ΜΕΤΕΓΧΕΙΡΗΤΙΚΕΣ ΕΠΙΠΛΟΚΕΣ ΜΕΤΑ ΠΑΓΚΡΕΑΤΕΚΤΟΜΗ

ΔΗΜΗΤΡΗΣ Π. ΚΟΡΚΟΛΗΣ
Επιστημονικά Υπεύθυνος - Διευθυντής
Χειρουργικής Κλινικής
ΓΑΟΝΑ «Ο Άγιος Σάββας»

Post – Pancreatectomy Complications

- One of the most debated topics in pancreatic surgery
- Rate of complications among the highest in abdominal surgery
- Mortality <5%
- Morbidity 30 – 60%
- Impact on patient recovery and hospital stay
- Massive utilization of resources and cost for the health system
- Definitions
- ISGPS

Post – Pancreatectomy Complications

- Post Operative Pancreatic Fistula (POPF)
- Post Pancreatectomy Hemorrhage (PPH)
- Delayed Gastric Emptying (DGE)
- Bile Leakage
- Chyle Leak
- Post Pancreatectomy Acute Pancreatitis (PPAP)

Two Thousand Consecutive Pancreaticoduodenectomies

John L Cameron, MD, FACS, Jin He, MD, PhD

Complication	n	%
Delayed gastric emptying	410	21
Postoperative pancreatic fistula	295	15
Wound infection	222	11
Cardiac event	69	3
Pneumonia	38	2
Delayed bleeding	32	2
Chyle leak	28	1
Any complication	894	45

JACS 2015

Two Thousand Consecutive Pancreaticoduodenectomies

John L Cameron, MD, FACS, Jin He, MD, PhD

Complication	First 1,000 Whipples	Second 1,000 Whipples	p Value
Delayed gastric emptying, n (%)	166 (17)	244 (24)	<0.0001
Postoperative pancreatic fistula, n (%)	116 (12)	179 (18)	<0.0001

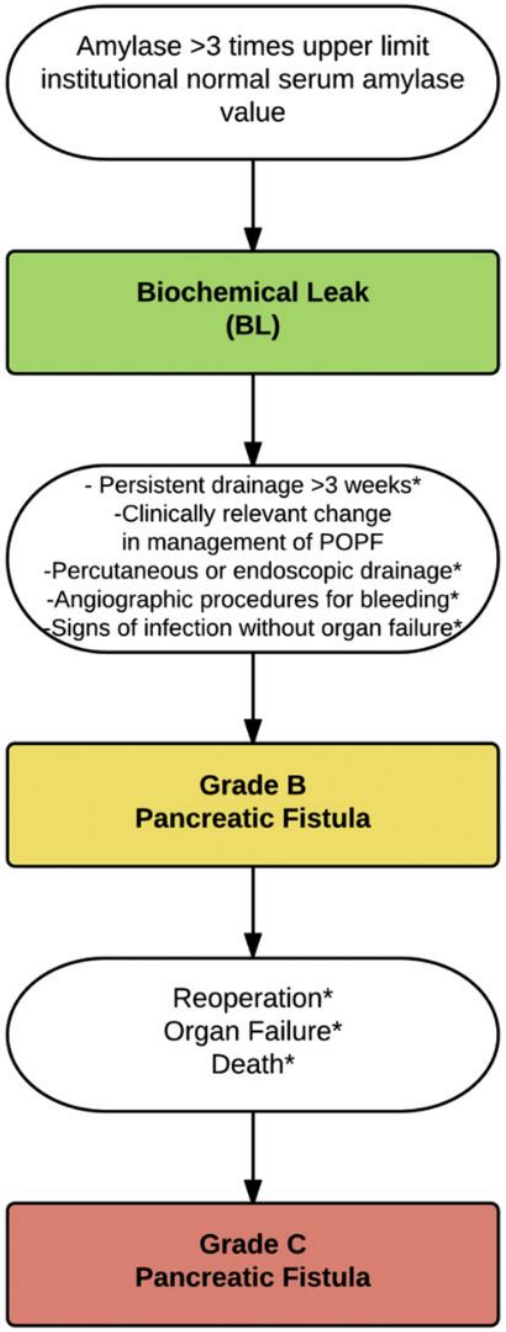
Data	First 1,000 Whipples	Second 1,000 Whipples	p Value
Age, y, mean ± SD	64 ± 13	66 ± 12	0.002
Range	15–103	13–93	
≥80	81	129	<0.001
Charlson Age-Comorbidity Index, mean ± SD	2.7 ± 1.5	2.9 ± 1.6	0.04
Male, n	546	548	
Whipple, n	1,000	1,000	
Total pancreatectomy, n	46	56	
30-d mortality, n	8	20	
Hospital mortality (index admission), n	10	21	

Post Operative Pancreatic Fistula (POPF)

- The most feared complication
- The *"Achilleas heal"*
- Death responsibility: 35-90% after pancreatic resection
- POPF → PPH / DGE / Adj Chemo
- POPF after PD: 11% - 25%
  DP: 13% - 30% (less CR)
- Usually between 3rd – 7th PODs
- Preop factors:

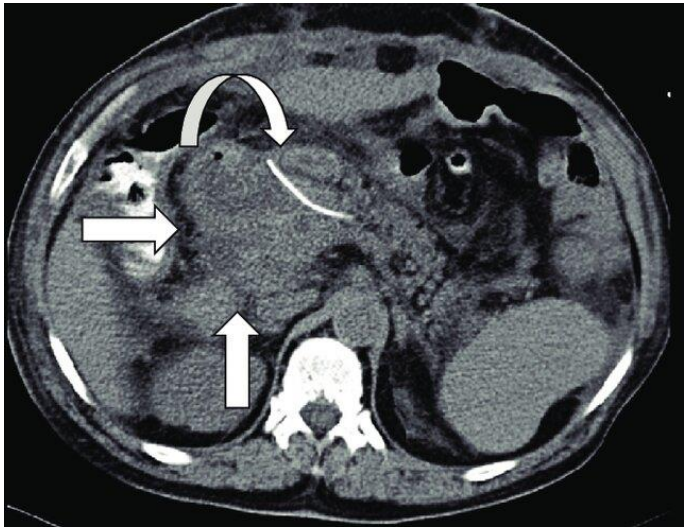
ASA	diabetes
gender	cardiovascular
BMI	hypoalbuminemia

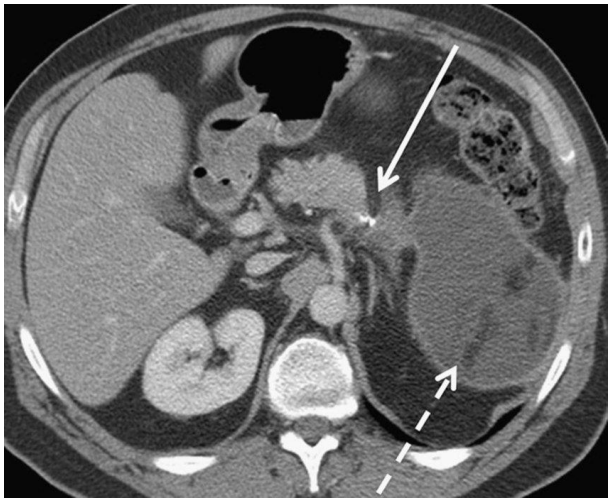
The 2016 update of the International Study Group (ISGPS) definition and grading of postoperative pancreatic fistula: 11 Years After



Surgery 2017

POPF





ORIGINAL SCIENTIFIC ARTICLES

A Prospectively Validated Clinical Risk Score Accurately Predicts Pancreatic Fistula after Pancreatoduodenectomy

Mark P Callery, MD, FACS, Wande B Pratt, MD, MPH, Tara S Kent, MD, FACS, Elliot L Chaikof, MD, PhD, FACS, Charles M Vollmer Jr, MD, FACS

Table 2. Fistula Risk Score for Prediction of Clinically Relevant Pancreatic Fistula after Pancreatoduodenectomy (Model III)

Risk factor	Parameter	Points*
Gland texture	Firm	0
	Soft	2
Pathology	Pancreatic adenocarcinoma or pancreatitis	0
	Ampullary, duodenal, cystic, islet cell	1
Pancreatic duct diameter, mm	≥5	0
	4	1
	3	2
	2	3
	≤1	4
Intraoperative blood loss, mL	≤400	0
	401–700	1
	701–1,000	2
	>1,000	3

