

Early drain colour change for detection of Clinically Relevant Postoperative Pancreatic Fistula (CR-POPF)

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RESEARCH WEEK
20-24 OCTOBER 2025
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Introduction

- Clinically Relevant Postoperative Pancreatic Fistula (CR-POPF) remains the most significant complication after pancreatic resection.
- Standard prediction relies on drain amylase levels, which are delayed and often logistically challenging.
- Drain fluid colour may provide an **early, low-cost visual marker** of CR-POPF.
- Aim:** To determine whether early postoperative drain colour change can predict CR-POPF.

Methods

- Design:** Retrospective cohort study, 2010–2022.
- Setting:** Northern Health, Melbourne (Ethics approval ALR 06.2021).
- Participants:** 169 adults who underwent pancreatic resection (pancreatoduodenectomy, distal, total, or other).
- Variables:** Demographics, pancreatic texture, duct diameter, drain colour (dark red, brown, port-wine). Drain colour assessed during **postoperative days 1–5**.
- Outcomes:** CR-POPF (ISGPS 2016 definition).
- Analysis:** Univariate and multivariate logistic regression (STATA 18); significance set at $p < 0.05$.

Table 2 – Comparison of non-CR-POPF versus CR-POPF.

Factor	Non-CR-POPF	CR-POPF	p-value
N	119	39	
Texture (soft)	64 (53.8%)	33 (84.6%)	<0.001
Pancreatic duct (mm), median (IQR)	2.0 (2.0, 4.0)	2.0 (2.0, 4.0)	0.049
Pancreatic duct <3mm	67 (56.3%)	29 (74.4%)	0.045
BMI, median (IQR)	27.0 (23.0, 30.0)	30.0 (26.0, 32.0)	0.008
Smoking	59 (49.6%)	21 (53.8%)	0.64
Blood loss (mL), median (IQR)	500.0 (300.0, 800.0)	400.0 (200.0, 700.0)	0.50
LoS with Hospital In The Home /rehabilitation, median (IQR)	13.5 (5.0, 25.0)	32.0 (16.0, 45.0)	0.043
Highest CRP, median (IQR)	161.9 (117.2, 225.4)	212.4 (147.0, 332.3)	0.017
Type of pancreaticectomy			0.52
Pancreatoduodenectomy	79 (66.4%)	26 (66.7%)	
Distal pancreaticectomy	27 (22.7%)	8 (20.5%)	
Total pancreaticectomy	8 (6.7%)	1 (2.6%)	
Subtotal pancreaticectomy	3 (2.5%)	2 (5.1%)	
Central pancreaticectomy	2 (1.7%)	2 (5.1%)	
Abnormal drain colour in POPF	20 (16.8%)	37 (94.9%)	<0.001
Abnormal drain colour in first 5 days	18 (15.1%)	29 (74.4%)	<0.001
Drain colour detected before enzyme investigation	15 (12.6%)	28 (71.8%)	<0.001

Table 4 – Multivariate analysis of predictive variables for CR-POPF

Factors	Odds ratio (95% CI power)	p-value
Ductal diameter <3mm	1.21 (0.44 – 3.3)	0.71
Pancreatic texture	2.0 (0.64 – 6.1)	0.24
Gender (male)	1.4 (0.55 – 3.6)	0.49
BMI	1.03 (0.96 – 1.1)	0.38
Age	0.99 (0.96 – 1.02)	0.65
Smoking	1.3 (0.52 – 3.2)	0.59
Dark red/brown/port wine drain colour in first 5 days	11.7 (4.7 – 29.2)	<0.001

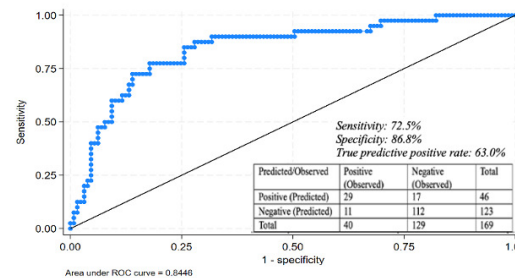


Figure 1 – Receiver operating characteristic (ROC) analysis and confusion matrix.

Results

CR-POPF incidence: 23.7% (Grade B: 20.1%, Grade C: 3.6%).

Key associations:

- Soft pancreas (OR 4.8, 95% CI 1.9–12.1, $p < 0.001$)
- Duct < 3 mm (OR 2.3, 95% CI 1.04–5.1, $p = 0.04$)
- Abnormal drain colour** within 5 days → OR 11.7 (95% CI 4.7–29.2, $p < 0.001$)

Predictive performance:

- Sensitivity 72.5%, Specificity 86.8%
- AUC = 0.845 (strong discriminative ability)

Clinical timing: 71.8% of CR-POPF patients had abnormal drain colour **before** raised amylase was detected.

Conclusion

- Early drain colour change (dark red, brown, or port-wine)** is a strong and independent predictor of CR-POPF.
- This visual marker offers a **simple, rapid bedside tool** for early identification and timely intervention.
- May reduce morbidity, enable tailored management, and guide drain removal decisions.
- Future **prospective, multicentre validation** recommended to standardize colour assessment.

Key Takeaway

Abnormal drain colour within the first 5 postoperative days predicts CR-POPF 11-fold higher than normal drain colour.