

Appendix D: Clinical evidence tables

Reference	Baker 2018 ¹¹
Study type	Prospective Cohort study
Study sample	Patients were prospectively enrolled from March 2014-2015 and eligible if they were undergoing an abdominal operation
Inclusion criteria	298 patients deemed eligible by their surgical oncologist as an appropriate surgical candidate, and the operation was planned under GA with entry into the Peritoneum.
Exclusion criteria	Patients excluded if they underwent an emergent operation
Risk tools	ACS NSQIP
Outcome	90 day morbidity
Results	ACS NSQIP any complication – OR = 1.042 (CI 1.030-1.116), P value = <0.0001, c-statistic = 0.6061

Reference	Bennett-Guerrero 2003 ¹⁴
Study type	Prospective Cohort study of risk prediction tool
Study sample	2 cohorts of patients undergoing major, non-cardiac surgery over the same time interval (August 1996 to June 1998). One cohort included patients undergoing surgery at the Mount Sinai Hospital, New York and the second cohort included patients undergoing surgery at the Queen Alexandra hospital and St Mary's hospital in Portsmouth.
Inclusion criteria	Patients undergoing major, non-cardiac surgery. USA (n=1056). UK (n=1539).
Exclusion criteria	None provided
Risk tools	P-POSSUM
Outcome	Mortality – in hospital mortality
Results	UK cohort - predicted mortality rate = 10.2%, observed mortality rate = 9.9 US cohort - predicted mortality rate = 7.8%, observed mortality rate = 2.1% UK cohort - predicted no. of deaths = 156, Observed number of deaths = 152 US cohort – predicted no. of deaths = 82, observed no. of deaths = 22

Reference	Blair 2018 ¹⁷
Study type	Retrospective review of cohort
Study sample	Retrospective review of a single institution, multi-surgeon, database of all patients undergoing PN for renal cell carcinoma from February 1998 to June 2015.
Inclusion criteria	470 Patients undergoing PN for renal cell carcinoma. 272 males and 198 women with a median age of 57 years
Exclusion criteria	Patients were excluded if complete records were not available and if the pathology of the tumor was determined to be anything other than RCC.
Risk tools	ACS NSQIP surgical risk calculator
Outcome	30 days overall complications and mortality
Results	Comparing predicted vs observed outcomes for all patients, the risk of overall complications were significantly under estimated (9.16% vs 16.81%, p<0.001) by the NSQIP. 95% CI = -7.65 (-7.07, -7.33). Mortality = (0.33 vs 0.21%, p<0.001) 95% CI = 0.12 (0.09-0.16).

Reference	Bodea 2018 ¹⁸
Study type	Retrospective cohort study
Study sample	Elective surgery patients at the Surgical Clinic no. 3 Cluj Romania between July 2013- December 2015.
Inclusion criteria	113 Participants undergoing elective Pancreaticoduodenectomy for periampullary malignant tumors. 64 males and 49 females, aged between 22-81 (median of 64).
Exclusion criteria	No exclusion criteria provided
Risk tools	P-POSSUM
Outcome	Mortality Morbidity
Results	The c-statistic was 0.61 for morbidity and 0.61 for mortality. Comparing the observed and estimated morbidity and mortality, statistical significant results (p=0.05 and p=0.03, respectively) Morbidity =ROC sensibility 0.65 [CI95% (0.562, 0.735)] and specificity 0.5 [CI95% (0.388, 0.606)]

Reference	Bonaventura 2019 ²⁰
Study type	Retrospective cohort study

Reference	Bonaventura 2019 ²⁰
Study sample	Patients undergoing cholecystectomy for acute cholecystitis at the surgery unit of Ospedale Policlinico San Martino hospital between 2005 and 2013.
Inclusion criteria	271 patients undergoing cholecystectomy for acute chloecystitis
Exclusion criteria	Patients who were younger than 18 were excluded
Risk tools	CCI ASA
Outcome	In hospital complications
Results	CCI in hospital complications – c-statistic = 0.662 (p= 0.0086) ASA in hospital complications – OR = 1.92 (CI 1.04-3.54) p=<0.001

Reference	Boyd 2019 ²²
Study type	Retrospective cohort study
Study sample	Records of patients who underwent pelvic reconstructive and incontinence surgery in a single tertiary centre from July 2014 to July 2017 were reviewed
Inclusion criteria	731 women patients 18 years or older undergoing surgery for pelvic organ prolapse or incontinence by all routes were included
Exclusion criteria	Non pelvic reconstructive procedures or procedures with same day hospital discharge were excluded.
Risk tools	ACS NSQIP risk calculator
Outcome	30 day Mortality
Results	NSQIP mortality – 0 event rate NSQIP any complication - C statistic = 0.547 (p 0.039), BS = 35.037
Comments	Women only and excluded all same day DC patients

Reference	Bronheim 2018 ²⁴
Study type	Retrospective review of cohort
Study sample	Retrospective review of ACS-NSQIP database from 2006 to 2014
Inclusion criteria	52,066 adult patients undergoing posterior lumbar decompression surgery
Exclusion criteria	None provided
Risk tools	ASA score

Reference	Bronheim 2018²⁴
Outcome	30 days mortality and morbidity
Results	c-statistic results as a predictor for any complication = 0.770 SE 0.023 (P= <0.001 CI= 0.726 - 0.815) c-statistic results as a predictor for mortality = 0.800 SE 0.002 (P= <0.001 CI= 0.796 - 0.804)

Reference	Brooks 2005²⁵
Study type	Retrospective review of cohort
Study sample	All 3048 consecutive patients undergoing surgical procedures under the care of a single consultant surgeon working at a district general hospital between February 1999 and September 2002 were considered for analysis.
Inclusion criteria	A cohort of 949 higher-risk patients remained and was used in this analysis.
Exclusion criteria	Patients at low risk of death were excluded from analysis, including 1185 patients undergoing day-case procedures, 149 children and 765 young patients undergoing minor or intermediate inpatient procedures.
Risk tools	POSSUM P-POSSUM Surgical risk score
Outcome	Mortality
Results	ROC AUC (95% CI) POSSUM: 0.92 (0.90 to 0.95) P-POSSUM: 0.92 (0.90 to 0.95) SRS: 0.89 (95 per cent c.i. 0.86 to 0.93) Actual mortality rate: 8.4% Expected mortality rate: POSSUM: 12.6% P-POSSUM: 7.3% SRS: 5.9%