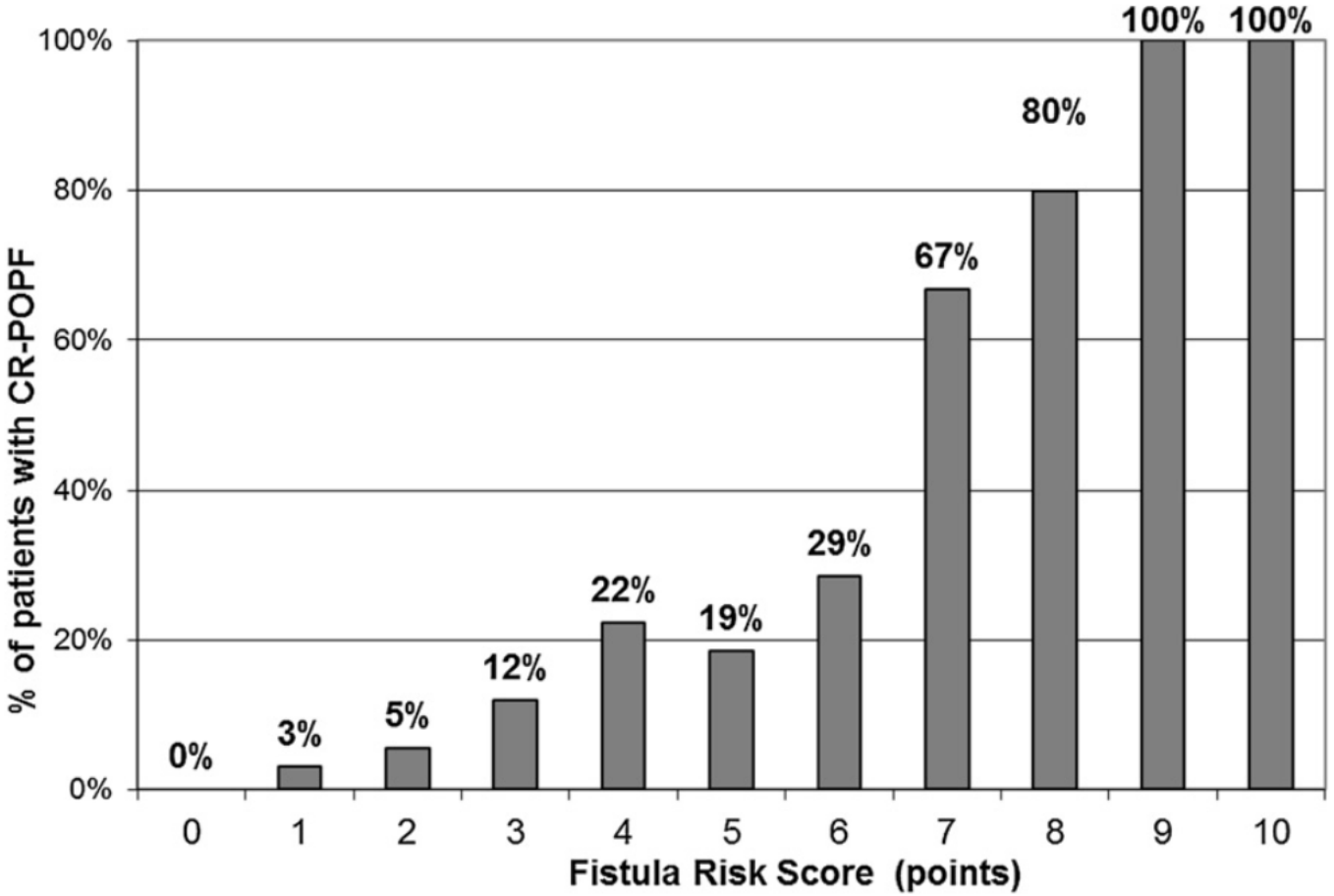
*Total 0 to 10 points.

J Am Coll Surg 2013

ORIGINAL SCIENTIFIC ARTICLES

A Prospectively Validated Clinical Risk Score Accurately Predicts Pancreatic Fistula after Pancreatoduodenectomy

Mark P Callery, MD, FACS, Wande B Pratt, MD, MPH, Tara S Kent, MD, FACS, Elliot L Chaikof, MD, PhD, FACS, Charles M Vollmer Jr, MD, FACS



JACS 2013

ORIGINAL SCIENTIFIC ARTICLES

A Prospectively Validated Clinical Risk Score Accurately Predicts Pancreatic Fistula after Pancreatoduodenectomy

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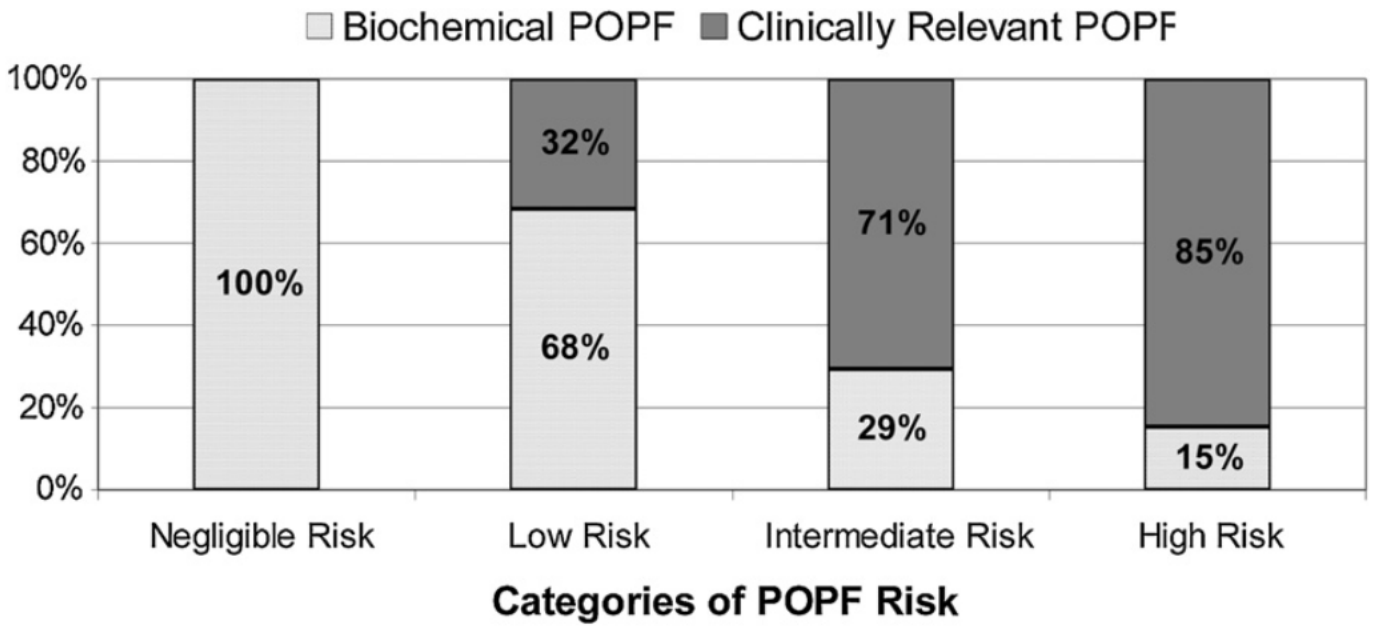


