72 years; women, 78 years • Sex: 77.6% male • Mean aneurysm diameter: not reported • Position of aneurysm: not reported • Comorbidities: not reported
Methods	Data collection: investigators obtained data from the American National Hospital Discharge Survey (NHDS) database. The data entered into the database were collected by evaluation of inpatient records from 500 acute care, non-federally funded hospitals. Two data collection processes were used: either hospital staff evaluated patient records and transcribed them into an NHDS medical abstract form, or an automated system was used to collect the data. Analysis: multivariate logistic regression
Outcomes	Endpoint: operative mortality; assumed to be 30-day or in-hospital mortality Risk factors: age, sex and renal failure
Risk of bias assessment (using CASP tool)	1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? No – investigators identified patients who underwent emergency repair of ruptured AAA using ICD 9 diagnosis/procedure codes and Clinical Modification System codes. 3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed data from a national hospital discharge database to ascertain the presence/absence of risk factors 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear 6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes

Full citation	Heller J A, Weinberg A, Arons R, Krishnasastri K V, Lyon R T, Deitch J S, Schulick A H, Bush H L, Jr , and Kent K C (2000) Two decades of abdominal aortic aneurysm repair: have we made any progress?. Journal of vascular surgery 32(6), 1091-100
	<p>Other considerations: stepwise regression was not performed. Instead, all variables with p-values <0.25 in univariate analyses were included in a logistic regression model.</p> <p>Overall risk of bias: high</p> <p>Directness: directly applicable</p>
Full citation	Korhonen S J, Ylonen K, Biancari F, Heikkinen M, Salenius J P, Lepantalo M, Finnvasc Study, and Group (2004) Glasgow Aneurysm Score as a predictor of immediate outcome after surgery for ruptured abdominal aortic aneurysm. The British journal of surgery 91(11), 1449-52
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): Finland</p> <p>Aim of the study: to assess the value of the Glasgow Aneurysm Score in predicting postoperative death after repair of ruptured AAA</p> <p>Study dates: January 1996 to December 1999</p> <p>Follow-up: 30-days</p> <p>Sources of funding: not reported</p>
Participants	<p>Sample size: 836</p> <p>Inclusion criteria: people who underwent emergency repair (unspecified) of ruptured AAA were included</p> <p>Exclusion criteria: not reported</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: 70.5 years • Sex: 87.1% male • Mean aneurysm diameter: not reported • Position of aneurysm: not reported • COPD: 13.4% • Coronary artery disease: 43.2% • Cerebrovascular disease: 13.4% • Renal failure: 3.3% • Hypertension: 37.2% • Diabetes: 6.7% • Hyperlipidaemia: 4.5%

Full citation	Korhonen S J, Ylonen K, Biancari F, Heikkinen M, Salenius J P, Lepantalo M, Finnvasc Study, and Group (2004) Glasgow Aneurysm Score as a predictor of immediate outcome after surgery for ruptured abdominal aortic aneurysm. The British journal of surgery 91(11), 1449-52
Methods	Data collection: investigators obtained preoperative, intraoperative and postoperative data from the Finnish national Vascular registry (Finnvasc) that collected data from 21 surgical centres across the country. Preoperative Glasgow Aneurysm Scale scores were not readily available from the Finnvasc registry. As a result, investigators had to calculate scores using information from the clinical profiles/records of patients' clinical reported in the registry Analysis: multivariate logistic regression
Outcomes	Endpoints: 30-day mortality Risk factors: shock and Glasgow Aneurysm Score
Risk of bias assessment (using CASP tool)	1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? Yes 3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed data from a vascular surgery registry to ascertain the presence/absence of risk factors 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Yes (b) Have they taken account of the confounding factors in the design and/or analysis? Yes 6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes Other considerations: logistic regression with backwards stepwise selection was employed for multivariate analyses Overall risk of bias: moderate Directness: directly applicable