Reference	Bulow 2019²⁷
Study type	Retrospective review of cohort

Reference	Bulow 2019 ²⁷
Study sample	Retrospective review of patients from the Swedish Hip Arthroplasty register between 2005 and 2012
Inclusion criteria	43,224 patients treated with hip arthroplasty for a femoral neck fracture
Exclusion criteria	None provided
Risk tools	CCI
Outcome	30 and 90 days mortality and long term mortality – 1 year post op
Results	c-statistic 30 day mortality = 0.59 c-statistic 90 day mortality = 0.59 c-statistic 1 year mortality = 0.58

Reference	Cengiz 2014 ³²
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	335 consecutive patients undergoing colorectal cancer surgery between 2002 and 2012 in third-level healthcare centres. Male patients (n = 196) consisted 58.5% of all patients and 38.2% (n = 128) of all patients were over 70 years of age. Number of elective surgeries or curative resection was 279 (83.3%) or 265 (79.1%), respectively.
Inclusion criteria	Consecutive patients undergoing colorectal cancer surgery
Exclusion criteria	None provided
Risk tools	Possum P-possum ACPGBI scores
Outcome	Mortality within postoperative 30-days that extend the duration of hospital stay.
Results	Mortality and morbidity were observed in 17 and 109 patients, respectively. Mortality predictive scores: POSSUM: c-statistic = 89.7, 95% CI = 86.0-92.8, sensitivity = 88.2, specificity = 78.6. P-POSSUM: c-statistic = 90.4, 95% CI = 86.7-93.3, sensitivity = 94.1, specificity = 73.0 ACPGBI score: c-statistic = 78.1, 95% CI = 73.3-82.4, sensitivity = 76.5, specificity = 70.8

Reference	Chun 2018 ³³
Study type	Retrospective case control study

Reference	Chun 2018 ³³
Study sample	Patients who had undergone surgery at a single tertiary care centre.
Inclusion criteria	217 patients who had undergone spinal surgery for various spine diseases. 103 men and 114 women with a mean age of 57.0 years.
Exclusion criteria	None included
Risk tools	E-PASS POSSUM
Outcome	Postoperative complications within 1 month after surgery
Results	The c-statistic for predicted post-operative complications was 0.588 for the E-PASS and 0.721 for the POSSUM.

Reference	Cologne 2015 ³⁷
Study type	Retrospective cohort study
Study sample	Consecutive laparoscopic colon resections performed on an elective basis from April 2011 through July 2014 by two colorectal surgeons at a tertiary referral centre
Inclusion criteria	116 patients were included if they were older than 18 years, if the procedure was performed by one of the 2 specified surgeons, if a preoperative ACS risk score was calculated and if completed postoperative medical records were available.
Exclusion criteria	None provided
Risk tools	ACS NSQIP risk calculator
Outcome	Mortality Any complication
Results	Observed vs predicted risk for any complication = (17.3% vs 19.4%, p=0.05), mortality = (1.07% vs 0.83%, p=0.86).

Reference	Dahlke 2014 ³⁹
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	Data obtained from the ACS NSQIP participant file 2011 release for patients undergoing a broad range of surgeries across all surgical specialities.
Inclusion criteria	238,649 patients were included for analysis if they underwent a general surgery. 58.8% female with a median age of 54.1 years.
Exclusion criteria	None provided

Reference	Dahlke 2014³⁹
Risk tools	ACS NSQIP – All information
Outcome	Overall Morbidity
Results	AUC/c-statistic for overall morbidity = 0.861

Reference	Donati 2004⁴³
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	Data were collected from all patients, with no age limits imposed, who underwent any type of elective or emergency surgical procedure in two different hospitals. N=1936
Inclusion criteria	Patients who underwent any type of elective or emergency surgical procedure/
Exclusion criteria	Patients having cardiac surgery or Caesarean delivery were excluded.
Risk tools	POSSUM P-POSSUM ASA
Outcome	Overall mortality
Results	AUC/c-statistic (SE, 95% CI) POSSUM: 0.915 (SE 0.016, CI 0.884–0.947) P-POSSUM: 0.912 (SE 0.033, CI 0.898–0.924) ASA: 0.810 (SE 0.044, CI 0.792–0.828)

Reference	Dutta 2011⁴⁵
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	121 Patients undergoing oesophago-gastric cancer resections in Glasgow Royal Infirmary from January 2005 to May 2009
Inclusion criteria	Patients undergoing oesophago-gastric curative cancer resections who had data to score the POSSUM, P-POSSUM, O-POSSUM, and mGPS models were included in the study
Exclusion criteria	None provided
Risk tools	Possum P-possum

Reference	Dutta 2011⁴⁵
Outcome	Mortality and Morbidity Both short term and long term survival were recorded
Results	Observed morbidity was 49%, whereas POSSUM predicted post-operative morbidity in 60%, giving an overall standardised morbidity ratio of 0.25 and 0.71. ROC analysis for the POSSUM morbidity equation (c-statistic 0.639, 95% CI 0.541–0.737, P = 0.008) ROC analysis for the P-POSSUM mortality equation gave c-statistic 0.808 (95% CI 0.55–1.06, P = 0.020), POSSUM (c-statistic 0.759, 95% CI 0.48–1.04, P = 0.051)

Reference	Egberts 2011⁴⁸
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	The medical records of 191 patients undergoing surgery for IBD at the Department of General Surgery and Thoracic Surgery at the University Hospital of Kiel from 2004 to 2009 were analysed retrospectively. There were a total of 191 patients (81 male and 110 female) with a mean age of 38.1 years (range 5–75). There were 158 patients operated on for Crohn's disease and 33 patients for UC
Inclusion criteria	Patients with a histologically proven MC or CU and an abdominal surgery were included.
Exclusion criteria	Patients who presented with a perianal affection and were treated with proctological techniques (seton drainage, fistula repair, etc.) without abdominal surgery were excluded from this study.
Risk tools	Possum
Outcome	Mortality Morbidity
Results	The overall complication rate was 27.7%, and the mortality was 0.5%. The morbidity rate predicted by POSSUM was 28.4% and the mortality rate 7.2%.

Reference	Egberts 2011⁴⁷
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	The medical records of 143 patients with cutaneous melanoma who underwent a radical lymph node dissection (RLND) at the Department of General Surgery and Thoracic Surgery at the University Hospital of Kiel from 1985 to 2008 were analysed retrospectively. There were 143 patients (59 male, 84 female) with a mean age of 58.1 years (range: 20–89 years)

Reference	Egberts 2011 ⁴⁷
Inclusion criteria	Patients with cutaneous melanoma who underwent a radical lymph node dissection (RLND)
Exclusion criteria	None provided
Risk tools	Possum
Outcome	Mortality Morbidity
Results	The actual mortality rate was 0% whereas the rate estimated by POSSUM was 8.3%. The POSSUM (ie predicted) morbidity rate for all patients together was 32.9% and the observed morbidity for all patients was similar at 28.0%.