0 points 1 – 2 points 3 – 6 points 7 – 10 points

JACS 2013

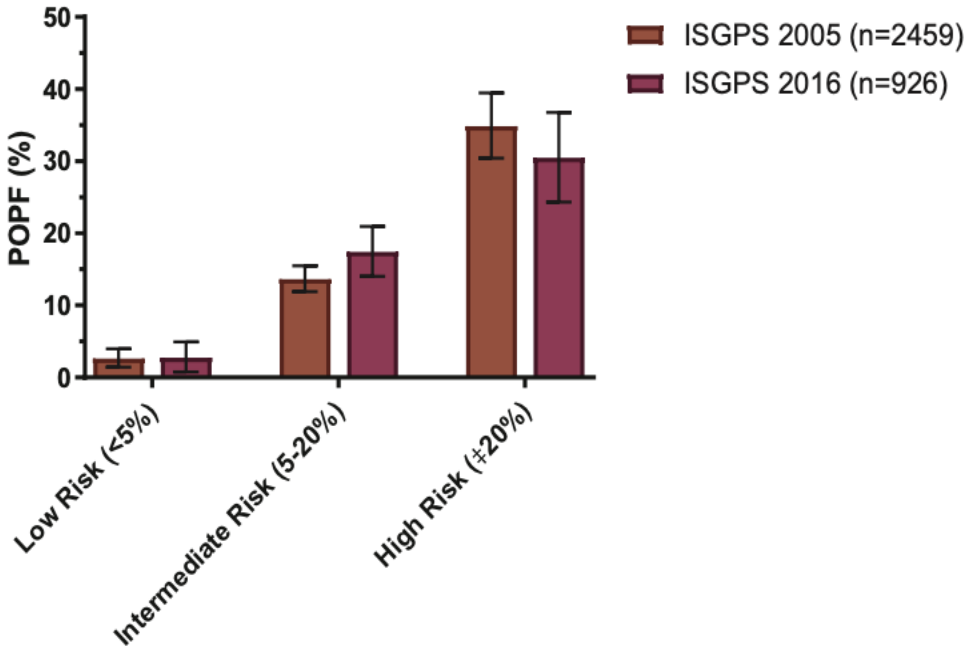
Alternative Fistula Risk Score for Pancreatoduodenectomy (a-FRS)

Design and International External Validation

Timothy H. Mungroop, MD, L. Bengt van Rijssen, MD,* David van Klaveren, PhD,† F. Jasmijn Smits, MD,‡ Victor van Woerden, MD,§ Ralph J. Linnemann, MD,¶ Matteo de Pastena, MD,|| Sjors Klompmaker, MD,* Giovanni Marchegiani, MD,|| Brett L. Ecker, MD,** Susan van Dieren, PhD,* Bert Bonsing, MD,** Olivier R. Busch, MD,* Ronald M. van Dam, MD,§ Joris Erdmann, MD,†† Casper H. van Eijck, MD,‡‡ Michael F. Gerhards, MD,§§ Harry van Goor, MD,¶¶ Erwin van der Harst, MD,|||| Ignace H. de Hingh, MD,*** Koert P. de Jong, MD,††† Geert Kazemier, MD,‡‡‡ Misha Luyer, MD,*** Awad Shamali, MD,§§§ Salvatore Barbaro, MD,§§§ Thomas Armstrong, MD,§§§ Arjun Takhar, MD,§§§ Zaed Hamady, MD,§§§ Joost Klaase, MD,¶¶¶ Daan J. Lips, MD,|||||| I. Quintus Molenaar, MD,‡ Vincent B. Nieuwenhuijs, MD,¶ Coen Rupert, MD,**** Hjalmar C. van Santvoort, MD,†††† Joris J. Scheepers, MD,‡‡‡‡ George P. van der Schelling, MD,§§§§ Claudio Bassi, MD,|| Charles M. Vollmer, MD,** Ewout W. Steyerberg, PhD,‡‡ Mohammed Abu Hilal, MD,§§§ Bas Groot Koerkamp, MD,‡‡ and Marc G. Besselink, MD, MSc, PhD*, for the Dutch Pancreatic Cancer Group*

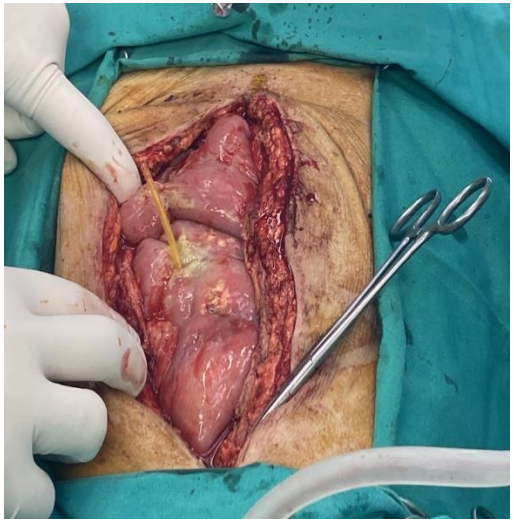
Alternative Fistula Rick Score

Risk factor	
Pancreatic texture	
Firm	0
Soft	1
BMI (kg/m^2)	
Value	
Duct size (mm)	
Value, truncated at 5	
Score	
{exp [−3.136 + 0.947(texture) + 0.0679(BMI) − 0.385(duct size)]}/{1 + exp [−3.136 + 0.947(texture) + 0.0679(BMI) − 0.385 (duct size)]}	
Risk profile	
Low (0–5%), intermediate (>5% to 20%), and high (≥20%)	



Ann Surgery 2017

Preventive Strategies



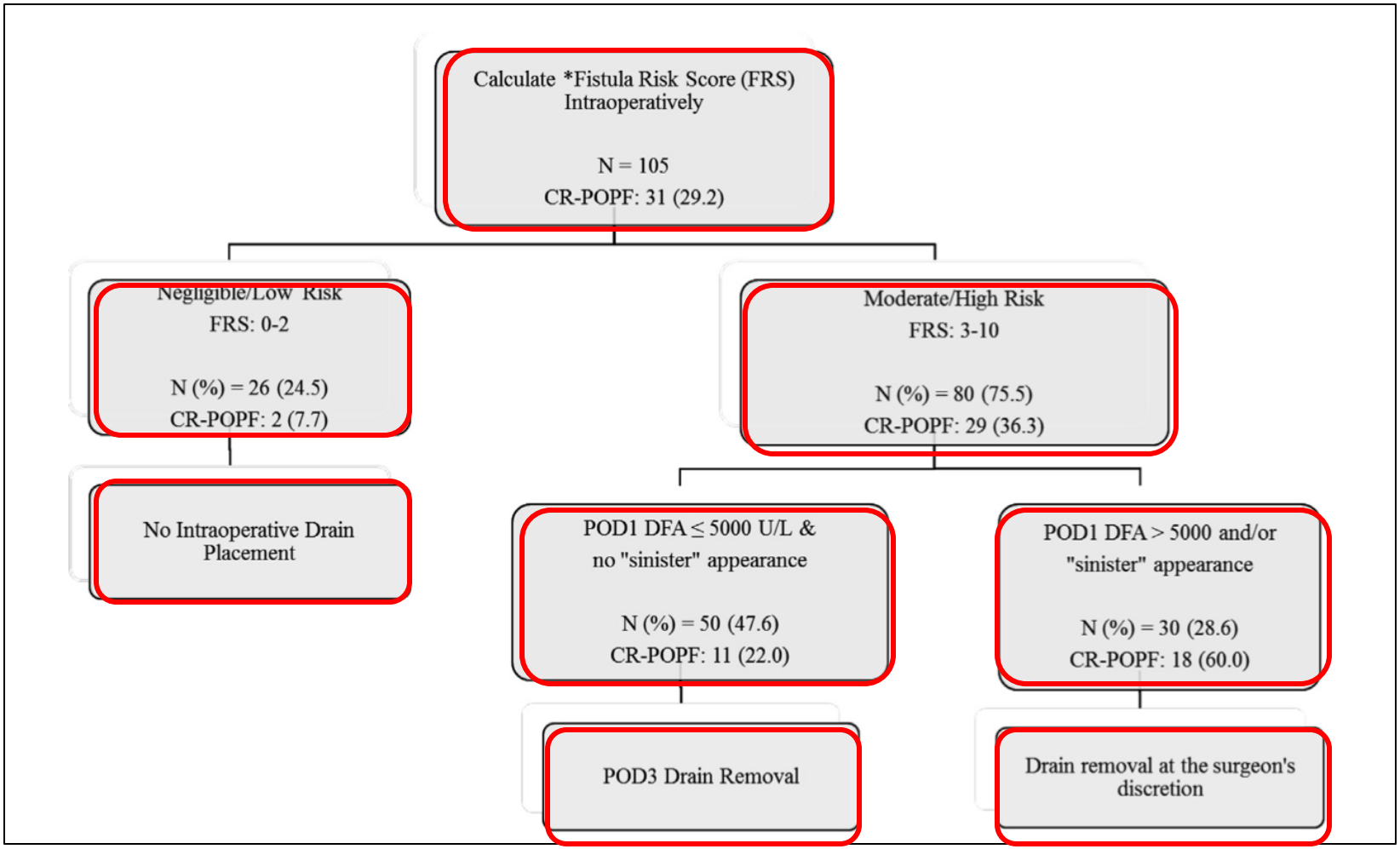
- Extent of Mobilization and Vascularity
- Pancreatoenteric Anastomosis vs None
- Duct-to-Mucosa vs Invagination
- Pancreatojejunostomy (PJ) vs Pancreatogastrostomy (PG)
- Roux-en-Y vs Single Loop Reconstruction
- Selective Use of Drains
- Role of Stents
- Octreotide
- Fibrin glue
- Role of Omentum and Falciform ligament
- Staple line reinforcement in DP

