

Appendix D – Clinical evidence tables

Full citation	Ambler Graeme K, Gohel Manjit S, Mitchell David C, Loftus Ian M, Boyle Jonathan R, Audit , Quality Improvement Committee of the Vascular Society of Great Britain , and Ireland (2015) The Abdominal Aortic Aneurysm Statistically Corrected Operative Risk Evaluation (AAA SCORE) for predicting mortality after open and endovascular interventions. Journal of vascular surgery 61(1), 35-43
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): UK</p> <p>Aim of the study: to develop a reliable risk model for in-hospital mortality after AAA surgery and compare it with established risk assessment tools</p> <p>Study dates: February 2010 to April 2011</p> <p>Follow-up: not reported</p> <p>Sources of funding: not reported</p>
Participants	<p>Sample size: 8,088 patients in a derivation cohort and 2,694 in an external validation cohort (sex-specific proportions were not reported). For the purpose of this review, only analysis of the validation cohort will be considered.</p> <p>Inclusion criteria: patients who underwent elective EVAR or open repair (technique-specific proportions were not reported)</p> <p>Exclusion criteria: not reported</p> <p>Baseline characteristics</p> <ul style="list-style-type: none"> • Mean age: 74.9 years • Sex: 84.8% male • Mean aneurysm diameter: not reported • Diabetes: 11.8% • Cardiac disease:42.4%
Methods	<p>Data collection: data were obtained from a registry of prospectively recorded information called the UK National Vascular Database. The National Vascular Database collects clinical, demographic, and outcome data of patients undergoing key index vascular surgical procedures. Data entry exceeds 90% of cases in most regions. Multiple imputation was used to adjust for missing data.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Outcome: in-hospital mortality</p> <p>Risk assessment tools: Vascular Biochemical and Haematological Outcome Model (VBHOM), Physiological and Operative Severity Score for enUmeration of Mortality (POSSUM), Vascular Governance North West (VGNW) risk model for mortality, and the Medicare risk prediction tool</p>
Study Appraisal using CASP	<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

(Critical appraisal skills programme)	<p>3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed data from a vascular society registry to ascertain the presence/absence of risk factors used in the risk prediction models assessed in this study.</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 – retrospective cohort study in which confounding may not have been accurately assessed.</p> <p>(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</p> <p>(b) Was the follow up of subjects long enough? Yes</p> <p>Overall risk of bias: Moderate</p> <p>Directness: directly applicable</p>
Full citation	Biancari F, Heikkinen M, Lepantalo M, and Salenius J P (2003) Glasgow Aneurysm Score in patients undergoing elective open repair of abdominal aortic aneurysm: A Finnvasc study. European Journal of Vascular and Endovascular Surgery 26(6), 612-617
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): Finland, Netherlands, and UK</p> <p>Aim of the study: to determine whether the GAS predicts postoperative outcomes after open repair of AAA</p> <p>Study dates: January 1991 to December 1999</p> <p>Follow-up: not reported</p> <p>Sources of funding: nor reported</p>
Participants	<p>Sample size: 1,911; 87.5% (1672/1911) male</p> <p>Inclusion criteria: patients who underwent elective open repair of AAA</p> <p>Exclusion criteria: not reported</p> <p>Baseline characteristics</p> <ul style="list-style-type: none"> • Mean age: 68 years • Sex: 87.5% male • Mean aneurysm diameter: not reported • Comorbidities not reported
Methods	<p>Data collection: data were retrospectively obtained from a Finnish surgical registry. Pre-, intra- and postoperative data were prospectively collected and entered into the registry's database. Severe complications included sepsis, as well as cardiac, cerebrovascular, renal, pulmonary venous, and peripheral arterial complications. These were defined according to the registry criteria.</p> <p>Analysis: multivariate logistic regression</p>