Full citation	McPhee James, Eslami Mohammad H, Arous Elias J, Messina Louis M, and Schanzer Andres (2009) Endovascular treatment of ruptured abdominal aortic aneurysms in the United States (2001-2006): a significant survival benefit over open repair is independently associated with increased institutional volume. Journal of vascular surgery 49(4), 817-26
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): USA</p> <p>Aim of the study: to evaluate national outcomes of patients who underwent EVAR for ruptured AAA</p> <p>Study dates: 2001 to 2006</p> <p>Follow-up: not reported</p> <p>Sources of funding: authors received funding but it was not clear who funded them</p>
Participants	<p>Sample size: 27,750</p> <p>Inclusion criteria: people who underwent emergency EVAR or open surgical repair of ruptured AAA were included</p> <p>Exclusion criteria: people with ICD 9 codes indicating intact AAA were excluded</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: 73.1 years • Sex: 77.1% male • Mean aneurysm diameter: not reported • Position of aneurysm: not reported • Renal failure: 8.0% • Congestive heart failure: 2.8% • Diabetes: 8.8% • Chronic lung disease: 34.3% • Hypertension: 37.6% • Obesity: 3.6% • Liver disease: 0.96%
Methods	<p>Data collection: data were obtained from the American Nationwide Inpatient Sample database; which covers approximately 20% of non-federal hospitalisations from 38 American states. Investigators identified patients with ruptured AAA using ICD9 procedure codes as well as Clinical Modification System codes. After identification of the sample, ICD9 diagnosis codes were used to identify comorbid conditions and complications.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Endpoints: in-hospital mortality</p> <p>Risk factors: age, sex, congestive heart failure, hypertension, chronic lung disease, liver disease, renal failure, and diabetes</p>

Full citation	McPhee James, Eslami Mohammad H, Arous Elias J, Messina Louis M, and Schanzer Andres (2009) Endovascular treatment of ruptured abdominal aortic aneurysms in the United States (2001-2006): a significant survival benefit over open repair is independently associated with increased institutional volume. Journal of vascular surgery 49(4), 817-26
Risk of bias assessment (using CASP tool)	<p>1. Did the study address a clearly focused issue? Yes</p> <p>2. Was the cohort recruited in an acceptable way? No – investigators identified patients who underwent emergency repair of ruptured AAA using ICD 9 diagnosis/procedure codes.</p> <p>3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed patient diagnosis codes to ascertain the presence/absence of risk factors</p> <p>4. Was the outcome accurately measured to minimise bias? Yes</p> <p>5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear</p> <p>6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes</p> <p>Other consideration: it is unclear whether a stepwise approach was used in the logistic regression analysis</p> <p>Overall risk of bias: high</p> <p>Directness: directly applicable</p>

Full citation	Mureebe Leila, Egorova Natalia, McKinsey James F, and Kent K Craig (2010) Gender trends in the repair of ruptured abdominal aortic aneurysms and outcomes. Journal of vascular surgery 51(4 Suppl), 9S-13S
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): USA</p> <p>Aim of the study: to evaluate gender-specific trends in the diagnosis and treatment of ruptured AAA in the United States Medicare population</p> <p>Study dates: 1995 to 2006</p> <p>Follow-up: 30-days</p> <p>Sources of funding: no external funding was received</p>
Participants	<p>Sample size: 51,000</p> <p>Inclusion criteria: people who underwent emergency EVAR or open surgical repair of ruptured AAA were included</p> <p>Exclusion criteria: not reported</p> <p>Baseline characteristics: not reported</p>
Methods	<p>Data collection: most data were obtained from the Medicare Inpatient Standard Analytical file: a national database which collects data on all Medicare reimbursed hospitalisations. The Medicare Inpatient Standard Analytical file data were supplemented by data from other Medicare databases. Investigators identified patients with ruptured AAA using ICD9 procedure codes.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Endpoint: 30-day mortality</p> <p>Risk factors: age and sex</p>
Risk of bias assessment (using CASP tool)	<ol style="list-style-type: none"> 1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? No – investigators identified patients who underwent emergency repair of ruptured AAA using ICD 9 diagnosis/procedure codes 3. Was the exposure accurately measured to minimise bias? Yes – although investigators retrospectively reviewed patient diagnosis codes, the risk factors (age and sex) assessed in the multivariate regression are considered to be accurately measured 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear 6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes <p>Other considerations: it is unclear whether a stepwise approach was used in the logistic regression analysis</p> <p>Overall risk of bias: moderate</p>