World J Surg 2019
Cochrane Database Syst Rev 2017
Ann Surg 2017

Drain Management after Pancreatoduodenectomy: Reappraisal of a Prospective Randomized Trial Using Risk Stratification

Matthew T McMillan, BA, Giuseppe Malleo, MD, Claudio Bassi, MD, FACS, Giovanni Butturini, MD, PhD, Roberto Salvia, MD, PhD, Robert E Roses, MD, Major K Lee, MD, PhD, Douglas L Fraker, MD, FACS, Jeffrey A Drebin, MD, PhD, FACS, Charles M Vollmer Jr, MD, FACS

J Am Coll Surg 2015



POPF Treatment

- Drainage
- Inhibition of food-induced pancreatic secretion
- Low-fat diet
- TPN – Enteral feeding
- Daily energy supply 20-30kcal/kg body weight
- Somatostatin
- Broad spectrum antibiotics
- Intervention for intraabdominal collections and abscess
- Under US / CT scan / EUS
- ERCP for POPF after DP
- Monitoring - ICU
- Re-Operation SHOULD be the Last Resort!!!

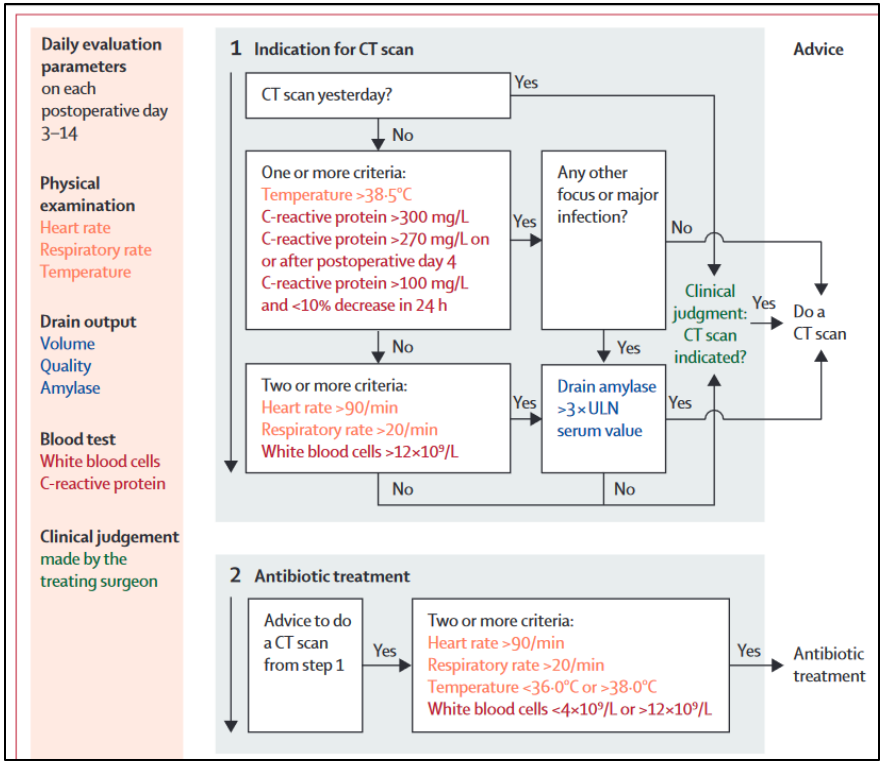
Langenbecks Arch Surg 2016

HPB (Oxford) 2009

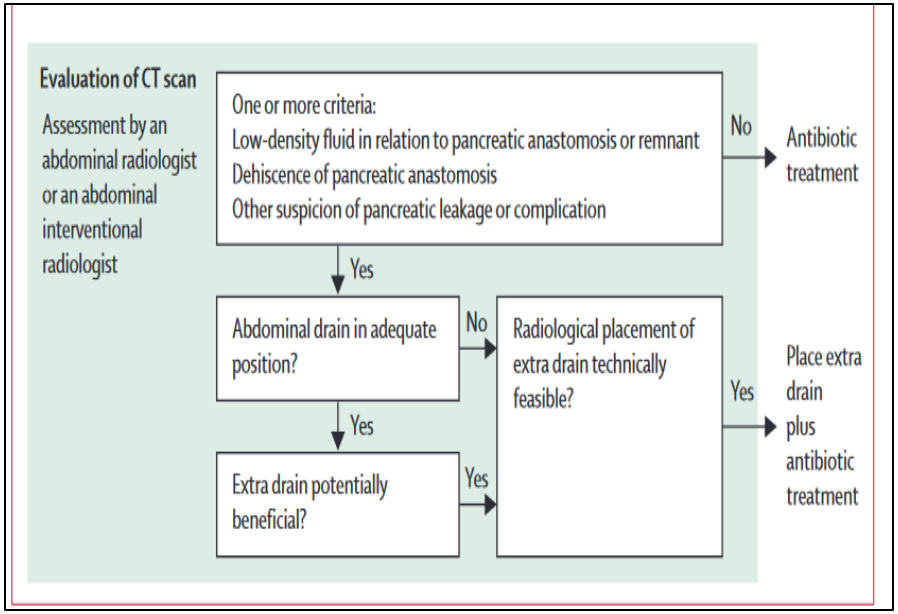
J Gastrointest Surg 2013

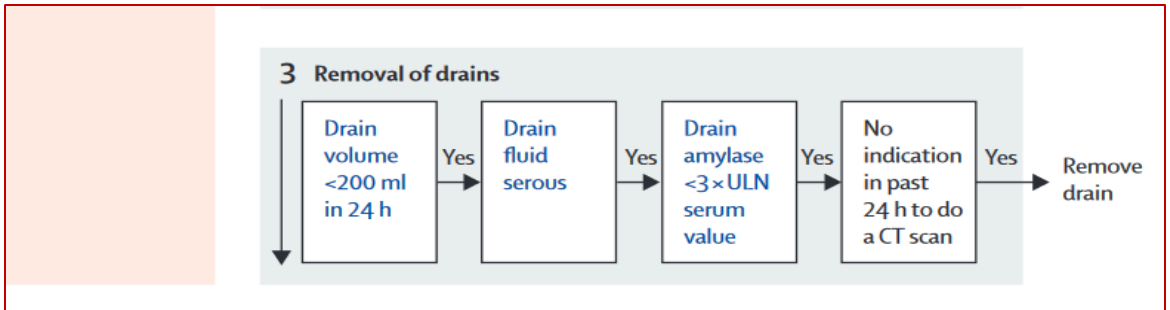
Algorithm-based care versus usual care for the early recognition and management of complications after pancreatic resection in the Netherlands: an open-label, nationwide, stepped-wedge cluster-randomised trial

F Jasmijn Smits*, Anne Claire Henry*, Marc G Besselink, Olivier R Busch, Casper H van Eijck, Mark Arntz, Thomas L Bollen, Otto M van Delden, Daniel van den Heuvel, Christiaan van der Leij, Krijn P van Lienden, Adriaan Moelker, Bert A Bonsing, Inne H Borel Rinkes, Koop Bosscha, Ronald M van Dam, Wouter J M Derksen, Marcel den Dulk, Sebastiaan Festen, Bas Groot Koerkamp, Robbert J de Haas, Jeroen Hagendoorn, Erwin van der Harst, Ignace H de Hingh, Geert Kazemier, Marion van der Kolk, Mike Liem, Daan J Lips, Misha D Luyer, Vincent E de Meijer, J Sven Mieog, Vincent B Nieuwenhuijs, Gijs A Patijn, Wouter W te Riele, Daphne Roos, Jennifer M Schreinemakers, Martijn W J Stommel, Fennie Wit, Babs A Zonderhuis, Lois A Daamen, C Henri van Werkhoven, I Quintus Molenaar†, Hjalmar C van Santvoort†, for the Dutch Pancreatic Cancer Group