Reference	Filip 2014 ⁵¹
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	Patients diagnosed with oesophageal cancer in whom surgery was performed between January 2004 and March 2013
Inclusion criteria	Patients diagnosed with oesophageal cancer in whom surgery was performed. Out of 137 patients diagnosed with oesophageal cancer, esophagectomy was performed in 43 cases.
Exclusion criteria	Patients with unresectable tumours on laparotomy or thoracotomy or those with palliative surgery were excluded
Risk tools	POSSUM Charlson Age adjusted Charlson ASA score
Outcome	Mortality and Morbidity within 30 days after surgery
Results	Postoperative mortality (11.62%) was best predicted by POSSUM score (10.48; 95% CI 9.37 -11.66). The observed morbidity was 58.13%, higher than that expected by POSSUM (48.24%; 95%CI, 44.82-51.66) with a morbidity ratio O/E of 1.2. Expected mortality for P-POSSUM was 2.71 (95%CI, 2.31 - 3.12), O-POSSUM was 6.83 (95%CI, 6.21-7.25), whereas the observed mortality in our series was 11.62%, thus giving a mortality ratio observed/expected of 1.1 for POSSUM, 4.28 for P-POSSUM and 1.7 for O-POSSUM. The observed morbidity given was 58.13%, higher than that expected by the POSSUM (48.24%; 95%CI, 44.82 - 51.66) with a morbidity ratio O/E of 1.2. c-statistic for morbidity p-value POSSUM score 0.826 (0.67-0.92) 0.0001 Physiological score 0.74 (0.58-0.86) 0.0014

Reference	Filip 2014⁵¹
	Operative score 0.607 (0.44-0.75) 0.21 Charlson comorbidity index 0.608 (0.44-0.75) 0.21 Age adjusted Charlson index 0.736 (0.58-0.85) 0.0018
Comments	Unclear what outcome is being predicted for c-statistic, presumed morbidity.

Reference	Fu 2019⁵⁴
Study type	Retrospective chart review of ACS NSQIP
Study sample	Data from the ACS NSQIP from 2005 to 2015 was extracted
Inclusion criteria	10,527 patients who underwent total shoulder arthroplasty were identified in the NSQIP
Exclusion criteria	Cases missing age, sex, height, weight and those younger than 18 years old.
Risk tools	ASA score Modified Charlston Comorbidity Index
Outcome	30 day postoperative adverse event
Results	ASA any adverse event – c-statistic = 0.607 (0.587 – 0.627) mCCI any adverse event - c-statistic = 0.555 (0.536 – 0.575)

Reference	Goffi 1999⁵⁶
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	Patients admitted during one year period for major elective or emergency operations, benign or malignant. N=187
Inclusion criteria	Patients admitted during one year period for major elective or emergency operations, benign or malignant.
Exclusion criteria	Not reported
Risk tools	ASA
Outcome	Mortality and 30 days post-operative any complication combined
Results	AUC: 0.777

Reference	Golan 2018⁵⁷
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Reference	Golan 2018 ⁵⁷
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	Patients in prospectively maintained database who underwent open RC with either ileal conduit or orthotopic neobladder urinary diversion for bladder cancer between Jan 2007 and Dec 2016.
Inclusion criteria	954 patients undergoing radical cystectomy with urinary diversion Males = 752 and median age =70 (62-76)
Exclusion criteria	Patients who underwent a continent catheterisable urinary diversion were not included.
Risk tools	ACS NSQIP risk calculator
Outcome	Mortality and 30 days post-operative any complication
Results	Predicted vs observed any complication= 30.7% vs 40.3% and mortality = 1.3% vs 2.2%. Any complication c-statistic = 0.58 (p<0.001), mortality c-statistic = 0.62 (p=0.02).

Reference	Haga 2011 ⁵⁹
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	Patients who received any of the 41 elective procedures were eligible for enrolment. These procedures comprised more than 90% of all scheduled operations in general surgery. Elective surgery was defined as surgery that did not require emergency surgery within 48 hours from admission. N=5272
Inclusion criteria	Patients who received any of the 41 elective procedures were eligible for enrolment
Exclusion criteria	Exclusion criteria were as follows: (1) patients who did not sign the consent forms to participate in this study; (2) those who had concomitant cancer of different organs; (3) those who had a history of cancer in the previous 5 years; and (4) those who received concomitant surgery in different surgical fields such as enucleation of an esophageal submucosal tumor via right thoracotomy and distal pancreatectomy for pancreatic cancer.
Risk tools	POSSUM P-POSSUM E-PASS
Outcome	Mortality
Results	AUC (95% CI) POSSUM: 0.74 (0.63-0.86) P-POSSUM: 0.81 (0.75-0.88) E-PASS: 0.82 (0.69-0.95)

Reference	Hightower 2010 ⁶¹
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	Patients undergoing major abdominal cancer surgery. N=32
Inclusion criteria	Patients .18 yr of age screened in the Pre-anaesthesia Assessment Center scheduled for one of the following (frequency of surgery): Gastrectomy (3), Pancreatectomy (2), Radical cystectomy (14), Radical nephrectomy (1), Radical transabdominal tumour debulking (2), Pelvic exenteration (5), Low anterior resection (1), Retroperitoneal lymph node dissection (4)
Exclusion criteria	Any patient who is unable to exercise, deemed unacceptable for surgery after evaluation in the Pre-anaesthesia Assessment Center, surgery is cancelled for any reason, suffering any of the following within 3 months before visiting the Pre-anaesthesia Assessment Center: Myocardial infarction, Cerebrovascular event, Transient ischaemic attack, Pulmonary embolic event, Existing acute or chronic deep vein thrombosis, Pregnancy.
Risk tools	ASA
Outcome	Morbidity during 7-day post-op period
Results	Morbidity c-statistic = 0.688 (p<0.038), 95% CI= 0.52315 - 0.85185)

Reference	Hirose 2014 ⁶²
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	601 consecutive patients who underwent spinal surgery between January 2005 and December 2009 at Kumamoto University Hospital.
Inclusion criteria	Patients who underwent spinal surgery. The surgical procedures included laminoplasty and anterior fusion to treat cervical disorders (169 patients); posterior fusion for thoracic disorders (16 patients); laminectomy, posterior fusion, and discectomy for lumbar disorders (259 patients); resection of spinal tumors (117 patients); spinal fusion for scoliosis (27 patients); and curettage or spinal fusion for pyogenic spondylitis (13 patients). 327 were male and 274 were female, and their mean age was 58.7 years (range 7–88 years).
Exclusion criteria	None provided
Risk tools	POSSUM E-PASS
Outcome	Mortality and Morbidity
Results	The ROC curves of each model for the detection of postoperative complications were evaluated - the c-statistic of predicted

Reference	Hirose 2014⁶²
	morbidity rate (PMR) for E-PASS was 0.668 (95% CI 0.596–0.739) and higher than for POSSUM (0.588; 95% CI 0.513–0.663).