Full citation	Noel A A, Gloviczki P, Cherry Jr, K J, Bower T C, Panneton J M, Mozes G I, Harmsen W S, Jenkins G D, Hallett Jr, and J W (2001) Ruptured abdominal aortic aneurysms: the excessive mortality rate of conventional repair. Journal of vascular surgery : official publication, the Society for Vascular Surgery [and] International Society for Cardiovascular Surgery, and North American Chapter 34(1), 41-46
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): USA</p> <p>Aim of the study: to review clinical variables affecting outcomes of all patients who underwent surgical repair for ruptured AAA at a single vascular centre</p> <p>Study dates: January 1980 to November 1998</p> <p>Follow-up: 30-days</p> <p>Sources of funding: not reported</p>
Participants	<p>Sample size: 413</p> <p>Inclusion criteria: patients who underwent EVAR or open surgical repair for ruptured AAA at a single centre were included</p> <p>Exclusion criteria: people with ruptured thoracoabdominal, isolated iliac artery aneurysms; pseudoaneurysms; or chronic, contained aneurysms were excluded</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: 74.3 years • Sex: 82% male • Mean aneurysm diameter: not reported • Position of aneurysm: not reported • Coronary artery disease: 48% • Peripheral vascular disease: 20% • Hypertension: 53% • Diabetes: 14% • COPD: 33% • Renal insufficiency: 13%
Methods	<p>Data collection: investigators identified the study sample and ascertained the presence of risk factors by retrospectively reviewing hospital records. Preoperative data included clinical presentation, haematocrit, blood pressure, APACHE</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Endpoint: 30-day mortality</p> <p>Risk factors: age, APACHE II score, cardiac arrest,</p>

Full citation	Noel A A, Gloviczki P, Cherry Jr, K J, Bower T C, Panneton J M, Mozes G I, Harmsen W S, Jenkins G D, Hallett Jr, and J W (2001) Ruptured abdominal aortic aneurysms: the excessive mortality rate of conventional repair. Journal of vascular surgery : official publication, the Society for Vascular Surgery [and] International Society for Cardiovascular Surgery, and North American Chapter 34(1), 41-46
Risk of bias assessment (using CASP tool)	<p>1. Did the study address a clearly focused issue? Yes</p> <p>2. Was the cohort recruited in an acceptable way? Yes</p> <p>3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed hospital records to ascertain the presence/absence of risk factors</p> <p>4. Was the outcome accurately measured to minimise bias? Yes</p> <p>5 (a) Have the authors identified all important confounding factors? Yes</p> <p>(b) Have they taken account of the confounding factors in the design and/or analysis? Yes</p> <p>6 (a) Was the follow up of subjects complete enough? Yes</p> <p>(b) Was the follow up of subjects long enough? yes</p> <p>Other considerations: stepwise selection was used to identify significant predictors</p> <p>Overall risk of bias: moderate</p> <p>Directness: directly applicable</p>

Full citation	Robinson William P, Schanzer Andres, Li Youfu, Goodney Philip P, Nolan Brian W, Eslami Mohammad H, Cronenwett Jack L, and Messina Louis M (2013) Derivation and validation of a practical risk score for prediction of mortality after open repair of ruptured abdominal aortic aneurysms in a US regional cohort and comparison to existing scoring systems. Journal of vascular surgery 57(2), 354-61
Study details	<p>Study design: prospective cohort study</p> <p>Location(s): USA</p> <p>Aim of the study: to develop a practical risk score for in-hospital mortality after open repair of ruptured AAA</p> <p>Study dates: 2003 to 2009</p> <p>Follow-up: not reported</p> <p>Sources of funding: no external funding was received</p>
Participants	<p>Sample size: 242</p> <p>Inclusion criteria: all patients who underwent open repair of ruptured AAA at 10 centres were included</p> <p>Exclusion criteria: not reported</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: not reported • Sex: 85.1% male • Mean aneurysm diameter: not reported • Position of aneurysm: not reported • Hypertension: 81.1% • Diabetes: 15.6% • Coronary artery disease: 11.6% • Congestive heart failure: 33.8% • COPD: 42.1% • Creatinine >2.1 mg/dL: 1.4%
Methods	<p>Data collection: trained nurses or clinical abstractors collected and entered data on over 100 clinical and demographic variables prospectively. Patients were evaluated for medical comorbidities as well as parameters reflective of preoperative severity of illness, including systolic blood pressure, history of preoperative cardiac arrest, haemoglobin, and creatinine. Research analysts were blinded to patient, surgeon and hospital identity.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Endpoint: in-hospital mortality</p> <p>Risk factors: age, cardiac arrest, and loss of consciousness,</p>