Lancet 2022



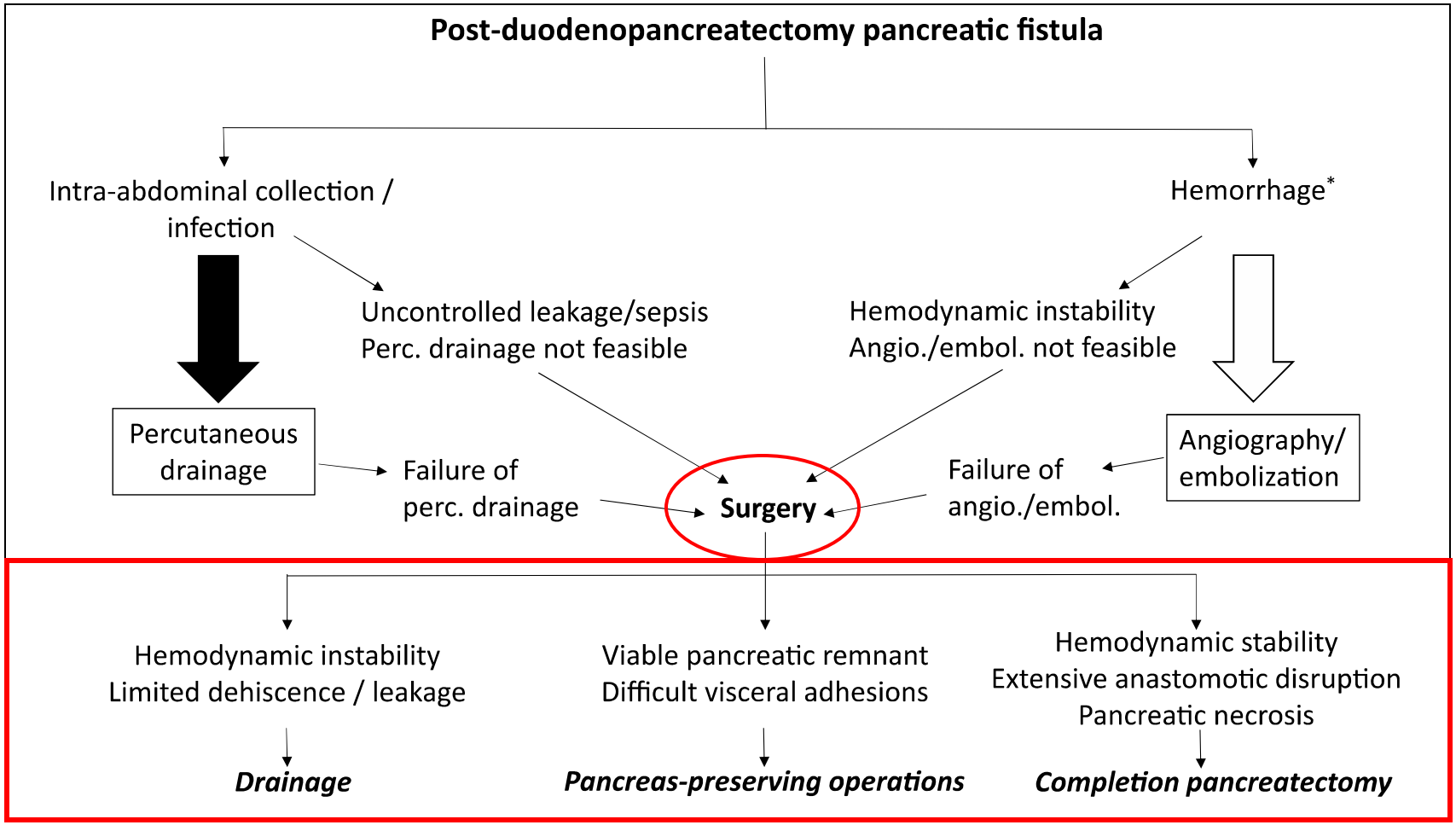


↓↓Mortality>50%!!!

http://dx.doi.org/10.1016/j.hpb.2017.08.036 HPB

REVIEW ARTICLE

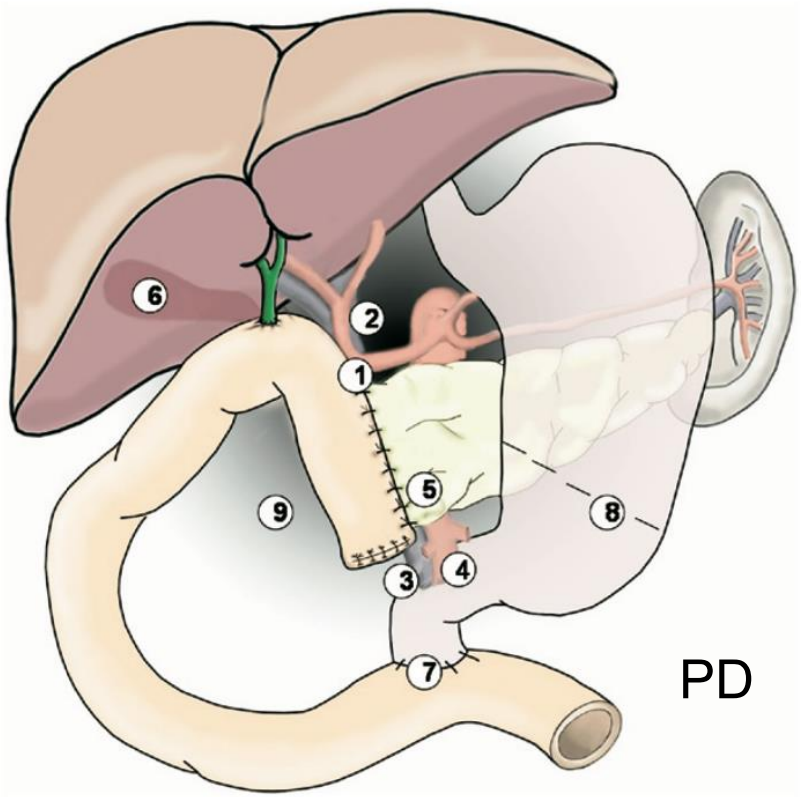
Completion pancreatectomy in the acute management of pancreatic fistula after pancreaticoduodenectomy: a systematic review and qualitative synthesis of the literature

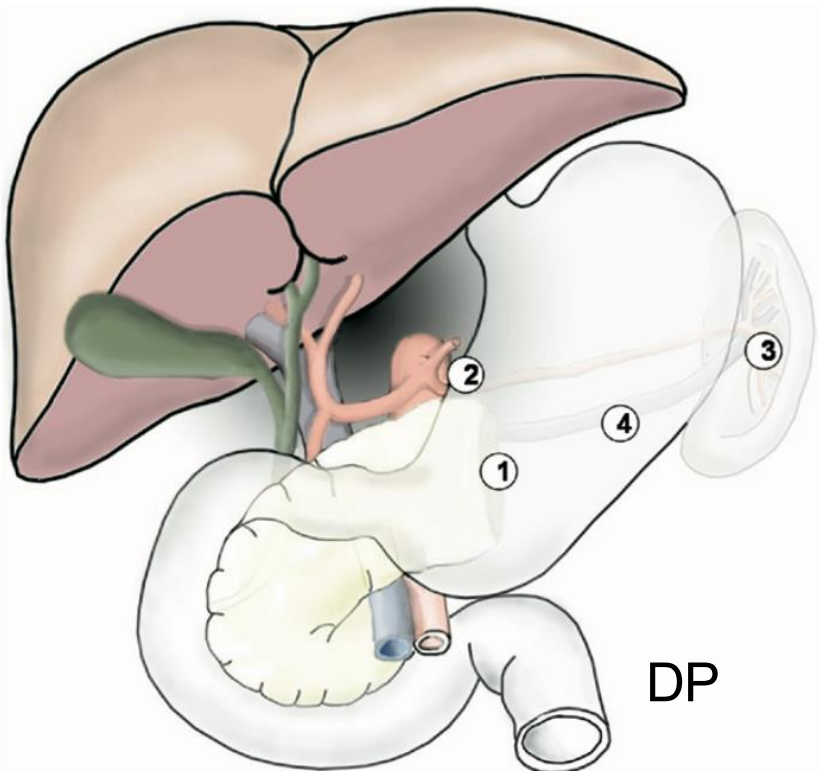


Post – Pancreatectomy Hemorrhage (PPH)

