

Supplementary table 1: full definitions of low-value services.

Service	Low-value patient indication	Recommendation & sources
Knee arthroscopy (debridement, lavage and chondroplasty)	<i>B:</i> Osteoarthritis or meniscal derangements; no ligament repair procedure or pyogenic arthritis. <i>N:</i> Also exclude mechanical symptoms; age > 55 years	NICE do not do: “Do not refer for arthroscopic lavage and debridement as part of treatment for osteoarthritis, unless the person has knee osteoarthritis with a clear history of mechanical locking”. ¹ <i>Choosing Wisely US</i> , American Medical Society for Sports Medicine (April 2014): “Avoid recommending knee arthroscopy as initial/management for patients with degenerative meniscal tears and no mechanical symptoms”. ² Sensitive and specific definition from Schwartz, et al. ³ Position statement from Australian Knee Society on arthroscopic surgery of the knee (February 2016). ⁴
Endoscopy (age ≤ 55 years)	Dyspepsia; no dysphagia, anaemia, abnormal weight loss, peptic ulcer disease, or personal/family history of cancer of the digestive system in previous 12 months	<i>Choosing Wisely Canada</i> , Canadian Association of Gastroenterology (October 2014): “Avoid performing an endoscopy for dyspepsia without alarm symptoms for patients under the age of 55 years”. ⁵
Inpatient intravitreal injections	No intraocular or eye surgery in admission or anaesthetic services	<i>Choosing Wisely Australia</i> , The Royal Australian and New Zealand College of Ophthalmologists. “Intravitreal injections may be safely performed on an outpatient basis. Don't perform routine intravitreal injections in a hospital or day surgery setting unless there is a valid clinical indication”. ⁶
Abdominal hysterectomy	Hysterectomy, plus: <i>B:</i> No Caesarean; no cancer diagnosis in previous 12 months; <i>N:</i> As above; no pelvic peritoneal adhesion or endometriosis	In Elshaug, et al. ⁷ list from Cochrane review: “Because of equal or significantly better outcomes on all parameters, [vaginal hysterectomy] should be performed in preference to [abdominal hysterectomy (AH)] where possible. Where [vaginal hysterectomy] is not possible,

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		[laparoscopic hysterectomy] may avoid the need for AH". ⁸ Contraindications to vaginal hysterectomy include adnexal pathology, severe endometriosis, and adhesions. ⁹
Colonoscopy (age < 50 years)	Constipation; no anaemia, sudden weight loss, personal/ family history of cancer or diseases of digestive system in previous 12 months	<i>Choosing Wisely Canada</i> , Canadian Association of Gastroenterology (April 2014): "Avoid performing a colonoscopy for constipation in those under the age of 50 years without family history of colon cancer or alarm features." ⁵
Spinal fusion surgery	<i>B</i> : Low back pain or spinal stenosis; no leg pain, sciatica, spondylolisthesis, or spinal deformities in previous 12 months. <i>N</i> : Same, but low back pain only; no leg pain in previous 12 months	<i>Choosing Wisely Canada</i> , Canadian Spine Society (June 2015): "Don't perform fusion surgery to treat patients with mechanical axial low back pain from multi-level spine degeneration in the absence of: leg pain with or without neurologic symptoms and/or signs of concordant neurologic compression; structural pathology such as spondylolisthesis or deformity." ⁵
Percutaneous coronary interventions (PCI): Coronary stent or balloon angioplasty	<i>B</i> : Stable coronary disease: coronary disease code (excluding unstable angina) 6 to 18 months prior PCI, and none 6 months prior. <i>N</i> : Not emergency; exclude all angina codes from indicator	Sensitive and specific definition from Schwartz, et al. ³ (from Boden, et al. ¹⁰).
Adenoidectomy with tube insertion procedure; no tonsillectomy	Tube insertion procedure; otitis media with effusion; age ≤ 12 years; no tonsillectomy; no upper respiratory tract symptoms in previous 12 months	NICE do not do (February 2008): "Once a decision has been taken to offer surgical intervention for otitis media with effusion (OME) in children, insertion of ventilation tubes is recommended. Adjuvant adenoidectomy is not recommended in the absence of persistent and/or frequent upper respiratory tract symptoms." ¹¹