Full citation	Robinson William P, Schanzer Andres, Li Youfu, Goodney Philip P, Nolan Brian W, Eslami Mohammad H, Cronenwett Jack L, and Messina Louis M (2013) Derivation and validation of a practical risk score for prediction of mortality after open repair of ruptured abdominal aortic aneurysms in a US regional cohort and comparison to existing scoring systems. Journal of vascular surgery 57(2), 354-61
Risk of bias assessment (using CASP tool)	1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? Yes 3. Was the exposure accurately measured to minimise bias? Yes 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear 6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes Other considerations: stepwise elimination was used to identify variables independently predictive of mortality. Overall risk of bias: low Directness: directly applicable

Full citation	Robinson William P, Schanzer Andres, Aiello Francesco A, Flahive Julie, Simons Jessica P, Doucet Danielle R, Arous Elias, and Messina Louis M (2016) Endovascular repair of ruptured abdominal aortic aneurysms does not reduce later mortality compared with open repair. Journal of vascular surgery 63(3), 617-24
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): USA</p> <p>Aim of the study: to assess long-term mortality of patients who underwent EVAR or open surgical repair of ruptured AAA</p> <p>Study dates: 2003 to 2013</p> <p>Follow-up: 5 years</p> <p>Sources of funding: no external funding was received</p>
Participants	<p>Sample size: 1,109</p> <p>Inclusion criteria: people who underwent emergency EVAR or open surgical repair of ruptured AAA were included</p> <p>Exclusion criteria: Patients with missing data and prior aneurysm repair or other aortic surgery were excluded from the analysis</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: not reported • Sex: EVAR group, 78% male; open repair group, 78% male • Mean aneurysm diameter: not reported • Position of aneurysm: not reported • Hypertension: EVAR group, 79%; open repair group, 78% • Diabetes: EVAR group, 17%; open repair group, 15% • Coronary artery disease: EVAR group, 23%; open repair group, 25% • Congestive heart failure: EVAR group, 14%; open repair group, 8.9% • Coronary artery bypass grafting: EVAR group, 23%; open repair group, 20% • COPD: EVAR group, 33%; open repair group, 35% • Cerebrovascular disease: EVAR group, 2.8%; open repair group, 3.6% • Creatinine >2.1 mg/dL: EVAR group, 8.9%; open repair group, 10%
Methods	<p>Data collection: data on patients who underwent EVAR or open surgical repair of ruptured AAA were retrospectively obtained from the VQ1 database: a vascular surgery registry that incorporates data from over 300 academic and community hospitals.</p> <p>Analysis: Multivariate cox regression</p>
Outcomes	<p>Endpoint: 5-year mortality</p> <p>Risk factors: sex, age, systolic blood pressure, loss of consciousness, cardiac arrest, dialysis, and history of cerebrovascular disease</p>
Risk of bias assessment	<p>1. Did the study address a clearly focused issue? Yes</p> <p>2. Was the cohort recruited in an acceptable way? Yes</p>

Full citation	Robinson William P, Schanzer Andres, Aiello Francesco A, Flahive Julie, Simons Jessica P, Doucet Danielle R, Arous Elias, and Messina Louis M (2016) Endovascular repair of ruptured abdominal aortic aneurysms does not reduce later mortality compared with open repair. Journal of vascular surgery 63(3), 617-24
(using CASP tool)	3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed data from a vascular surgery registry to ascertain the presence/absence of risk factors 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear 6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes Other considerations: stepwise regression was performed Overall risk of bias: moderate Directness: directly applicable