- Lower incidence compared with POPF
- 3% to 10% after pancreatectomy
- Major complication!!!
- Mortality rates 30% to 50%
- Time of Onset
  - a.Early<24hrs
  - b.Late>24hrs (2^{nd}-3^{rd} post week)
- Location
  - a.Intraluminal
  - b.Extraluminal
- Severity
  - a.Mild
  - b.Severe

Postpancreatectomy hemorrhage (PPH)–An International Study Group of Pancreatic Surgery (ISGPS) definition





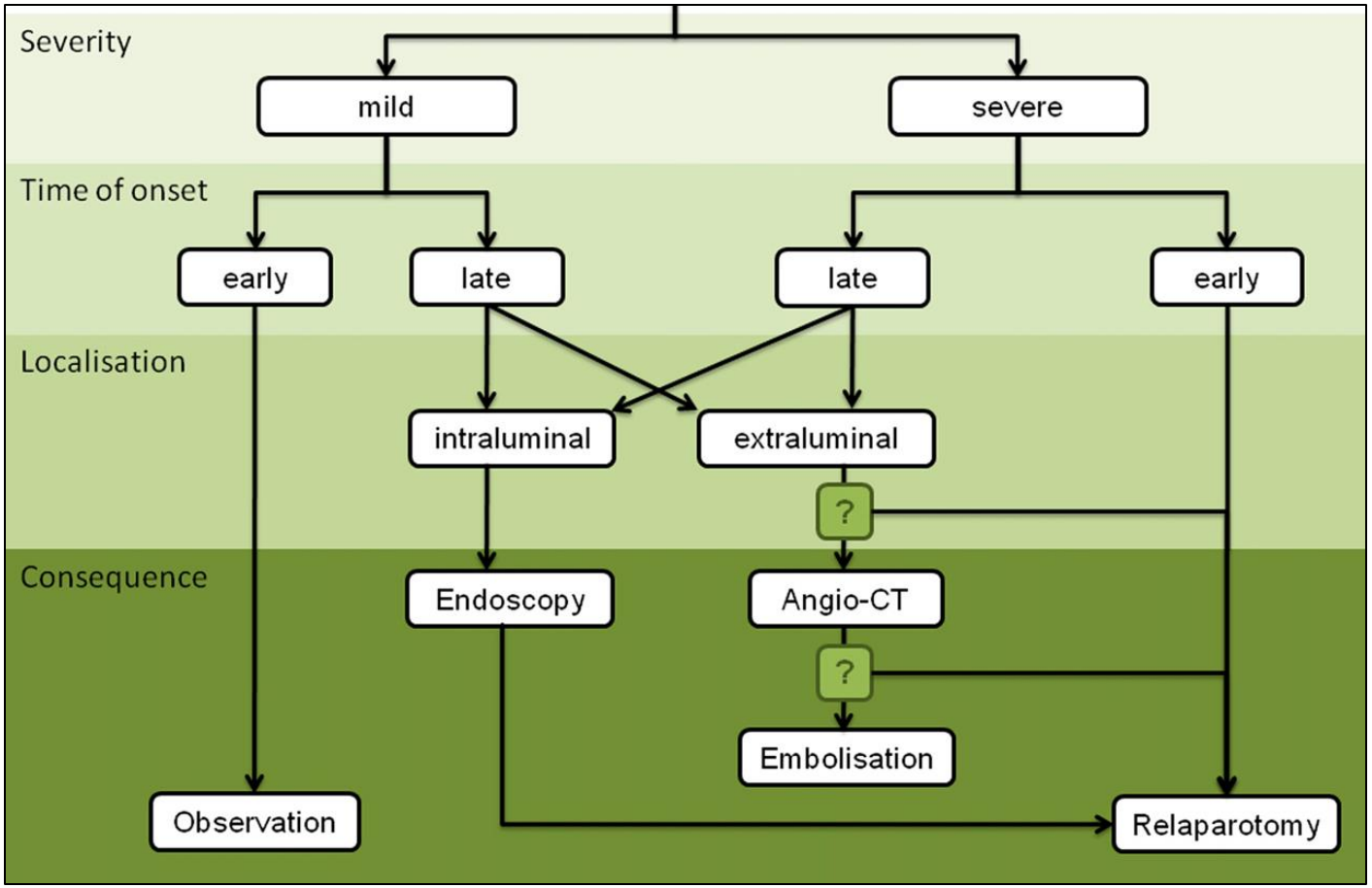
Surgery 2007

Postpancreatectomy hemorrhage (PPH)–An International Study Group of Pancreatic Surgery (ISGPS) definition

Grade	Time of onset, Location, Clinical impact of bleeding	Clinical condition	Diagnostic consequence	Therapeutic consequence
A	• Early • Intra- or extraluminal • Mild	Well	Observation, blood count, ultrasound, and, if neccessary, CT	No
B	• Early • Intra- or extraluminal • Severe or • Late • Intra- or extraluminal • Mild	Often well/ intermediate, very rarely life threatening	Observation, blood count, ultrasound, CT, angiography, endoscopy	Transfusion of fluid/ blood, ICU, therapeutic endoscopy, embolization, relaparotomy for early PPH
C	• Late • Intra- or extraluminal • Severe	Severely impaired, life-threatening	CT, angiography, endoscopy	Localization of bleeding, angiography and embolization, (endoscopy) *or* relaparotomy, ICU

Surgery 2007

Postpancreatectomy hemorrhage (PPH)–An International Study Group of Pancreatic Surgery (ISGPS) definition



Surgery 2007

Original Investigation | Surgery

Development and Validation of a Model for Postpancreatectomy Hemorrhage Risk

Emrullah Birgin, MD; Sebastian Hempel, MD; Alina Reeg, MD; Florian Oehme, MD; Annika Schnizer, MS; Johann S. Rink, MD; Matthias F. Froelich, MD; Svetlana Hetjens, DSc; Verena Plodeck, MD; Heiner Nebelung, MD; Schaima Abdelhadi, MD; Mohammad Rahbari, MD; Patrick Téoule, MD; Erik Rasbach, MD; Christoph Reissfelder, MD; Jürgen Weitz, MD; Stefan O. Schoenberg, MD; Marius Distler, MD; Nuh N. Rahbari, MD

N=1229 PDs/2 centers in Germany

Table 1. Multivariate Regression Analysis of Variables Associated With Postpancreatectomy Hemorrhage in the Derivation Cohort

Model and variable	OR (95% CI)	*P* value	β Regression coefficient	Points[a]
Clinical features				
Sentinel bleeding	35.10 (5.58-221.00)	<.001	3.56	2
Positive drainage culture				
Candida species	14.40 (2.24-92.20)	<.001	2.67	1
Radiologic features				
Fluid collection with gas	12.10 (2.22-65.50)	.004	2.49	1
Rim enhancement	12.00 (2.08-69.50)	.006	2.49	1