Outcomes	Outcome: 30-day mortality, severe complications, cardiac complications ICU stay longer than 5 days Risk assessment tools: GAS
Study Appraisal using CASP (Critical appraisal skills programme)	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 surgical registry to ascertain the presence/absence of risk factors used in the risk prediction model assessed in this study. Authors acknowledge that risk factor definitions in the registry were country specific. 4. Was the outcome accurately measured to minimise bias? Yes 5. (a) Have the authors identified all important confounding factors? Unclear – retrospective cohort study in which confounding may not have been accurately assessed. (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 Overall risk of bias: Moderate Directness: directly applicable

Full citation	Biancari F, Hobo R, and Juvonen T (2006) Glasgow Aneurysm Score predicts survival after endovascular stenting of abdominal aortic aneurysm in patients from the EUROSTAR registry. The British journal of surgery 93(2), 191-4
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): Finland, Netherlands, and UK</p> <p>Aim of the study: to evaluate the efficacy of the GAS in predicting the survival of patients who underwent EVAR</p> <p>Study dates: October 1996 to March 2005</p> <p>Follow-up: up to 30 days</p> <p>Sources of funding: not specified</p>
Participants	<p>Sample size: 5,498; 94.1% (5,173/5,498) male</p> <p>Inclusion criteria: patients who underwent elective EVAR of aneurysms greater than 4.0 cm in diameter were included</p> <p>Exclusion criteria: patients with aneurysms less than 4.0 cm in diameter and those treated with a withdrawn endograft were excluded</p> <p>Baseline characteristics</p> <ul style="list-style-type: none"> • Median age: 72.7 years • Sex: 94.1% male • Median aneurysm diameter: 56 mm • Comorbidities not reported
Methods	<p>Data collection: data were obtained from a database (EUROSTAR registry) containing demographic and risk factor details, as well as outcomes of patients who had undergone EVAR procedures across various vascular units in Europe</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Outcome: 30-day mortality</p> <p>Risk assessment tools: GAS</p>
Study Appraisal using CASP (Critical appraisal skills programme)	<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 European EVAR registry to ascertain the presence/absence of risk factors used in the risk prediction model assessed in this study. 4. Was the outcome accurately measured to minimise bias? Yes 5. (a) Have the authors identified all important confounding factors? Unclear – retrospective cohort study in which confounding may not have been accurately assessed. (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear

Full citation	Biancari F, Hobo R, and Juvonen T (2006) Glasgow Aneurysm Score predicts survival after endovascular stenting of abdominal aortic aneurysm in patients from the EUROSTAR registry. The British journal of surgery 93(2), 191-4
	6. (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes Overall risk of bias: Moderate Directness: directly applicable
Full citation	Carlisle JB, Danjoux G, Kerr K. et al. (2015) Validation of long-term survival prediction for scheduled abdominal aortic aneurysm repair with an independent calculator using only pre-operative variables. Anaesthesia. 70 (6):654-65. doi: 10.1111/anae.13061.
Study details	Study design: retrospective cohort study Location(s): UK Aim of the study: to establish the discrimination and calibration of an external survival calculator based on general population survival, compared with the Kaplan–Meier estimate after scheduled repair of abdominal aortic aneurysm Study dates: 1999 to 2013 Follow-up: not reported Sources of funding: No external funding or competing interests were declared
Participants	Sample size: 1,096 patients in a validation cohort; 89.6% male Inclusion criteria: patients who underwent elective EVAR (44.1%) or open repair (55.9%) from 4 hospitals across England were included Exclusion criteria: not reported Baseline characteristics <ul style="list-style-type: none"> • Mean age: Newcastle, 74.3 years; Sheffield, 73.5 years; South Tees, 74.0 years; Torbay, 72.6 years • Sex: 89.6% male • Mean aneurysm diameter: not reported • Comorbidities not reported
Methods	Data collection: predictor variable data were obtained from anonymised records that hospitals routinely collected before scheduled repairs of abdominal aortic aneurysms. Survival data were obtained through assessment of NHS databases. Analysis: multivariate logistic regression
Outcomes	Outcome: mortality at 1, 2, 3 4 and 5 years Risk assessment tools: Carlisle Calculator