Reference	Hirose 2015⁶³
Study type	A single centre retrospective cohort study
Study sample	Retrospective review of 275 consecutive patients who underwent spinal surgery between Jan 2008 and Dec 2009 at Kumamoto University Hospital.
Inclusion criteria	275 patients undergoing spinal surgery. The same 4 surgeons performed the procedures. 146 male and 129 females, mean age was 59.7 years.
Exclusion criteria	None provided
Risk tools	E-PASS
Outcome	Total postoperative morbidities
Results	Total postoperative morbidities, c-statistic = 0.681

Reference	Hobson 2007⁶⁵
Study type	Prospective comparison study
Study sample	All patients undergoing surgery in the emergency theatre of the Leicester general hospital over a 4-month period from June to September 2003.
Inclusion criteria	163 patients undergoing surgery in the emergency theatre including general surgery, gynaecology, renal, urology and vascular.
Exclusion criteria	None provided
Risk tools	POSSUM P-POSSUM
Outcome	30 day mortality 60 day/in hospital mortality
Results	30 day mortality, c-statistic = POSSUM - 0.946, P-POSSUM - 0.940. In hospital Mortality, c-statistic = POSSUM – 0.932, P-POSSUM – 0.928.

Reference	Huisman 2014⁶⁹
Study type	Prospective cohort study

Reference	Huisman 2014 ⁶⁹
Study sample	Recruitment took place in 6 different countries at 11 medical centers between September 2008 and January 2012 and included 263 cancer patients scheduled for elective surgery
Inclusion criteria	A cohort of cancer patients aged 70 or over who were candidate for elective surgery under general anesthesia, were invited to take part by the local coordinator. The median age of this cohort was 76 years (Range: 70–96) and 66.5% of patients were female. The majority of surgical procedures were laparotomies (n = 156; 59.3%) and breast cancer surgeries (n = 76; 28.9%).
Exclusion criteria	Patients requiring emergency surgical management (within 24 hours) were excluded from this study. Medical centres that included less than 10 patients were excluded from analysis, which resulted in the analysis of 263 patients
Risk tools	Timed up and go ASA classification
Outcome	Mortality and 30 day morbidity
Results	In a univariable logistic regression analysis the TUG and ASA were not predictive of 30-day mortality. For morbidity - Sensitivity of a high TUG was 42.0% and specificity was 89.8%. The c-statistic was 0.66 (95%-CI = 0.57–0.75; p<0.001). Sensitivity of ASA ≥3 was 57.1% and specificity was 58.5%. The c-statistic was 0.58 (95%-CI = 0.49–0.67, p = 0.09).

Reference	Igari 2013 ⁷⁰
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	Patients undergoing general surgical procedures at Ohta Nishinouchi General Hospital between April 2003 and March 2009
Inclusion criteria	593 Patients aged ≥80 years who underwent surgery under general anaesthesia. 287 male and 387 females, mean age 83 years.
Exclusion criteria	None provided
Risk tools	POSSUM P-POSSUM
Outcome	Postoperative morbidity and mortality within 30 days post operatively
Results	POSSUM - Observed/expected morbidity ratio was 1.44 and mortality ratio was 0.98 P-POSSUM – the O/E ratio was 1.0.

Reference	Jones 1992 ⁷⁴
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Reference	Jones 1992 ⁷⁴
Study type	Retrospective cohort analysis of risk prediction tools
Study sample	From January to June 1990, patient admissions were recorded to the high-dependency unit. N=117
Inclusion criteria	Patients admitted to the high-dependency unit immediately after surgery
Exclusion criteria	Analysis excluded 13 patients admitted with multiple injuries following trauma
Risk tools	POSSUM
Outcome	Postoperative morbidity and mortality (30 days)
Results	POSSUM Mortality AUC: 0.753 (+/-0.081) Morbidity AUC: 0.82 Observed: Mortality 13/117, morbidity 59/117 Expected: Mortality 20/117, morbidity 59/117

Reference	Katlic 2019 ⁷⁸
Study type	Retrospective cohort study
Study sample	Patients aged ≥75 years who presented to Sinai Hospital of Baltimore for major elective surgery between September 2012 and July 2016
Inclusion criteria	1025 geriatric surgical patients undergoing major elective surgery including cardiac, thoracic, vascular, orthopaedic, surgical oncology, general surgery, urologic and neurologic.
Exclusion criteria	None provided
Risk tools	Charleston Comorbidity index ASA Score Fried's 5 point frailty score
Outcome	Any NSQIP complication
Results	Fried's 5 point frailty – c-statistic = 0.70 (p=0.680) ASA score – c-statistic = 0.70 (p=0.755) CCI – c-statistic = 0.64 (p=0.008)

Reference	Kim 2018 ⁸⁴
Study type	Retrospective cohort study
Study sample	The national inpatient sample from the USA was queried for patients who underwent a total shoulder arthroplasty or reverse total shoulder arthroplasty between 2002 and 2014
Inclusion criteria	90,491 patients undergoing total shoulder arthroplasty or reverse total shoulder arthroplasty
Exclusion criteria	None provided
Risk tools	Charlston comorbidity index
Outcome	Any inpatient complication and mortality
Results	CCI mortality – c-statistic = 0.827 (CI 0.774-0.88) CCI any complication – c-statistic = 0.691 (CI 0.680-0.703)