Full citation	Schlosser Felix J. V, Vaartjes Ilonca, van der Heijden , Geert J M. G, Moll Frans L, Verhagen Hence J. M, Muhs Bart E, de Borst , Gert J, Tiel Groenestege, Andreas T, Kardaun Jan W. P. F, Reitsma Johannes B, van der Graaf , Yolanda , and Bots Michiel L (2010) Mortality after hospital admission for ruptured abdominal aortic aneurysm. <i>Annals of vascular surgery</i> 24(8), 1125-32
Study details	Study design: retrospective cohort study Location(s): Netherlands Aim of the study: to quantify age- and gender-specific mortality risks for patients hospitalised for ruptured AAA Study dates: January to December 1997 (1 year), and January to December 2000 (1 year) Follow-up: 5-years Sources of funding: the study was supported by a grant of Netherlands Heart Foundation
Participants	Sample size: 1,463 Inclusion criteria: people admitted to hospital with a ruptured AAA were included (type of repair aneurysm repair procedure was not specified) Exclusion criteria: people with a previous hospital admission for the same condition or other peripheral arterial disease were excluded Baseline characteristics: <ul style="list-style-type: none"> • Mean age: 73.3 years • Sex: 85.6% male • Mean aneurysm diameter: not reported • Position of aneurysm: not reported • Cardiovascular disease: 18.5% • Acute myocardial infarction: 2.8% • Ischaemic heart disease: 8.0% • Congestive heart failure: 2.1% • Diabetes: 2.7%
Methods	Data collection: data were obtained by linking 3 national databases: the Dutch Hospital Discharge Register, the population register, and Statistics Netherlands. Investigators identified the records of patients who underwent emergency aneurysm repair using ICD9 codes. The presence of risk factors was also ascertained using ICD9 codes; however, no information was available about the performed surgical procedure, the size of the AAA, or several potential important established risk factors (lipids, blood pressure, smoking, family history). Analysis: multivariate Cox proportional hazards survival analysis
Outcomes	Endpoint: 28-day, and 5-year mortality Risk factors: age, sex, diabetes, ischemic heart disease, congestive heart failure, and cerebrovascular disease
Risk of bias assessment	1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? No – investigators identified patients who underwent emergency repair of ruptured AAA using ICD 9 diagnosis/procedure codes

Full citation	Schlosser Felix J. V, Vaartjes Ilonca, van der Heijden , Geert J M. G, Moll Frans L, Verhagen Hence J. M, Muhs Bart E, de Borst , Gert J, Tiel Groenestege, Andreas T, Kardaun Jan W. P. F, Reitsma Johannes B, van der Graaf , Yolanda , and Bots Michiel L (2010) Mortality after hospital admission for ruptured abdominal aortic aneurysm. <i>Annals of vascular surgery</i> 24(8), 1125-32
(using CASP tool)	3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed patient diagnosis codes to ascertain the presence/absence of risk factors 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear 6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes Other considerations: it is unclear whether a stepwise approach was used in the logistic regression analysis Overall risk of bias: High Directness: directly applicable

Full citation	Trenner M, Haller B, Sollner H, Storck M, Umscheid T, Niedermeier H, and Eckstein H H (2015) Twelve years of the quality assurance registry on ruptured and non-ruptured abdominal aortic aneurysms of the German Vascular Society (DGG): Part 3: Predictors of perioperative outcome with a focus on annual caseload. English version. Gefasschirurgie 20(1), 32-44
Study details	<p>Study design: Germany</p> <p>Location(s): Retrospective cohort study</p> <p>Aim of the study: to assess clinical, morphological and structural predictors of increased mortality of patients undergoing EVAR or open surgical repair of ruptured and non-ruptured AAA</p> <p>Study dates: January 1999 to December 2010</p> <p>Follow-up: not reported</p> <p>Sources of funding: not reported</p>
Participants	<p>Sample size: 4,859</p> <p>Inclusion criteria: patients who underwent EVAR or open repair for ruptured or unruptured AAA. Analyses were stratified according to whether aneurysms had ruptured or not</p> <p>Exclusion criteria: Not reported</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean Age: 73.8 years • Sex: not reported • Mean aneurysm diameter: 7.6 cm • Position of aneurysm: 27.1% of patients had an iliac artery aneurysm • Comorbidities: Coronary Heart Disease, 71.6%; COPD, 56.3%; Creatinine > 2mg/dl, 24.5%
Methods	<p>Data collection: investigators obtained data from a German AAA quality assurance registry: 201 hospitals across Germany participated in data collection. Assessment of whether complications were present was performed at the discretion of the treating physician, according to general clinical standards.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Endpoint: in-hospital mortality</p> <p>Risk factors: age, AAA diameter, presence of iliac aneurysms</p>
Risk of bias assessment (using CASP tool)	<ol style="list-style-type: none"> 1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? Yes 3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed data from a quality assurance registry to ascertain the presence/absence of risk factors 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Unclear

