Exercise

Full citation	**Barakat H M, Shahin Y, Khan J A et al. (2016) Preoperative supervised exercise improves outcomes after elective abdominal aortic aneurysm repair. Annals of Surgery 264, 47-53**
Study details	Study type: randomised, non-blinded trial Location(s): UK Aim(s): to assess the impact of a preoperative medically supervised exercise programme on postoperative outcomes of elective AAA repair Study dates: September 2009 to January 2014 Follow-up: 3 months Sources of funding: University of Hull (self-funded)
Participants	Population: patients with AAAs undergoing EVAR or open surgical repair. Sample size: 124; 89.5% (111/124) male Inclusion criteria: patients older than 18 years with AAAs greater than 5.5 cm in diameter were included Exclusion criteria: thoracic aortic aneurysms, presence of factors that would limit exercise participation, patients requiring expedited or urgent aneurysm repair Baseline characteristics: • Mean age: Exercise group, 73.8 years; control group, 72.9 years • Sex: Exercise group, 90.3% male; control group, 88.7% male • Mean aneurysm size: Exercise group 6.0 cm; control group, 6.3 cm • Hypertension: Exercise group, 72.6%; control group, 69.4% • Coronary artery disease: Exercise group, 38.7%; control group, 37.1% • Hyperlipidaemia: Exercise group, 43.5%; control group, 40.3% • Peripheral artery disease: Exercise group, 14.5%; control group, 12.9% • Diabetes: Exercise group, 6.5%; control group, 14.5% • Cerebrovascular disease: Exercise group, 16.1%; control group, 17% • COPD: Exercise group, 29.0%; control group, 37.1%
Intervention	Hospital based exercise classes: Patients attended 1 hour-long classes, 3 times a week. Exercises comprised a 5-minute warm up, using a cycle ergometer, heel-raise repetitions, knee extensions, dumbbells' biceps/arm curls, step-up lunges, knee bends (bodyweight), and 5 minutes for cool down and stretching.
Comparison	No exercise (controls)

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Outcomes measures	The primary outcome was the composite rate of cardiac, pulmonary, and renal complications. Secondary outcomes included length of stay, APACHE II scores, occurrence of systematic inflammatory response syndrome, mortality, and bleeding requiring reoperation or transfusion.
Risk of bias assessment (using Cochrane risk of bias tool)	1. Random sequence generation (selection bias): Low risk – Randomisation was performed using a computer-generated sequence prepared by an independent professional 2. Allocation concealment (selection bias): Low risk – Randomisation was performed using opaque, sealed, identical 3. envelopes containing the treatment allocation 4. Blinding of participants and personnel (performance bias): Low risk – It was not possible to blind participants but this was unlikely to bias results as objective outcomes were measured 5. Blinding of outcome assessment (detection bias): Low risk – Clinicians including consultant surgeons, anaesthetists, medical staff and interventional radiologists were blinded to group allocations 6. Incomplete outcome data (attrition bias): Low risk – There were no losses to follow-up. 7. Selective reporting (reporting bias): Low risk – All pre-specified outcomes were reported. 8. Other bias: Low risk – none identified Overall risk of bias: Low Directness: directly applicable

Full citation	**Dronkers J, Veldman A, Hoberg E et al. (2008) Prevention of pulmonary complications after upper abdominal surgery by preoperative intensive inspiratory muscle training: a randomized controlled pilot study. Clinical rehabilitation 22, 134-42**
Study details	Study type: randomised, single-blind trial Location(s): Netherlands Aim(s): to investigate the effects of preoperative inspiratory muscle training on the incidence of atelectasis in patients at high risk of pulmonary complications scheduled for elective AAA surgery Study dates: not reported Follow-up: 7 days Sources of funding: not reported
Participants	Population: patients with AAAs undergoing elective surgical repair (not specified) who were considered to have a high risk of pulmonary complications. Sample size: 20; 20% (5/15) male Inclusion criteria: patients who were due to undergo AAA surgical repair, with a scheduled delay of at least 2 weeks, and at least 1 of the following risk factors were included: age over 65 years, smoking within 2 months before surgery, presence of COPD, and a BMI greater than 27 were included Exclusion criteria: cerebrovascular disorders, neuromuscular diseases, a history of lung surgery, cardiovascular instability, receiving immunosuppressive treatment within 30 days of surgery, or treatment by a physical therapist within 8 weeks of surgery Baseline characteristics: • Mean age: Exercise group, 70 years; control group, 59 years • Sex: Exercise group, 80% male; control group, 70% male • Mean aneurysm size: not reported • COPD: Exercise group, 10%; control group, 10%
Intervention	Inspiratory muscle training: Patients took part in a training programme involving one 15-minute exercise session, 6 days a week, for at least 2 weeks prior to surgery. One session per week was supervised by the same physical therapist and the other 5 sessions were unsupervised.
Comparison	No exercise
Outcomes measures	Outcomes included incidence of atelectasis, patient satisfaction, and respiratory function.
Risk of bias assessment (using	1. Random sequence generation (selection bias): Unclear risk – Authors state that an independent research assistant randomly assigned patients to treatment groups. No further information was provided. 2. Allocation concealment (selection bias): Low risk – Group allocations were concealed using sealed and numbered envelopes.