Reference	Kong 2013 ⁸⁸
Study type	Temporal validation of a prospective observational study and the external validation was a retrospective observational study
Study sample	Major colorectal operations performed at Geelong hospital and Western Hospital from 2008-2010
Inclusion criteria	474 major colorectal operations performed at Geelong hospital (temporal validation) and 389 cases at Western Hospital (external validation)
Exclusion criteria	Patients undergoing surgery for reversal of colostomy or ileostomy, diverting stoma formation, transanal endoscopic microsurgery, and laparotomy or laparoscopy with washout of peritoneal cavity.
Risk tools	POSSUM P-POSSUM ACPGBI
Outcome	Mortality
Results	Temporal validation (of BH tool) dataset POSSUM: mortality c-statistic = 0.790 p=<0.001 P-POSSUM: mortality c-statistic = 0.801 p=0.88 ACPGBI: mortality c-statistic = 0.721 p= 0.006 External validation (of BH tool) dataset POSSUM: mortality c-statistic = 0.696 p=<0.0001

Reference	Kong 2013⁸⁸
	P-POSSUM: mortality c-statistic = 0.681 p=0.13 ACPGBI: mortality c-statistic = 0.658 p=<0.0001

Reference	Kwok 2011⁹³									
Study type	Retrospective cohort									
Study sample	Data from ACS NSQIP N=1730									
Inclusion criteria	Very elderly patients aged 80+ undergoing emergency colon surgery									
Exclusion criteria	Not reported									
Risk tools	ASA Surgical risk scale									
Outcome	Mortality									
Results	Overall mortality was 489 (28%)									
	<table border="1"> <thead> <tr> <th>Tool</th> <th>C-statistic</th> <th>Goodness of fit (p value)</th> </tr> </thead> <tbody> <tr> <td>ASA</td> <td>0.66</td> <td>0.14</td> </tr> <tr> <td>Surgical risk scale</td> <td>0.66</td> <td>0.14</td> </tr> </tbody> </table>	Tool	C-statistic	Goodness of fit (p value)	ASA	0.66	0.14	Surgical risk scale	0.66	0.14
Tool	C-statistic	Goodness of fit (p value)								
ASA	0.66	0.14								
Surgical risk scale	0.66	0.14								

Reference	Lakomkin 2018⁹⁴
Study type	Retrospective chart review of ACS NSQIP
Study sample	Data from ACA NSQIP from 2008 to 2014
Inclusion criteria	2,170 patients undergoing spinal tumor resection
Exclusion criteria	None provided
Risk tools	ASA score Modified Charlston Comorbidity Index
Outcome	30 day Mortality
Results	ASA – mortality – ‘not predictive of any adverse event’ CCI – mortality OR = 1.24 (CI= 1.12 – 1.36) P value= <0.001, c-statistic = 0.860

Reference	Lima 2019 ¹⁰¹
Study type	Prospective observational study
Study sample	Patients scheduled to undergo elective surgery during a 3 month period at a University hospital
Inclusion criteria	235 patients over 60 years old scheduled to undergo elective procedures under general, regional or combined anaesthesia for general, gynaecological, plastic, vascular, or orthopaedic surgeries at a university hospital were enrolled.
Exclusion criteria	Patients who were admitted to ICU immediately after surgery, submitted to emergency or urgent surgery procedures, unable to speak or understand the Portuguese language or incapable of signing the informed consent were excluded.
Risk tools	P-POSSUM
Outcome	30 day Mortality
Results	P-POSSUM 30 day mortality AUROC = 0.563

Reference	Moonesinghe 2013 ¹¹⁰
Study type	Prospective observational study
Study sample	Study of surgical patients age 65 years or older who presented to the Johns Hopkins Hospital anesthesia preoperative evaluation center for elective surgery during a 1-year period (June 22, 2005 to July 1, 2006). N=594
Inclusion criteria	Patients were recruited on selected days of the week with days of the week rotated on a regular basis. Using this sampling method, a total of 666 eligible patients were identified on the days sampled; 21 declined participation in the study and 2 participants requested removal from the study after enrolment.
Exclusion criteria	Patients with Parkinson disease (n = 2), previous stroke (n = 11), a Mini-Mental Status Examination score <18 (n = 2), and those taking carbidopa/levodopa, donepezil hydrochloride, or antidepressants (n = 34) because previous studies have found that these medications cause symptoms that are potentially collinear with domains of frailty.
Risk tools	ASA
Outcome	Surgical complications
Results	ASA AUROC = 0. 0.626

Reference	Markovic 2018 ¹⁰⁵
Study type	Retrospective chart review
Study sample	Pilot study included patients who were being prepared for one of the major non-cardiac surgeries under general anaesthesia. N=78

Reference	Markovic 2018¹⁰⁵		
Inclusion criteria	Patients who were being prepared for extensive non-cardiac surgeries under general anaesthesia.		
Exclusion criteria	Not reported		
Risk tools	ASA NSQIP SORT		
Outcome	Mortality		
Results	Mortality		
	Test	Event rate (%)	C-statistic (95% CI)
	ASA		0.669 (0.506-0.832)
	NSQIP	14 (18%)	0.813 (0.702-0.924)
	SORT		0.797 (0.671-0.924)
Comments	Population/surgery characteristics unclear		

Reference	Neary 2007¹¹⁶		
Study type	Prospective observational cohort study		
Study sample	The study was performed at Gloucestershire Royal Hospital, a district hospital with 700 beds, and was approved by the Hospital Audit Committee. N=2349		
Inclusion criteria	The study included a consecutive cohort of patients who needed non-elective, non-cardiac surgery in the 12 months from 1 July 2001.		
Exclusion criteria	Not reported		
Risk tools	P-POSSUM Surgical Risk Score		
Outcome	Mortality (30d) Morbidity		
Results	Expected/Observed mortality		
	Expected mortality risk	Observed mortality	
		P-POSSUM	SRS

Reference	Neary 2007 ¹¹⁶		
	<10	42 of 2075 (2.0)	83 of 2217 (3.7)
	10-20	22 of 96 (23)	34 of 92 (37)
	20-30	13 of 46 (28)	
	30-40	18 of 34 (52)	17 of 30 (57)
	40-50	7 of 28 (25)	
	50-60	8 of 22 (36)	3 of 5 (60)
	60-70	9 of 13 (69)	
	70-80	7 of 11 (64)	4 of 5 (80)
	80-90	5 of 11 (45)	
	90-10	10 of 13 (77)	
	<p>c-statistic for P-POSSUM mortality = 0.90 (0.87–0.93) c-statistic for SRS mortality = 0.85 (0.82–0.89)</p>		