Full citation	Trenner M, Haller B, Sollner H, Storck M, Umscheid T, Niedermeier H, and Eckstein H H (2015) Twelve years of the quality assurance registry on ruptured and non-ruptured abdominal aortic aneurysms of the German Vascular Society (DGG): Part 3: Predictors of perioperative outcome with a focus on annual caseload. English version. Gefasschirurgie 20(1), 32-44
	(b) Have they taken account of the confounding factors in the design and/or analysis? Unclear 6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes Other considerations: it is unclear whether a stepwise approach was used in the logistic regression analysis Overall risk of bias: moderate Directness: directly applicable

Full citation	Van Beek , S C, Reimerink J J, Vahl A C, Wisselink W, Reekers J A, Legemate D A, and Balm R (2014) Outcomes after open repair for ruptured abdominal aortic aneurysms in patients with friendly versus hostile aortoiliac anatomy. European Journal of Vascular and Endovascular Surgery 47(4), 380-387
Study details	<p>Study design: prospective cohort study</p> <p>Location(s): Netherlands</p> <p>Aim of the study: to assess the risk of mortality in patients with ruptured aortoiliac aneurysms that were unsuitable for EVAR</p> <p>Study dates: May 2004 to February 2011</p> <p>Follow-up: not reported</p> <p>Sources of funding: This study was partially funded by the AMC Foundation and the Netherlands Heart Foundation</p>
Participants	<p>Sample size: 208</p> <p>Inclusion criteria: people with ruptured aortoiliac aneurysms who underwent open surgical repair were included. All patients had aneurysms that were considered unsuitable for treatment with EVAR.</p> <p>Exclusion criteria: people who had previously undergone aortic reconstruction, had a ruptured AAA with an aortoenteric fistula, or whose anatomy was not classified, were excluded.</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: 74.3 years • Sex: 77% male • Mean aneurysm diameter: • Position of aneurysm: aortoiliac aneurysm • Cardiac comorbidity: 44% • Pulmonary comorbidity: 22% • Renal comorbidity: 13% • Cerebrovascular comorbidity: 17%
Methods	<p>Data collection: investigators recruited people who could not participate in the Amsterdam Acute Aneurysm (AJAX) due to 'hostile' aneurysm anatomies that precluded EVAR (as they automatically received open surgery). Mortality data were collected prospectively and verified by checking for errors in the communal registry of all death certificates in the Netherlands.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Endpoint: 30-day or in-hospital mortality (composite rate)</p> <p>Risk factors: age, sex, cardiac comorbidity (arrhythmia, cardiac surgery or myocardial infarction), COPD, renal comorbidity (history of chronic kidney failure or dialysis), cerebrovascular comorbidity previous history of transient ischemic attack or stroke) and the need for cardiopulmonary resuscitation</p>

Full citation	Van Beek , S C, Reimerink J J, Vahl A C, Wisselink W, Reekers J A, Legemate D A, and Balm R (2014) Outcomes after open repair for ruptured abdominal aortic aneurysms in patients with friendly versus hostile aortoiliac anatomy. European Journal of Vascular and Endovascular Surgery 47(4), 380-387
Risk of bias assessment (using CASP tool)	<p>1. Did the study address a clearly focused issue? Yes</p> <p>2. Was the cohort recruited in an acceptable way? Yes</p> <p>3. Was the exposure accurately measured to minimise bias? Yes</p> <p>4. Was the outcome accurately measured to minimise bias? Yes</p> <p>5 (a) Have the authors identified all important confounding factors? Yes</p> <p>(b) Have they taken account of the confounding factors in the design and/or analysis? Yes</p> <p>6 (a) Was the follow up of subjects complete enough? Yes</p> <p>(b) Was the follow up of subjects long enough? Yes</p> <p>Other considerations: it is unclear whether a stepwise approach was used in the logistic regression analysis</p> <p>Overall risk of bias: low</p> <p>Directness: directly applicable</p>

