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Preoperative risk prediction tools that predict morbidity risk in adults undergoing surgery: An Evidence Review

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Background

Risk prediction tools play a critical role in preoperative care by estimating the likelihood of negative outcomes or complications. This is particularly valuable for **low-risk settings like surgical hubs.**

The aim of this review was to:

- identify and map the evidence for **14 validated pre-operative surgical risk prediction tools** currently used in Wales within elective and non-emergency surgical settings
- review and select tools deemed to be the most appropriate in the context of surgical hubs

This study was developed in collaboration with Planned Care Wales.

Evidence Base

Studies included in this review were published between 1999 and 2024.

Initially, a total of **118 external validation** studies were identified across 12 risk prediction tools.
There was **a lot of variation among the 118 studies** with regards to;

- **which surgical specialties** the risk prediction tools are relevant to
- **how complications are defined**
- **which measures are used** to determine a tool's predictive ability

This makes direct comparisons very challenging.

4 **Four** tools were selected for a more in-depth analysis.
A total of **76 studies were** identified across these 4 risk prediction tools.

Limitations of the evidence

- **No evidence was found on the predictive ability of risk prediction tools for selecting patients suitable for surgical hubs.**
- It is **unclear** whether study findings are **generalisable to the UK.**
- **No quality appraisal of included studies** was conducted so findings should be interpreted with caution.
- No evidence was identified assessing the predictive ability of two tools: the Carlisle Risk Calculator and the National Emergency Laparotomy Audit Parsimonious Risk Score

No single tool was found that adequately predicted complications across **all surgical specialties.** Because of this, **some tools may be better suited to specific surgery types than others**, or a **combination of tools** may be needed to adequately assess an individual's level of risk.

Key Findings

No tool should be used in isolation for clinical decision making

	Number of external validation studies and predictive ability by surgical type			
Surgical type	**ACS NSQIP**	**ASA Classification system**	**P-POSSUM**	**RCRI**
Ear, nose and throat			1	
General	12	1	5	
Gynaecology	1		1	
Mixed (multiple surgical types)	3	2		9
Neurosurgery	4			
Orthopaedic	6	3		2
Plastic	2			
Urology	3	1		1
Thoracic	1			
Vascular	1	2		1

Predictive ability for composite complications

- Very poor or poor
- Fair
- Good or excellent

The level of *'predictive ability for composite complications'* indicates each tool's ability to predict **two or more complications that might arise from a given surgery.**

Number of external validation studies for each tool

An external validation study assesses how well a prediction model performs

The mix of surgery types differed across studies, for further detail about **which surgery types were included in the mixed datasets**, please see the full report or clinical summary linked below.

Further research using consistent methods is needed
to better understand the predictive ability of risk prediction tools.

A **clinical summary** of the findings from this study has been produced to **provide guidance on the application of these risk prediction tools**, available here.

The full evidence review, **including economic considerations**, is available to view here:
https://www.medrxiv.org/content/10.1101/2025.06.27.25330118v1