Study Appraisal using CASP (Critical appraisal skills programme)	<ol style="list-style-type: none">1. Did the study address a clearly focused issue? Yes2. Was the cohort recruited in an acceptable way? Yes3. Was the exposure accurately measured to minimise bias? Yes – although this is a retrospective cohort study there is little risk of bias due to the fact that data on exposure were directly obtained from hospital health records4. Was the outcome accurately measured to minimise bias? Yes5. (a) Have the authors identified all important confounding factors? Unclear – retrospective cohort study in which confounding may not have been accurately assessed. (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear6. (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes <p>Overall risk of bias: Moderate Directness: directly applicable</p>
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Full citation	Choke E, Lee K, McCarthy M, Nasim A, Naylor A R, Bown M, and Sayers R (2012) Risk models for mortality following elective open and endovascular abdominal aortic aneurysm repair: A single institution experience. European Journal of Vascular and Endovascular Surgery 44(6), 549-554
Study details	<p>Study design: prospective cohort study</p> <p>Location(s): UK</p> <p>Aim of the study: to develop and validate an “in-house” risk model for predicting perioperative mortality following elective AAA repair and to compare this with other models</p> <p>Study dates: January 2000 to October 2010</p> <p>Follow-up: not reported</p> <p>Sources of funding: the study was part funded by the British Society of Endovascular Therapy</p>
Participants	<p>Sample size: 1,153 patients in a derivation cohort and 343 in an external validation cohort (sex-specific proportions were not reported). For the purpose of this review, only analysis of the validation cohort will be considered.</p> <p>Inclusion criteria: patients undergoing elective EVAR or open repair. No further details were provided.</p> <p>Exclusion criteria: not reported</p> <p>Baseline characteristics</p> <ul style="list-style-type: none"> • Mean age: not reported • Sex: 88.9% male • Mean aneurysm diameter: not reported • Myocardial infarction within the last 10 years: 17.3% • Respiratory disease: 18.0% • Diabetes: 8.6% • Previous transient ischaemic attack or stroke: 8.9%
Methods	<p>Data collection: data were prospectively collected using a standardised proforma, adapted from a proforma produced by the UK National Vascular Database</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Outcome: The primary end point was the composite of 30-day and in-hospital death</p> <p>Risk assessment tools: Medicare risk prediction tool, VGNW risk model, GAS and an “in-house” risk calculator. The in-house risk calculator will not be considered in this review as bespoke risk assessment tools are not included in this question’s review protocol.</p>
Study Appraisal using CASP	<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

Full citation	Choke E, Lee K, McCarthy M, Nasim A, Naylor A R, Bown M, and Sayers R (2012) Risk models for mortality following elective open and endovascular abdominal aortic aneurysm repair: A single institution experience. European Journal of Vascular and Endovascular Surgery 44(6), 549-554
(Critical appraisal skills programme)	4. Was the outcome accurately measured to minimise bias? Yes 5. (a) Have the authors identified all important confounding factors? Unclear – minimal details were provided in the study manuscript. (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 Overall risk of bias: Low Directness: directly applicable