Full citation	Van Dongen , H P A, Leusink J A, Moll F L, Brons F M, De Boer , and A (1998) Ruptured abdominal aortic aneurysms: Factors influencing postoperative mortality and long-term survival. European Journal of Vascular and Endovascular Surgery 15(1), 62-66
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): Netherlands</p> <p>Aim of the study: To update mortality rates and long-term survival of patients admitted to the hospital with ruptured AAA and to study prognostic factors associated with mortality</p> <p>Study dates: January 1980 and January 1994</p> <p>Follow-up: 30 days</p> <p>Sources of funding: not reported</p>
Participants	<p>Sample size: 309</p> <p>Inclusion criteria: people who underwent open surgical repair (termed, laparotomy) of ruptured AAA were included. Rupture was defined as either evidence of retroperitoneal haematoma or free blood in the peritoneal cavity at the time of laparotomy.</p> <p>Exclusion criteria: not specified</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: 71 years • Sex: 89% male • Mean aneurysm diameter: not reported • Position of aneurysm: not reported • Comorbidities: not reported
Methods	<p>Data collection: data relating to patient demographics, comorbidities and in-hospital mortality were collected by retrospective review of patient records. Mortality after hospital discharge was determined by obtaining information from the administration of the municipality in which the patient had lived. If the patient had moved to another municipality the new address was requested and the procedure was repeated until the present place of residence or date of death was known.</p> <p>Analysis: multivariate logistic regression and Cox proportional hazards survival analysis</p>
Outcomes	<p>Endpoint: mortality within 48 hours, and 30-day mortality</p> <p>Risk factors: age and hypotension</p>
Risk of bias assessment (using CASP tool)	<ol style="list-style-type: none"> 1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? Yes 3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed hospital records to ascertain the presence/absence of risk factors 4. Was the outcome accurately measured to minimise bias? Yes

Full citation	Van Dongen , H P A, Leusink J A, Moll F L, Brons F M, De Boer , and A (1998) Ruptured abdominal aortic aneurysms: Factors influencing postoperative mortality and long-term survival. European Journal of Vascular and Endovascular Surgery 15(1), 62-66
	<p>5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear</p> <p>6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes</p> <p>Other considerations: it is unclear whether a stepwise approach was used in the logistic regression analysis Overall risk of bias: moderate Directness: directly applicable</p>
Full citation	Visser Jacob J, Williams Martine, Kievit Jur, Bosch Johanna L, and Group A Study (2009) Prediction of 30-day mortality after endovascular repair or open surgery in patients with ruptured abdominal aortic aneurysms. Journal of vascular surgery 49(5), 1093-9
Study details	<p>Study design: prospective cohort study Location(s): Netherlands Aim of the study: to identify risk factors that predict 30-day mortality for patients with ruptured AAA treated with endovascular repair or open surgery Study dates: December 2004 to October 2006 Follow-up: 30-days Sources of funding: The study was funded by Erasmus MC Health Care Efficiency grant and an unrestricted educational grant from the "Lijf en Leven" Foundation.</p>
Participants	<p>Sample size: 201 Inclusion criteria: people who presented with ruptured AAAs and were treated by EVAR or open surgical repair were included. Exclusion criteria: people were excluded if they died before AAA repair could be initiated Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: 73.3 years • Sex: 85.6% male • Mean aneurysm diameter: not reported • Position of aneurysm: infarenal, 58%; juxtarenal, 34%; suprarenal, 3%; not reported, 5% • Renal insufficiency: 11.9% • Diabetes: 10.4% • Hypertension: 44.3%