Reference	Ngulube 2019 ¹¹⁸
Study type	Prospective observational cohort study
Study sample	The study included all consecutively admitted patients undergoing a variety of major general surgical operations at Parirenyatwa Group of Hospitals (PGH) and Harare Central Hospital (HCH) over a 9 month period from January to September of 2015.
Inclusion criteria	181 patients (123 males, 58 females) aged 18 years and above undergoing a major general surgical procedure as defined by the British United Provident Association, with timing ranging from elective to emergency were included. Mean age 47 (SD 18.7)
Exclusion criteria	Below the age of 18 years, if managed conservatively, if it was a day case or any procedure categorised as minor and any case falling outside the scope of general surgery. Those also excluded were patients with more than 1 missing result or those requiring admission into a critical care unit post operatively but failed because of shortage of beds and those operated on by surgical trainees with less than 2 years experience.
Risk tools	POSSUM P-POSSUM
Outcome	Mortality

Reference	Ngulube 2019 ¹¹⁸
	Morbidity
Results	c-statistic for POSSUM morbidity = 0.775 (p<0.0001). O:E ratio = 0.88 c-statistic for POSSUM mortality = 0.818 (p=0.818). O:E ratio = 0.74 c-statistic for P-POSSUM mortality = 0.814 (p<0.000) O:E ratio = 1.06

Reference	Organ 2002 ¹²⁰
Study type	Prospective observational cohort study
Study sample	All surgical patients undergoing a surgical procedure admitted to the Royal Brisbane Hospital intensive care facility in 1999 were reviewed retrospectively.
Inclusion criteria	All surgical patients undergoing a surgical procedure.
Exclusion criteria	Patients on whom no operation had been performed were excluded. Those in the category of trauma were also excluded because trauma patients were excluded from Copeland's original data-set and subsequent studies. Neurosurgical patients were not evaluated in our study as most were treated in a separate unit not contributing to the ICF database.
Risk tools	P-POSSUM
Outcome	Mortality
Results	c-statistic for P-POSSUM mortality = 0.68 (0.57–0.78) O:E ratio = 0.68 Observed deaths: 28/229, Expected deaths: 49.9/225

Reference	Reis 2019 ¹³⁷
Study type	Retrospective cohort study
Study sample	All patients admitted to surgical ICU after open vascular surgery from January 2006 to July 2013 in a large academic hospital.
Inclusion criteria	833 patients admitted to surgical ICU after open vascular surgery from January 2006 to July 2013
Exclusion criteria	None provided
Risk tools	POSSUM
Outcome	Hospital mortality

Reference	Reis 2019¹³⁷
Results	POSSUM hospital mortality – observed/expected ration of 0.98 (43/44) and AUROC = (0.829)

Reference	Rivard 2016¹³⁸															
Study type	Retrospective chart review															
Study sample	Patients who underwent laparotomy on the gynecologic oncology service at a single academic hospital from January 2009 to December 2013. N=1094															
Inclusion criteria	Patients undergoing laparotomy															
Exclusion criteria	Not reported															
Risk tools	NSQIP															
Outcome	Mortality Complications															
Results	<table border="1"> <thead> <tr> <th>Outcome</th> <th>Event rate (%)</th> <th>Odds ratio (95%CI)</th> <th>C-statistic</th> <th>Bier score</th> </tr> </thead> <tbody> <tr> <td>Mortality</td> <td>9 (0.8)</td> <td>1.18 (1.08-1.29)</td> <td>0.851</td> <td>0.007</td> </tr> <tr> <td>Any complication</td> <td>368 (33.6)</td> <td>1.06 (1.04-1.08)</td> <td>0.635</td> <td>0.323</td> </tr> </tbody> </table>	Outcome	Event rate (%)	Odds ratio (95%CI)	C-statistic	Bier score	Mortality	9 (0.8)	1.18 (1.08-1.29)	0.851	0.007	Any complication	368 (33.6)	1.06 (1.04-1.08)	0.635	0.323
Outcome	Event rate (%)	Odds ratio (95%CI)	C-statistic	Bier score												
Mortality	9 (0.8)	1.18 (1.08-1.29)	0.851	0.007												
Any complication	368 (33.6)	1.06 (1.04-1.08)	0.635	0.323												
Comments	Low overall mortality event rate.															

Reference	Saafan 2019¹⁴²
Study type	Retrospective chart review
Study sample	Retrospective chart review of all perforated duodenal ulcer patients at Hamad general hospital (Doha) and Alwakra hospital in Qatar using the hospitals administrative electronic database between January 2014 and December 2017.
Inclusion criteria	152 patients presenting to ER and diagnosed and operated for perforated duodenal ulcers
Exclusion criteria	Patients < 14 years old or with perforated other organs were excluded
Risk tools	ASA score (≥ 3)
Outcome	30 day post op morbidity
Results	ASA 30 day morbidity – c-statistic =0.69 (0.55–0.83), p=0.009, sensitivity = 58.82% (36.01–78.39) and Specificity = 75.56 (67.66–82.03)

Reference	Saafan 2019¹⁴²
Comments	Male patients only and includes patients over 14 years old. Low risk of bias

Reference	Shaker 2019¹⁴⁹
Study type	Retrospective review of cohort
Study sample	Retrospective review ACS NSQIP database from 2009 to 2013
Inclusion criteria	200 gynaecologic oncology patients 70+ years older undergoing laparotomy.
Exclusion criteria	None provided
Risk tools	ACS NSQIP surgical risk calculator
Outcome	30 days any complications and mortality
Results	Mortality = OR 1.12 (1.01-1.25), P value= 0.03, C statistic = 0.811, Brier score = 0.015 Any complication = OR 1.06(1.02 – 1.09), P value = 0.003, C statistic = 0.652, Brier score = 0.237
Comments	Female patients only of 70+ years old

Reference	Sharrock 2017¹⁵¹			
Study type	Retrospective cohort study			
Study sample	Consecutive hospital admissions were recorded between 02 January 2014 and 25 August 2015. N=193			
Inclusion criteria	Patients were eligible if they were aged 70 or over when admitted as an emergency for abdominal surgery.			
Exclusion criteria	Not reported			
Risk tools	P-POSSUM ASA			
Outcome	Mortality			
Results	Mortality			
	Outcome	Correlation	c-statistic	P value
	P-POSSUM			
	Correlation with days to death	-0.28		0.21
	Mortality		0.784	<0.001

Reference	Sharrock 2017¹⁵¹		
	ASA		
	Mortality	0.771	<0.001

Reference	Simpson 2018¹⁵⁵		
Study type	Retrospective review of cohort		
Study sample	Retrospective review of the National Emergency Laparotomy Database between January 2014 to September 2016		
Inclusion criteria	103 patients over 80 years old undergoing emergency laparotomy		
Exclusion criteria	None provided		
Risk tools	P-POSSUM		
Outcome	Inpatient, 30 day and 90 day mortality		
Results	Inpatient mortality = c-statistic 0.51, 30 day mortality = c-statistic 0.75, 90 day mortality c-statistic = 0.75		
Comments	Patients over 80 years old.		