Full citation	Eslami Mohammad H, Rybin Denis, Doros Gheorghe, Kalish Jeffrey A, Farber Alik, Vascular Study Group of New, and England (2015) Comparison of a Vascular Study Group of New England risk prediction model with established risk prediction models of in-hospital mortality after elective abdominal aortic aneurysm repair. Journal of vascular surgery 62(5), 1125-33.e2
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): UK</p> <p>Aim of the study: to develop a risk prediction model using Vascular Study Group of New England (VSGNE) data and to compare it with established models</p> <p>Study dates: 2003 to 2013</p> <p>Follow-up: not reported</p> <p>Sources of funding: not reported</p> <p>Baseline characteristics</p> <ul style="list-style-type: none"> • Mean age: not reported • Sex: 77.5% male • Mean aneurysm diameter: people who underwent EVAR, 57.9 mm; people who underwent open surgery, 63.4 mm • Diabetes: 17.4% • Congestive heart failure: 8.8% • Myocardial disease: 32.5% • Vascular disease: 9.3%
Participants	<p>Sample size: 4,431; 77.5% (3,432/4,431) male</p> <p>Inclusion criteria: patients who underwent elective EVAR or open repair were included (technique-specific proportions were not reported)</p> <p>Exclusion criteria: patients who underwent emergency AAA repair, had prior aortic surgery, patients who had missing information in their records, and those who had a supra celiac clamp during aortic repair were excluded</p>
Methods	<p>Data collection: data were obtained from a database developed by a regional cooperative (35 academic and community hospitals) to collect data on patients who undergo vascular procedures</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Outcome: in-hospital mortality</p> <p>Risk assessment tools: Medicare risk assessment tool, VGNW risk model, GAS, and a risk prediction model derived from VSGNE data.</p> <p>Note - the VSGNE model assessed in this study is not the same as the Vascular Study Group of New England Cardiac Risk Index (VSG-CRI) model outlined in the review protocol. Furthermore, data relating to the VSGNE model cannot be considered as this is a seminal paper in which investigators created the model using a derivation cohort and did not validate it using an external validation cohort.</p>

Full citation	Eslami Mohammad H, Rybin Denis, Doros Gheorghe, Kalish Jeffrey A, Farber Alik, Vascular Study Group of New, and England (2015) Comparison of a Vascular Study Group of New England risk prediction model with established risk prediction models of in-hospital mortality after elective abdominal aortic aneurysm repair. Journal of vascular surgery 62(5), 1125-33.e2
Study Appraisal using CASP (Critical appraisal skills programme)	<ol style="list-style-type: none">1. Did the study address a clearly focused issue? Yes2. Was the cohort recruited in an acceptable way? Yes3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed data from a surgical registry to ascertain the presence/absence of risk factors used in the risk prediction model assessed in this study.4. Was the outcome accurately measured to minimise bias? Yes5. (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? Unclear – retrospective cohort study in which confounding may not have been accurately assessed.6. (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes <p>Overall risk of bias: Moderate Directness: directly applicable</p>

Full citation	Faizer Rumi, DeRose Guy, Lawlor D Kirk, Harris Kenneth A, and Forbes Thomas L (2007) Objective scoring systems of medical risk: a clinical tool for selecting patients for open or endovascular abdominal aortic aneurysm repair. Journal of vascular surgery 45(6), 1102-1108
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): Canada</p> <p>Aim of the study: to assess the utility of comorbidity-based objective scoring systems for defining subgroups of patients who might most benefit from open or endovascular aneurysm repair</p> <p>Study dates: January 1999 to December 2004</p> <p>Follow-up: up to 4 years</p> <p>Sources of funding: Not reported</p>
Participants	<p>Sample size: 862; 83% (716/862) male</p> <p>Inclusion criteria: patients who underwent elective EVAR (n=304) or open repair (n=558) of AAAs greater than 5.5 cm in diameter</p> <p>Exclusion criteria: Not reported</p>
Methods	<p>Data collection: data were obtained from a database of prospectively recorded information from a university-affiliated medical centre. The database contained patient demographic data, intervention modality, outcome and specific grading of a number of medical risk factors. All procedures were performed by one of four surgeons.</p> <p>Analysis: multivariate logistic regression</p> <p>Baseline characteristics</p> <ul style="list-style-type: none"> • Mean age: EVAR group, 75 years; open surgery group, 71 years • Sex: EVAR group, 86.2% male; open surgery group, 81.2% male • Mean aneurysm diameter: not reported • Asymptomatic coronary artery disease: EVAR group, 18.1%; open surgery group, 39.4% • Congestive heart failure: EVAR group, 18.1%; open surgery group, 39.4% • COPD: EVAR group, 44.7%; open surgery group, 11.6% • Chronic renal failure: EVAR group, 2.3%; open surgery group, 2% • Cerebrovascular disease: EVAR group, 3%; open surgery group, 2.2% • Hypertension: EVAR group, 85.9%; open surgery group, 86%
Outcomes	<p>Outcome: 30-day mortality</p> <p>Risk assessment tools: GAS, Leiden Scoring System, and Comorbidity Severity Score (CSS)</p>