JAMA Surgery 2023

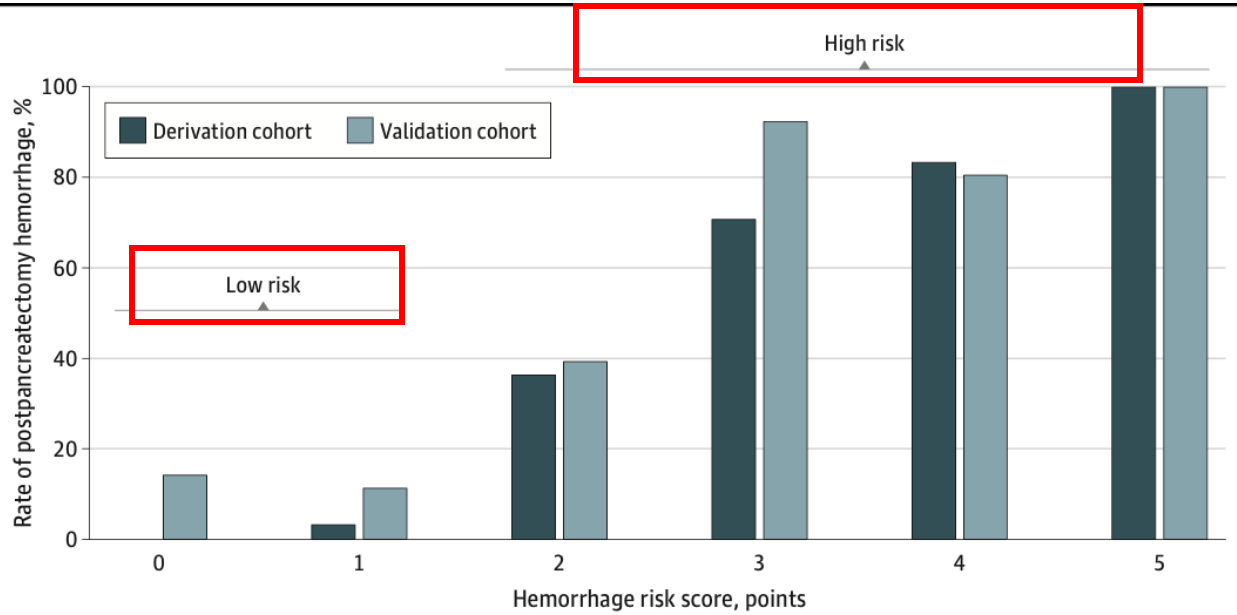


Table 2. Postoperative Outcomes and Risk Stratification Based on the Hemorrhage Risk Score in the Total Cohort

Variable	No. (%) Low risk (0-1 points) (n=191)	No. (%) High risk (≥2 points) (n=102)	*P* value
Postoperative complications[a]			
Grade I-IIIa	126 (66)	30 (29)	<.001
Grade IIIb-IVb	44 (23)	50 (49)	
Interventional treatment	64 (34)	74 (73)	<.001
Surgical revision	55 (29)	62 (61)	<.001
Completion pancreatectomy	28 (15)	32 (31)	.001
PPH			
Type B	3 (2)	20 (20)	<.001
Type C	8 (4)	43 (42)	
90-d Mortality rate	21 (11)	22 (22)	<.001

Biomedical Research 2017; 28 (1): 255-260

ISSN 0970-938X
www.biomedres.info

Sentinel bleeding after a pancreaticoduodenectomy: whether to perform a prophylactic embolization.

Peng Song[1*], Maoqiang Wang[2], Ning Wu[1], Feng Duan[2], Dabin Xu[3], Fengyong Liu[2]

- … as minor blood loss via surgical drains or the gastrointestinal tract with an asymptomatic interval between bleeding and hemorrhagic shock, has now been reported to precede with a delayed massive hemorrhage in 25 to 100% of cases…

- Prelude delayed massive hemorrhage (>5 POD)
  - erosive bleeding of skeletonized vessels
  - pseudoaneurysm rupture

- Prophylactic embolization may reduce the volume of blood transfusion and hospital stay

“sentinel bleed”

Delayed Gastric Emptying (DGE)

- Rarely a life-threatening complication
- Significant impact on the postop course
- Pt discomfort, longer hospital stay, increased readmission
- 13% - 45% after PD
- Predisposing factors:
  - POPF – Intraabdominal Abscess
  - Absence of hormonal stimulation – Motilin - CCK
  - Devascularization/denervation of pylorus
  - Extent of Lymphadenectomy
  - Diabetes
  - Blood loss / Operative time / PVR
  - Whipple vs PPPD
  - Antecolic vs Retrocolic
  - Handsewn vs Stapled
  - PJ vs PG

Cochrane Database Syst Rev 2016

Dig Surg 2016

Delayed gastric emptying (DGE) after pancreatic surgery: A suggested definition by the International Study Group of Pancreatic Surgery (ISGPS)

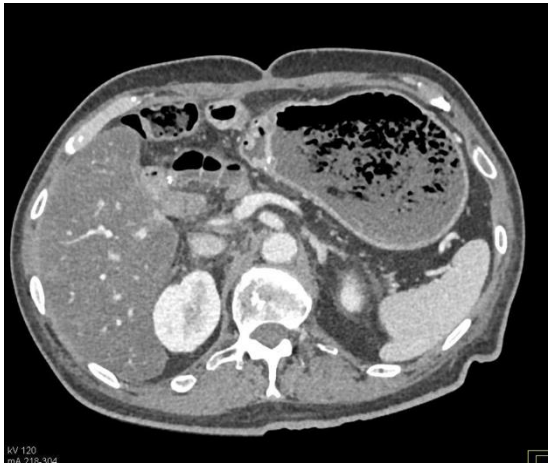
ISGPS classification of delayed gastric emptying (DGE).

DGE grade	Nasogastric tube required	Unable to tolerate solid diet by postoperative day	Vomiting/gastric distension	Use of prokinetics
A	4–7 days or reinsertion >POD 3	7	Yes/no	Yes/no
B	8–14 days or reinsertion >POD 7	14	Yes	Yes
C	>14 days or reinsertion >POD 14	21	Yes	Yes

POD, postoperative day.

Surgery 2007

Delayed Gastric Emptying (DGE)



- Clinical Diagnosis
- Symptomatic treatment
- NG Decompression
- Oral fasting
- TPN / Enteral feeding
- Contrast studies (gastroparesis)
- Endoscopy (ulceration, esophageal fungal infection)
- Proper POPF/Intraabdominal Collection Drainage
- Promotility drugs
- Low-dose Erythromycin

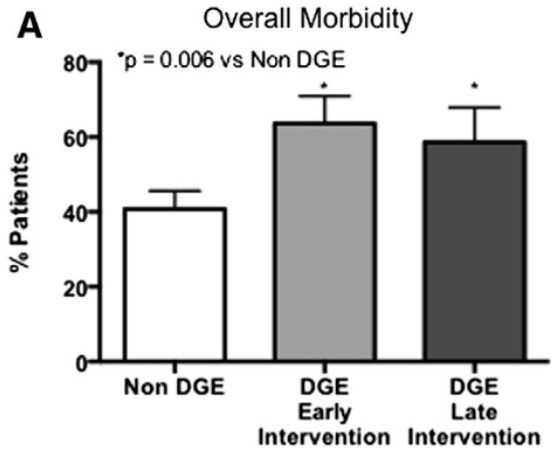
Surgery 2014

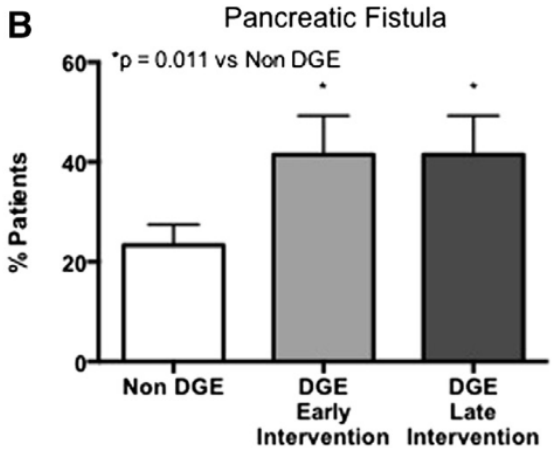
Ann Surg 2016

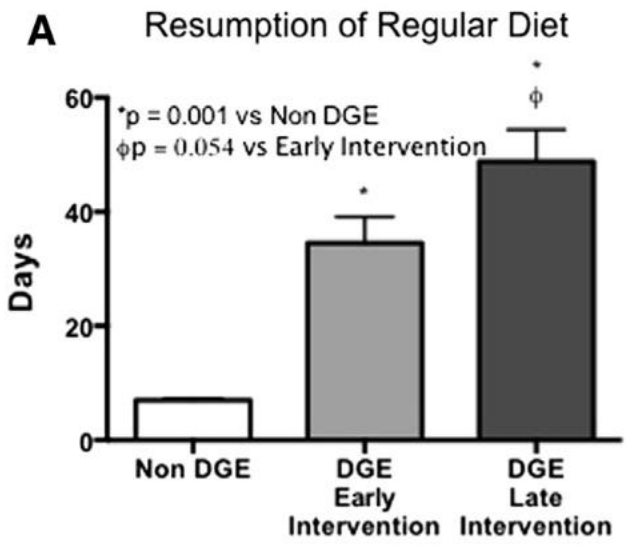
Optimal management of delayed gastric emptying after pancreatectomy: An analysis of 1,089 patients