Full citation	Visser Jacob J, Williams Martine, Kievit Jur, Bosch Johanna L, and Group A Study (2009) Prediction of 30-day mortality after endovascular repair or open surgery in patients with ruptured abdominal aortic aneurysms. Journal of vascular surgery 49(5), 1093-9
	<ul style="list-style-type: none"> • Angina pectoris: 11.9% • Previous myocardial infarction: 23.4% • Heart failure: 10% • COPD: 23.4%
Methods	<p>Data collection: The study was performed across 5 hospitals in the Netherlands. Prospectively collected data included patient characteristics, renal insufficiency, diabetes, hypertension, angina pectoris, myocardial infarction, congestive heart failure, myocardial infarction, congestive heart failure or cerebrovascular disease, haemodynamic condition, presence of shock. In order to obtain information about 30-day mortality and the causes of death, medical records of the participating hospitals were prospectively reviewed.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Endpoint: 30-day mortality</p> <p>Risk factors: age, shock, myocardial disease (myocardial infarction and/or angina pectoris), cerebrovascular disease and renal failure</p>
Risk of bias assessment (using CASP tool)	<ol style="list-style-type: none"> 1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? Yes 3. Was the exposure accurately measured to minimise bias? Yes 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Unclear (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear 6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes <p>Other considerations: all variables considered in the Glasgow Aneurysm Scale were included in the multivariate logistic regression analysis</p> <p>Overall risk of bias: low</p> <p>Directness: directly applicable</p>

Full citation	Von Meijenfeldt, G C I, Ultee K H. J, Eefting D, Hoeks S E, Ten Raa, S , Rouwet E V, Hendriks J M, Verhagen H J. M, Bastos Goncalves, and F M (2014) Differences in mortality, risk factors, and complications after open and endovascular repair of ruptured abdominal aortic aneurysms. European Journal of Vascular and Endovascular Surgery 47(5), 479-486
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): Netherlands</p> <p>Aim of the study: to assess differences in postoperative complications and survival in people who underwent EVAR and open repair for ruptured AAA</p> <p>Study dates: January 2000 to June 2013</p> <p>Follow-up: 30-days</p> <p>Sources of funding: no external funding was received</p>
Participants	<p>Sample size: 221</p> <p>Inclusion criteria: people with ruptured AAA who underwent EVAR or open surgical repair were included</p> <p>Exclusion criteria: Patients with infected aneurysms and those having had prior aneurysm repair were excluded</p> <p>Baseline characteristics:</p> <ul style="list-style-type: none"> • Mean age: EVAR group, 72.1 years; open surgery group, 71.9 years • Sex: EVAR group, 93% male; open surgery group, 89% male • Mean aneurysm diameter: not reported • Position of aneurysm: all were infrarenal aneurysm • Comorbidities: not reported
Methods	<p>Data collection: investigators identified patients who underwent AAA repair procedures by retrospectively reviewing hospital records and operation codes. If confirmed, patient demographics, clinical baseline characteristics, intraoperative details, and clinical and laboratory outcome were obtained. Postoperative complications and events were retrieved from hospital registries. Survival status and the exact date of death of treated patients were obtained via the national civil registry.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Endpoint: 30-day or in-hospital mortality</p> <p>Risk factors: age, haemoglobin level, eGFR measurements, and presence of shock</p>
Risk of bias assessment (using CASP tool)	<ol style="list-style-type: none"> 1. Did the study address a clearly focused issue? Yes 2. Was the cohort recruited in an acceptable way? Yes 3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed hospital records to ascertain the presence/absence of risk factors 4. Was the outcome accurately measured to minimise bias? Yes 5 (a) Have the authors identified all important confounding factors? Unclear

Full citation	Von Meijenfeldt, G C I, Ultee K H. J, Eefting D, Hoeks S E, Ten Raa, S , Rouwet E V, Hendriks J M, Verhagen H J. M, Bastos Goncalves, and F M (2014) Differences in mortality, risk factors, and complications after open and endovascular repair of ruptured abdominal aortic aneurysms. European Journal of Vascular and Endovascular Surgery 47(5), 479-486
	(b) Have they taken account of the confounding factors in the design and/or analysis? Unclear 6 (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes Other considerations: stepwise regression was not performed. Instead, all significant variables in univariate analyses were included in a logistic regression model Overall risk of bias: high Directness: directly applicable