Study Appraisal using CASP (Critical appraisal skills programme)	<ol style="list-style-type: none">1. Did the study address a clearly focused issue? Yes2. Was the cohort recruited in an acceptable way? Yes3. Was the exposure accurately measured to minimise bias? No – investigators retrospectively reviewed a database to ascertain the presence/absence of risk factors used in the risk prediction models assessed in this study.4. Was the outcome accurately measured to minimise bias? Yes5. (a) Have the authors identified all important confounding factors? Unclear – retrospective cohort study in which confounding may not have been accurately assessed. (b) Have they taken account of the confounding factors in the design and/or analysis? Unclear6. (a) Was the follow up of subjects complete enough? Yes (b) Was the follow up of subjects long enough? Yes <p>Overall risk of bias: Moderate Directness: directly applicable</p>
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Full citation	Giles Kristina A, Schermerhorn Marc L, O'Malley A James, Cotterill Philip, Jhaveri Ami, Pomposelli Frank B, and Landon Bruce E (2009) Risk prediction for perioperative mortality of endovascular vs open repair of abdominal aortic aneurysms using the Medicare population. Journal of vascular surgery 50(2), 256-62
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): USA</p> <p>Aim of the study: to developed a differential predictive model of perioperative mortality after AAA repair.</p> <p>Study dates: 2001 to 2004</p> <p>Follow-up: not reported</p> <p>Sources of funding: This study was supported by Harvard-Longwood research training programme in vascular surgery</p>
Participants	<p>Sample size: 22,860 patients in a derivation cohort and 22,860 in an external validation cohort; 80.4% (18,400/22,860) male. For the purpose of this review, only analysis of the validation cohort will be considered.</p> <p>Inclusion criteria: patients older than 67 years, with at least 2 years of prior medical claims, who underwent elective EVAR (n=11,415) or open repair (n=11,415) were included</p> <p>Exclusion criteria: patients with a diagnosis of ruptured AAA, thoracic aneurysm, thoraco-abdominal aneurysms, or aortic dissection, as well as patients who had procedure codes for repair of the thoracic aorta or visceral bypass were excluded</p> <p>Baseline characteristics</p> <ul style="list-style-type: none"> • Mean age: not reported • Sex: EVAR group, 80.7% male; open surgery group, 80.5% male • Mean aneurysm diameter: not reported • Chronic renal insufficiency: EVAR group, 4.0%; open surgery group, 3.8% • Myocardial infarction within 2 years: EVAR group, 8.2%; open surgery group, 8.0% • Vulvular heart disease: EVAR group, 11.3%; open surgery group, 10.5% • Congestive heart failure: EVAR group, 13.3%; open surgery group, 13.1% • Peripheral vascular disease: EVAR group, 21.0%; open surgery group, 20.4% • Cerebrovascular disease: EVAR group, 16.3%; open surgery group, 16.2% • Hypertension: EVAR group, 66.0%; open surgery group, 65.8% • Diabetes: EVAR group, 15.3%; open surgery group, 15.7% • COPD: EVAR group, 29.5%; open surgery group, 30.1%
Methods	<p>Data collection: data were obtained from a database of prospectively recorded information from databases of the US medical healthcare provider (Medicare). Investigators obtained data relating to claims, patient demographic information, inpatient and outpatient and survival information.</p> <p>Analysis: multivariate logistic regression</p>