Reference	Slim 2006¹⁵⁷		
Study type	Prospective cohort study		
Study sample	Patients operated on for colorectal malignant or diverticular diseases, whether electively or on emergency basis, within a 4-month period. N=1421		
Inclusion criteria	Patients undergoing open or laparoscopic surgery (electively or on emergent basis) for colorectal cancers or diverticular disease.		
Exclusion criteria	Inflammatory bowel diseases or benign polyps, because both of those conditions require specific management, and other rare colorectal diseases (volvulus, chronic constipation, etc) because they involve specific therapeutic aspects.		
Risk tools	POSSUM P-POSSUM		
Outcome	Mortality		
Results	Mortality		
	Outcome	Predicted %	Observed % (95% CI) c-statistic
	POSSUM	11.3	n/a
	P-POSSUM	4.7	3.4 (2.5-4.44) 0.82

Reference	Suresh 2019¹⁶¹
Study type	Retrospective chart review study
Study sample	All patients undergoing panniculectomy procedure at Duke University Hospital from 2005 to 2016
Inclusion criteria	264 patients who underwent panniculectomy from 2005 – 2016 were included
Exclusion criteria	None provided
Risk tools	NSQIP risk calculator
Outcome	30 day post-operative any complications
Results	NSQIP risk calculator any complication – c-statistic =0.6193

Reference	Sutton 2002¹⁶²
Study type	Retrospective chart review study
Study sample	All patients admitted under the care of three surgeons between May 1997 and October 1999 were assessed. N=1946
Inclusion criteria	Patients transferred to the care of the firm while an inpatient and those whose care was on a shared basis with another firm were included.
Exclusion criteria	1351(31%) did not have an operation and were therefore excluded from further analysis
Risk tools	ASA Surgical Risk Scale
Outcome	Mortality
Results	AUC: ASA 0.93 (0.90–0.97) SRS 0.95 (0.93–0.97)

Reference	Teeuwen 2011¹⁶⁵
Study type	Retrospective case-control study
Study sample	Patients older than 15 years undergoing colorectal resection between January 2003 and January 2008 in the Radboud University Nijmegen Medical Centre. N=734

Reference	Teeuwen 2011 ¹⁶⁵		
Inclusion criteria	Not reported		
Exclusion criteria	Not reported		
Risk tools	POSSUM P-POSSUM		
Outcome	Mortality Morbidity		
Results	Outcome		Predicted %
			Observed %
	Mortality		
	POSSUM	17	8.9
	P-POSSUM	5.9	
Morbidity			
POSSUM	46	39.4	

Reference	Teoh 2017 ¹⁶⁶			
Study type	A retrospective chart review			
Study sample	All patients undergoing minimally invasive surgery on the gynecologic oncology service from January 1, 2009, to December 30, 2013. N=876			
Inclusion criteria	Gynaecology oncology patients undergoing minimally invasive surgery			
Exclusion criteria	Not reported			
Risk tools	ACS NSQIP			
Outcome	Mortality Any complication			
Results	Outcome		Event rate (%)	Odds ratio (95%CI)
				C-statistic
	Mortality		0	n/a
	Any complication		100 (11.4)	1.08 (0.99-1.18)

Reference	Tominaga 2016 ¹⁷⁰										
Study type	Retrospective cohort										
Study sample	Between January 2009 and August 2013, patients diagnosed with colorectal cancer and underwent curative colorectal resection at the Department of Surgical Oncology of Nagasaki University Graduate School of Biological Sciences. N=239										
Inclusion criteria	Patients over 70 years of age diagnosed with colorectal cancer and underwent curative colorectal resection										
Exclusion criteria	Not reported										
Risk tools	E-PASS										
Outcome	Mortality (Survival)										
Results	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">E-PASS score</th> <th style="width: 30%;">Survival (%)</th> <th style="width: 40%;">P value</th> </tr> </thead> <tbody> <tr> <td><0.2</td> <td>82.9</td> <td rowspan="2" style="text-align: center; vertical-align: middle;"><0.001</td> </tr> <tr> <td>≥0.2</td> <td>54.9</td> </tr> </tbody> </table>			E-PASS score	Survival (%)	P value	<0.2	82.9	<0.001	≥0.2	54.9
	E-PASS score	Survival (%)	P value								
	<0.2	82.9	<0.001								
≥0.2	54.9										

Reference	Tran Ba Loc 2010 ¹⁷¹										
Study type	Retrospective cohort study										
Study sample	From 2002 to 2004, elderly patients undergoing major colorectal surgery in France were enrolled. N=1186										
Inclusion criteria	Patients, at least 65 years old, undergoing major colorectal surgery.										
Exclusion criteria	Patients without POSSUM or follow-up data										
Risk tools	POSSUM P-POSSUM Surgical risk score										
Outcome	Mortality Morbidity										
Results	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Outcome</th> <th style="width: 30%;">O/E ratio</th> <th style="width: 20%;">P value*</th> <th style="width: 20%;">c-statistic (95% CI)</th> </tr> </thead> <tbody> <tr> <td>Morbidity</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Outcome	O/E ratio	P value*	c-statistic (95% CI)	Morbidity			
	Outcome	O/E ratio	P value*	c-statistic (95% CI)							
Morbidity											

Reference	Tran Ba Loc 2010 ¹⁷¹			
	POSSUM	1.22	0.001	0.75 (0.70, 0.80)
	Mortality			
	P-POSSUM	1.23	0.584	0.86 (0.81, 0.92)
	SRS	1.08	0.3	0.78 (0.70, 0.86)

Reference	Vather 2006 ¹⁷⁷		
Study type	Retrospective cohort study		
Study sample	Consecutive patients undergoing a major colorectal operation between January 2002 and October 2005 at the participating hospital. N=308		
Inclusion criteria	Patients undergoing a major colorectal operation		
Exclusion criteria	Patients with incomplete data		
Risk tools	POSSUM P-POSSUM		
Outcome	Mortality		
Results			
	Outcome	c-statistic	SE
	POSSUM	0.789	0.068
	P-POSSUM	0.786	0.068

Reference	Wang 2014 ¹⁷⁹		
Study type	Retrospective cohort		
Study sample	Consecutive patients treated surgically in the study centre following a diagnosis of hilar cholangiocarcinoma. N=100		
Inclusion criteria	Only patients with histologically confirmed cholangiocarcinoma were included.		
Exclusion criteria	Patients who underwent liver transplantation were not included in this study		
Risk tools	POSSUM P-POSSUM E-PASS		