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Cochrane risk of bias tool)	3. Blinding of participants and personnel (performance bias): Low risk – It was not possible to blind participants but this was unlikely to bias results as objective outcomes were measured. 4. Blinding of outcome assessment (detection bias): Low risk – Assessment of the primary outcome (atelectasis) was performed by radiologists who were blinded to treatment outcomes. 5. Incomplete outcome data (attrition bias): Low risk – Authors presented results based using an intention-to treat approach and presented final follow up results. All participants were accounted for. 6. Selective reporting (reporting bias): Low risk – All pre-specified outcomes were reported. 7. Other bias: Low risk – none identified. Overall risk of bias: Low Directness: directly applicable

Full citation	**Tew GA, Batterham AM, Colling K, et al. (2017) Randomized feasibility trial of high-intensity interval training before elective abdominal aortic aneurysm repair. The British journal of surgery 104(13), 1791-1801**
Study details	Study type: randomised, single-blind trial Location(s): UK Aim(s): to assess the feasibility of a preoperative high-intensity interval training (HIT) programme in patients awaiting elective abdominal aortic aneurysm repair Study dates: not reported Follow-up: 12 weeks Sources of funding: This study was funded by the National Institute for Health Research under its Research for Patient Benefit Programme
Participants	Population: patients with unruptured AAAs undergoing elective EVAR or open surgical repair Sample size: 53; 94.3% (50/53) male Inclusion criteria: patients > 18 years, with infrarenal AAAs 5.5 to 7.0 cm in diameter who were due to undergo AAA surgical repair open repair or EVAR were included Exclusion criteria: AAA managed non-operatively, not an infrarenal aneurysm (juxtarenal, suprarenal or thoracic), infrarenal AAA diameter exceeding 7·0 cm, emergency AAA repair, contraindication to exercise testing or training Baseline characteristics: • Mean age: Exercise group, 74.6 years; control group, 74.9 years • Sex: Exercise group, 92.6% male; control group, 96.2% male • Mean aneurysm size: Exercise group 6.0 cm; control group, 5.8 cm • Coronary artery disease: Exercise group, 40.7%; control group, 53.8% • Cerebrovascular disease: Exercise group, 25.9%; control group, 26.9% • Peripheral arterial disease: Exercise group, 0%; control group, 7.7% • Diabetes: Exercise group, 14.8%; control group, 7.7% • COPD: Exercise group, 22.2%; control group, 26.9%
Intervention	HIT: Patients in the exercise group were invited to complete three hospital-based exercise sessions per week, for the 4 consecutive weeks immediately preceding their intended operation date
Comparison	No exercise
Outcomes measures	Adverse events, quality of life, and length of stay

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Risk of bias assessment (using Cochrane risk of bias tool)	1. Random sequence generation (selection bias): Low risk – Authors stated that participants were randomised to groups using minimastion. Minimisation was performed with a 1:1 allocation ratio and equal weighting for the three minimisation factors (sex, type of procedure and study centre). 2. Allocation concealment (selection bias): Low risk – Allocation was concealed from those assessing eligibility and recruiting patients, with eligible patients allocated remotely via e-mail by the trial statistician. 3. Blinding of participants and personnel (performance bias): Low risk – It was not possible to blind participants but this was unlikely to bias results as objective outcomes were measured. 4. Blinding of outcome assessment (detection bias): Low risk – Authors stated that tests were performed by 2 experienced investigators blinded to group allocations, 5. Incomplete outcome data (attrition bias): Low risk – All losses to follow-up were reported and accounted for in a consort diagram. 6. Selective reporting (reporting bias): Low risk – All pre-specified outcomes were reported 7. Other bias: Low risk – none identified Overall risk of bias: Low Directness: directly applicable