Full citation	Giles Kristina A, Schermerhorn Marc L, O'Malley A James, Cotterill Philip, Jhaveri Ami, Pomposelli Frank B, and Landon Bruce E (2009) Risk prediction for perioperative mortality of endovascular vs open repair of abdominal aortic aneurysms using the Medicare population. Journal of vascular surgery 50(2), 256-62
Outcomes	Outcome: the primary endpoint was the composite of 30-day and in-hospital mortality Risk assessment tools: Medicare risk prediction tool
Study Appraisal using CASP (Critical appraisal skills programme)	<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 healthcare insurance provider data to ascertain the presence/absence of risk factors used in the risk prediction model assessed in this study. 4. Was the outcome accurately measured to minimise bias? No – the endpoint (mortality) was established using ICD-9-CM codes. 5. (a) Have the authors identified all important confounding factors? Unclear – retrospective cohort study in which confounding may not have been accurately measured. (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>Overall risk of bias: High Directness: directly applicable</p>

Full citation	Grant S W, Grayson A D, Purkayastha D, Wilson S D, McCollum C, participants in the Vascular Governance North West, and Programme (2011) Logistic risk model for mortality following elective abdominal aortic aneurysm repair. The British journal of surgery 98(5), 652-8
Study details	<p>Study design: prospective cohort study</p> <p>Location(s): UK</p> <p>Aim of the study: to develop a multivariable risk prediction model for 30-day mortality</p> <p>Study dates: September 1999 to October 2009</p> <p>Follow-up: up to 30 days</p> <p>Sources of funding: This study was funded by Manchester Surgical Research Trust</p>
Participants	<p>Sample size: 1,936 patients in a derivation cohort and 829 in an external validation cohort (sex-specific proportions were not reported) For the purpose of this review, only analysis of the validation cohort will be considered.</p> <p>Inclusion criteria: patients undergoing elective EVAR or open repair of AAA (technique-specific proportions were not reported)</p> <p>Exclusion criteria: not reported</p> <p>Baseline characteristics</p> <ul style="list-style-type: none"> • Mean age: not reported • Sex: 82.3% male • Maximal aneurysm diameter above 6 cm: 63.2% • Diabetes: 8.9% • History of myocardial infarction: 20.9% • Ischaemic heart disease: 39.3% • Respiratory disease: 28.2%
Methods	<p>Data collection: prospective data were collected on consecutive AAA repairs performed across 22 hospitals in England. All data including patient demographics, aneurysm diameter, comorbidities, preoperative medications, investigations, procedural details and outcomes were entered into a central database. Confirmation of any deaths that occurred after discharge, but within 30 days, was obtained using the National Strategic Tracing service.</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Outcome: 30-day mortality</p> <p>Risk assessment tools: VGNW risk model</p>
Study Appraisal using CASP	<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

Full citation	Grant S W, Grayson A D, Purkayastha D, Wilson S D, McCollum C, participants in the Vascular Governance North West, and Programme (2011) Logistic risk model for mortality following elective abdominal aortic aneurysm repair. The British journal of surgery 98(5), 652-8
(Critical appraisal skills programme)	<p>4. Was the outcome accurately measured to minimise bias? Yes</p> <p>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? 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>Overall risk of bias: Low Directness: directly applicable</p>
Full citation	Grant S W, Grayson A D, Mitchell D C, and McCollum C N (2012) Evaluation of five risk prediction models for elective abdominal aortic aneurysm repair using the UK National Vascular Database. The British journal of surgery 99(5), 673-9
Study details	<p>Study design: retrospective cohort study</p> <p>Location(s): UK</p> <p>Aim of the study: to evaluate the performance of five risk prediction models using the UK National Vascular Database</p> <p>Study dates: January 2008 to December 2010</p> <p>Follow-up: not reported</p> <p>Sources of funding: the study was funded by the UK NIHR HTA programme</p>
Participants	<p>Sample size: 10,891; 87.3% (9,503/10,891) male</p> <p>Inclusion criteria: patients undergoing elective EVAR (n=5,938) or open repair (n=4,953)</p> <p>Exclusion criteria: records from hospitals in the North West of England, which were used in the development of one of the risk prediction models, were excluded. All variables with 20% or more of missing data were excluded from the analysis.</p> <p>Baseline characteristics</p> <ul style="list-style-type: none"> • Mean age: 74.4 years • Sex: 82.8% male • Mean aneurysm diameter: 6.3 cm • Ischaemic heart disease: 31.8% • Previous myocardial infarction: 14.5% • Cardiac disease: 2.4% • Respiratory disease: 17.7%