Reference	Wang 2014 ¹⁷⁹			
Outcome	Mortality Morbidity			
Results	Outcome	O/E ratio	P value*	c-statistic
	Morbidity			
	POSSUM	1.00 (52/52)	0.488	0.843 (0.768-0.919)
	Mortality			
	POSSUM	1.11 (10/9)	0.520	0.863 (0.766-0.961)
	P-POSSUM	1.00 (10/10)	0.721	0.848 (0.740-0.956)
	E-PASS	1.00 (10/10)	0.671	0.842 (0.735-0.949)
	* Goodness of fit			

Reference	Wang 2017 ¹⁸²		
Study type	Retrospective cohort		
Study sample	Geriatric patients who underwent lumbar surgery between January 2014 and December 2016 N=242		
Inclusion criteria	Elderly patients (age>60 years) with isolated spinal stenosis who underwent conventional laminectomy without fusion.		
Exclusion criteria	Age <60 y Lumbar spondylolisthesis Not treated with conservative therapy for 3 mo Glasgow Coma scale score <3. Conventional decompressive laminectomy with fusion.		
Risk tools	ACS-NSQIP		
Outcome	Mortality Any complication		
Results	c-statistic:		
	Outcome	Event rate (%)	C-statistic (95% CI)
	Mortality	2 (0.8)	0.972 (0.929, 1.000)
	Any complication	106 (43.8)	0.683 (0.615,0.751)

Reference	Wani 2005¹⁸³		
Study type	Retrospective cohort study		
Study sample	Patients of diagnosed calcular disease of biliary tract over an 18 month period. N=500		
Inclusion criteria	The types of surgeries performed were categorized into three groups : TYPE-I: Cholecystectomy/ Cholecystostomy only. TYPE.II: Cholecystectomy with CBD exploration with T tube drainage, TYPE-III: Cholecystectomy with papillotomy/sphincteropeasty/choledochoduodenostomy or choledocho jujenostomy.		
Exclusion criteria	All the operations performed were open procedures and no laparoscopic operation is included.		
Risk tools	POSSUM scoring system		
Outcome	Morbidity Mortality		
Results	Predictive accuracy		
	Outcome	Sensitivity	Specificity
	Mortality	62%	94%
	Morbidity	60%	99%
	Correlation		
	Predicted rate (%)	Observed rate Mortality (%)	Morbidity (%)
	80	96	99
	70	84	87
	60	72	74
	50	60	62
	40	48	50
	30	36	37
	20	24	25
10	12	12	
Correlation between predicted and observed rates is significant, p<0.05			

Reference	Wolters 2006 ¹⁸⁶														
Study type	Prospective cohort study														
Study sample	From May 1996 to June 2000, patients meeting the inclusion criteria were included for analysis. N=107														
Inclusion criteria	patients received an aorto-bi-iliac or an aorto-bifemoral graft due to arterial occlusive disease														
Exclusion criteria	Not reported.														
Risk tools	POSSUM ASA														
Outcome	Mortality Morbidity														
Results	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">Outcome</th> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">c-statistic</th> </tr> </thead> <tbody> <tr> <td>Morbidity</td> <td></td> </tr> <tr> <td> POSSUM</td> <td>0.561</td> </tr> <tr> <td> ASA</td> <td>0.518</td> </tr> <tr> <td>Mortality</td> <td></td> </tr> <tr> <td> POSSUM</td> <td>0.471</td> </tr> <tr> <td> ASA</td> <td>0.590</td> </tr> </tbody> </table>	Outcome	c-statistic	Morbidity		POSSUM	0.561	ASA	0.518	Mortality		POSSUM	0.471	ASA	0.590
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Reference	Yap 2018 ¹⁸⁷
Study type	Single-centre prospective validation cohort study.
Study sample	Patients admitted to St Luke's Medical Center-Quezon City from January 2016 to March 2017. N=424
Inclusion criteria	<p>Patients aged 19 years and older admitted for preoperative evaluation and cardiopulmonary risk stratification before non-cardiac surgery.</p> <p>Surgeries eligible for inclusion included open, laparoscopic and percutaneous abdominal surgeries, anorectal surgeries, breast surgeries, thyroid surgeries, head and neck surgeries, orthopaedic surgeries, urologic surgeries, excision and incision biopsies of superficial masses, wound debridement, vascular surgeries, and neurosurgical procedures.</p>

Reference	Yap 2018 ¹⁸⁷											
Exclusion criteria	Ophthalmologic and endoscopic procedures were excluded.											
Risk tools	ACS NSQIP risk calculator											
Outcome	Mortality Morbidity											
Results	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Outcome</th> <th style="width: 30%;">Total events</th> <th style="width: 40%;">c-statistic</th> </tr> </thead> <tbody> <tr> <td>Mortality</td> <td>12 (3%)</td> <td>0.89</td> </tr> <tr> <td>Morbidity</td> <td>60 (14%)</td> <td>0.88</td> </tr> </tbody> </table>			Outcome	Total events	c-statistic	Mortality	12 (3%)	0.89	Morbidity	60 (14%)	0.88
	Outcome	Total events	c-statistic									
	Mortality	12 (3%)	0.89									
	Morbidity	60 (14%)	0.88									

Reference	Zattoni 2019 ¹⁸⁹
Study type	Prospective observational study
Study sample	All patients 70 years or older consecutively admitted to the emergency unit with an urgent need for abdominal surgery between December 2-15 and May 2016
Inclusion criteria	110 patients over 70 years old undergoing emergency abdominal surgery under general anaesthesia were enrolled
Exclusion criteria	Patients who underwent only medical management or who were operated on for vascular, thoracic, gynaecological or urological conditions were excluded
Risk tools	Age adjusted CCI ASA score
Outcome	30 day mortality
Results	Age adjusted CCI ≥ 6 30 day mortality – sensitivity = 95.2% (76.2-99.9), specificity = 48.3% (37.6-59.2) c-statistic = 71.8 ASA ≥ 4 30 day mortality - sensitivity = 57.1% (34-78.2), specificity = 82% (72.5-89.4) c-statistic = 69.6 Age adjusted CCI ≥ 6 90 day mortality – sensitivity = 96% (79.6-99.9), specificity = 50.6% (39.5-61.6) c-statistic = 73.3 ASA ≥ 4 90 day mortality - sensitivity = 52% (31.3-72.2), specificity = 82.4% (72.6-89.8) c-statistic = 67.2