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Epidural steroid injections	Low back pain; no sciatica, leg pain or radiculopathy in previous 12 months	<i>Choosing Wisely Australia</i> , Australian and New Zealand Association of Neurologists: "Don't perform epidural steroid injections to treat patients with low back pain who do not have radicular symptoms in the legs originating from the nerve roots." ⁶
Inferior vena cava (IVC filter) insertion	<i>B</i> : All patients. <i>N</i> : No deep vein thrombosis or adverse events to anticoagulants in admission or previous 12 months	<i>Choosing Wisely US</i> , Society for Vascular Surgery (January, 2015): "Don't use IVC filters as primary prevention of pulmonary emboli in the absence of an extremity clot or prior pulmonary embolus". ² <i>Choosing Wisely US</i> , American Society of Hematology (December 2013): "Don't use inferior vena cava (IVC) filters routinely in patients with acute VTE." ² Sensitive and specific definition from Schwartz, et al. ³
Carotid endarterectomy	<i>B</i> : Palliative care code in previous 12 months, age ≥ 75 , or ASA score is 4 or 5; no stroke or focal neurological symptoms in previous 12 months. <i>N</i> : Same, but if age ≥ 75 then ASA ≥ 3 , plus no emergency indication	<i>Choosing Wisely Canada</i> , Canadian Society of Vascular Surgery (June, 2015): "Don't perform carotid endarterectomies or stenting in most asymptomatic high risk patients with limited life expectancy." ⁵ Sensitive and specific definition from Schwartz, et al. ³
Laparoscopic uterine nerve ablation	<i>B</i> : All patients. <i>N</i> : Chronic pain	NICE do not do (October 2007): "The evidence on laparoscopic uterine nerve ablation (LUNA) for chronic pelvic pain suggests that it is not efficacious and therefore should not be used." ¹²
Endovascular abdominal aortic aneurysm repair	<i>B</i> : Palliative care code in previous 12 months, or age ≥ 75 , or ASA score is 4 or 5; no ruptured aneurysm. <i>N</i> : Same, but if age ≥ 75 then ASA ≥ 3	<i>Choosing Wisely Canada</i> , Canadian Society of Vascular Surgery (June, 2015): "Don't perform endovascular repair of abdominal aortic aneurysms in most asymptomatic high-risk patients with limited life expectancy." ⁵

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Retinal laser or cryotherapy	Lattice degeneration; no retinal detachment in admission or previous 12 months	<i>Choosing Wisely Australia</i> , Royal Australian and New Zealand College of Ophthalmologists: "In general there is no indication to perform prophylactic retinal laser or cryotherapy to asymptomatic conditions such as lattice degeneration (with or without atrophic holes), for which there is no proven benefit." ⁶
Nasolacrimal duct procedure (age ≤ 1 year)	Blocked nasolacrimal passage or duct	<i>Choosing Wisely UK</i> , Royal College of Ophthalmologists: "If a child is under 12 months old and has a blocked nasolacrimal duct, do not try to unblock." ¹³
Hyperbaric oxygen therapy	Foot/decubitus ulcers, carbon monoxide or dioxide poisoning, Crohn's disease, cancer, open wounds, soft tissue injuries, sudden deafness, and no excluding diagnoses	Measure from Duckett, et al. ¹⁴ NICE do not do: <ul style="list-style-type: none"> - (January 2004) "Hyperbaric oxygen therapy should not be used in the treatment of foot ulcers because there is a lack of trial evidence on its use", ¹⁵ - (August 2013) "Do not use hyperbaric oxygen therapy to manage autism in any context in children and young people", ¹⁶ - (June 2012) "Do not use hyperbaric oxygen therapy for the management of core symptoms of autism in adults", ¹⁷ - (April 2014) "Do not use hyperbaric oxygen therapy to treat a pressure ulcer in neonates, infants, children or young people", ¹⁸ - (November 2013) "hyperbaric oxygen should not be used in patients with multiple sclerosis (because research evidence does not show beneficial effects on the course of the condition)" ¹⁹

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Cholecystectomy with bariatric procedure (exc. biliopancreatic diversion)	Bariatric procedure; no gallbladder disease in previous 12 months	<i>Choosing Wisely US</i> , American Society for Metabolic and Bariatric Surgery (June 2015): "Don't routinely remove the gallbladder unless clinically indicated." ²
Open bariatric procedure (if service could be done laparoscopically: includes sleeve gastrectomy, gastric bypass, gastroplasty, gastric banding, biliopancreatic diversion, gastric reduction)	Primary bariatric procedure (no bariatric procedure in previous 12 months; not reversal or revision procedure)	<i>Choosing Wisely US</i> , American Society for Metabolic and Bariatric Surgery (June 2015): "Avoid an open approach for primary bariatric surgical procedures." ²
Vertebroplasty	No myeloma	Sensitive and specific definition from Schwartz, et al. ³ (from Buchbinder, et al. ²⁰ and Kallmes, et al. ²¹).
Electroconvulsive therapy (age ≤ 12 years)	Depression	NICE do not do (September, 2005): "Electroconvulsive Therapy (ECT) is not recommended in the treatment of depression in children (5-11 years)." ²²
Renal stenting or angioplasty (diagnosis of renovascular hypertension, atherosclerosis of renal artery, hypertensive heart (and kidney disease))	<i>B</i> : No fibromuscular dysplasia or pulmonary oedema in previous 12 months. <i>N</i> : Also, only renovascular hypertension or atherosclerosis of renal artery.	Sensitive and specific definition from Schwartz, et al. ³ (from ASTRAL authors ²³ and Cooper, et al. ²⁴).

For each low-value service indicator the service and the patient-indication is given. Broad (B) and narrow (N) patient-indications are used to identify low-value services based on similar recommendation/s. ASA: American Society of Anaesthesiologists physical status classification

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