Full citation	Grant S W, Grayson A D, Mitchell D C, and McCollum C N (2012) Evaluation of five risk prediction models for elective abdominal aortic aneurysm repair using the UK National Vascular Database. The British journal of surgery 99(5), 673-9
	<ul style="list-style-type: none"> Diabetes: 14.4%
Methods	Data collection: data were obtained from a vascular society registry called the UK National Vascular Database. The National Vascular Database collects data on a range of vascular surgical procedures from approximately 140 hospitals. Data included preoperative risk factors, laboratory test results, operative details, postoperative morbidity and in-hospital mortality. When a patient factor was missing from the database record, the factor was assumed to be absent for categorical variables, or replaced with the median value for continuous variables.
Outcomes	Outcome: in-hospital mortality Risk assessment tools: Medicare risk prediction tool, VGNW risk model, GAS, VBHOM, V-POSSUM
Study Appraisal using CASP (Critical appraisal skills programme)	<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 vascular society registry to ascertain the presence/absence of risk factors used in the risk prediction models assessed in this study. 4. Was the outcome accurately measured to minimise bias? Yes 5. (a) Have the authors identified all important confounding factors? Unclear – retrospective cohort study in which confounding may not have been accurately measured. (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>Overall risk of bias: Moderate Directness: directly applicable</p>
Full citation	Grant S W, Hickey G L, Carlson E D, and McCollum C N (2014) Comparison of three contemporary risk scores for mortality following elective abdominal aortic aneurysm repair. European Journal of Vascular and Endovascular Surgery 48(1), 38-44
Study details	<p>Study design: prospective cohort study Location(s): UK Aim of the study: to perform a contemporary prospective validation of the Medicare risk prediction tool, VGNW risk model, and British aneurysm repair risk models Study dates: April 2011 to March 2013 Follow-up: not reported Sources of funding: the study was partly funded by the UK National Institute for Health Research Health Technology Assessment (NIHR)</p>

Full citation	Grant S W, Hickey G L, Carlson E D, and McCollum C N (2014) Comparison of three contemporary risk scores for mortality following elective abdominal aortic aneurysm repair. European Journal of Vascular and Endovascular Surgery 48(1), 38-44
	HTA) programme
Participants	<p>Sample size: 1,124; 87.8% (931/1,124) male</p> <p>Inclusion criteria: patients undergoing elective EVAR (n=759) or open repair (n=365)</p> <p>Exclusion criteria: patients undergoing thoraco-abdominal or isolated iliac aneurysm repairs were excluded</p> <p>Baseline characteristics</p> <ul style="list-style-type: none"> • Mean age: not reported • Sex: 87.3% male • Mean aneurysm diameter: not reported • Cardiac disease: 40.1% • Renal dialysis: 0.6%
Methods	<p>Data collection: prospective data were collected on consecutive AAA repairs performed across 17 hospitals in England. Data were cleaned by removing duplicate records and correcting any transcriptional discrepancies and resolving any clinical and temporal conflicts. Missing data were imputed with the sample median (continuous or ordinal variables) or mode (dichotomous variables).</p> <p>Analysis: multivariate logistic regression</p>
Outcomes	<p>Outcome: in-hospital mortality</p> <p>Risk assessment tools: Medicare risk prediction tool, VGNW risk model for mortality, and the British Aneurysm Repair (BAR) score. The British aneurysm repair score will not be considered in this review as it is not specified in the review protocol.</p>
Study Appraisal using CASP (Critical appraisal skills programme)	<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? Yes (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>Overall risk of bias: Low</p> <p>Directness: directly applicable</p>