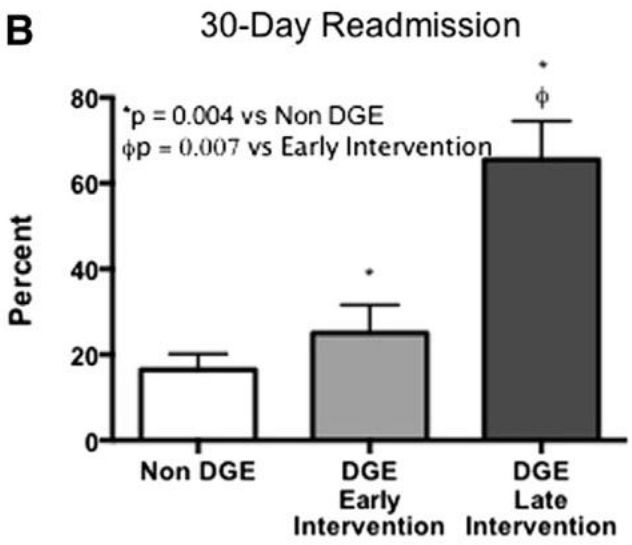
Joal D. Beane, MD,[a] Michael G. House, MD,[a] Akemi Miller, MD,[a] Attila Nakeeb, MD,[a] C. Max Schmidt, MD, PhD,[a] Nicholas J. Zyromski, MD,[a] Eugene Ceppa, MD,[a] David V. Feliciano, MD,[a] *and* Henry A. Pitt, MD,[b] *Indianapolis, IN, and Philadelphia, PA*

Surgery 2015









Bile Leakage

- Incidence varies between 2.2% and 8%
- Benign clinical course
- Increase hospitalization and morbidity
- If POPF(+) → Mortality >30%!!!
- Technical issues
- Small caliber and thin CBD
- Duct devascularization after ext portal lymphadenectomy
- Single layer, End-to-side hepaticojejunostomy
- Interrupted, fine sutures 4-0, 5-0
- “Parachuting” technique
- Drain
- Resolve spontaneously 50%
- PTC – PTBD

Surgery 2018
HPB 2017
World J Surg 2014

Bile leakage after hepatobiliary and pancreatic surgery: A definition and grading of severity by the International Study Group of Liver Surgery

Moritz Koch, MD,[a] O. James Garden, MD,[b] Robert Padbury, MD,[c] Nuh N. Rahbari, MD,[a] Rene Adam, MD,[d] Lorenzo Capussotti, MD,[e] Sheung Tat Fan, MD,[f] Yukihiro Yokoyama, MD,[g] Michael Crawford, MD,[h] Masatoshi Makuuchi, MD,[i] Christopher Christophi, MD,[j] Simon Banting, MD,[k] Mark Brooke-Smith, MD,[l] Val Usatoff, MD,[m] Masato Nagino, MD,[g] Guy Maddern, MD,[n] Thomas J. Hugh, MD,[o] Jean-Nicolas Vauthey, MD,[p] Paul Greig, MD,[q] Myrddin Rees, MD,[r] Yuji Nimura, MD,[g] Joan Figueras, MD,[s] Ronald P. DeMatteo, MD,[t] Markus W. Büchler, MD,[a] *and* Jürgen Weitz, MD,[a] *Heidelberg, Germany, Edinburgh, UK, Adelaide, Australia, Villejuif, France, Turin, Italy, Hong Kong, China, Nagoya, Japan, Sydney, Australia, Tokyo, Japan, Melbourne, Australia, Woodville, Australia, Houston, TX, Toronto, Canada, Basingstoke, UK, Girona, Spain, and New York, NY*

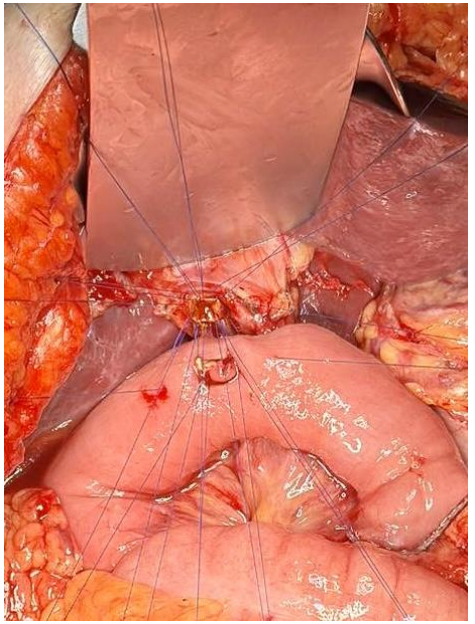


Table II. Consensus proposal of the ISGLS for a definition and grading of bile leakage after hepatobiliary and pancreatic surgery

Definition	Bile leakage is defined as fluid with an increased bilirubin concentration in the abdominal drain or in the intra-abdominal fluid on or after postoperative day 3, or as the need for radiologic intervention (ie, interventional drainage) because of biliary collections or relaparotomy resulting from bile peritonitis. Increased bilirubin concentration in the drain or intra-abdominal fluid is defined as a bilirubin concentration at least 3 times greater than the serum bilirubin concentration measured at the same time.
Grade	
A	Bile leakage requiring no or little change in patients' clinical management
B	Bile leakage requiring a change in patients clinical management (eg, additional diagnostic or interventional procedures) but manageable without relaparotomy, *or* a Grade A bile leakage lasting for >1 week
C	Bile leakage requiring relaparotomy

Surgery 2011

Chyle Leak

- Presence of a lipid-rich milky fluid from drains
- After POD3
- 4% - 10%
- Inadvertent injury to the cisterna chyli and/or tributaries
- Radical resection / Extended lymphadenectomy
- Neoadjuvant therapy
- Malabsorption/Malnutrition/Intraabdominal collections
- Treatment with low-fat diet with restriction of long chain triglycerides
- TPN / Enteral feeding
- Somatostatin analogues

Br J Surg 2017

World J Surg 2013

Chyle leak after pancreatic surgery: validation of the International Study Group of Pancreatic Surgery classification

Salvatore Paiella[1,*], Matteo De Pastena[1], Fabio Casciani, Teresa Lucia Pan, Selene Bogoni, Stefano Andrianello, Giovanni Marchegiani, Giuseppe Malleo, Claudio Bassi, Roberto Salvia

Chyle leak	Therapeutic consequence	Discharge with (surgical) drain or readmission related directly to the chyle leak	Prolonged hospital stay related to the chyle leak
A	None or oral dietary restrictions[a]	No	No
B	Nasoenteral nutrition with dietary restriction[a] and or TPN, percutaneous drainage by interventional radiology, maintenance of surgical drains, or drug (i.e. octreotide) treatment	Possibly	Yes
C	Other invasive in-hospital treatment, admission to the intensive care unit, and/or mortality	Possibly	Yes

Postoperative complications associated with CL.

Total chyle leakage $n = 43$	Grade A10 (23.3%)	Grade B31 (72.1%)	Grade C2 (4.6%)	*P* value
POPF	0 (0%)	5 (16.1%)	1 (50%)	<.001*
Abdominal collection	3 (30%)	18 (58.1%)	2 (100%)	.121
DGE	0 (0%)	3 (9.7%)	1 (50%)	.084
Percutaneous drainage	0 (0%)	3 (9.7%)	0 (0%)	.536
PPH	0 (0%)	7 (22.6%)	0 (0%)	.198
Sepsis	0 (0%)	9 (29%)	2 (100%)	.008*
Clavien-Dindo score ≥ III	0 (0%)	6 (19.4%)	2 (100%)	.004*
Length of stay (days, median, IRQ)	9.7 (2.2)	19.8 (10)	38 (12.7)	<.001*
R+ resection	0 (0%)	8 (25.8%)	0 (0%)	.280
Tumor size	50.8 (41.2)	30.6 (20.5)	35 (14.1)	.201
Lymph node harvest	24.5 (17.4)	39.6 (15.9)	27.5 (14.8)	.089
Positive lymph node harvest	0.5 (1.6)	4.3 (7.2)	0 (0)	.030*

Surgery 2018

Post - Pancreatectomy Acute Pancreatitis (PPAP)

- Recently diagnosed entity
- Rate 1% - 67%
- Manipulation, mobilization, vascular impairment, pancreatic juice stasis

↓

- acinar cell disruption

↓

- Intracellular activation of proteolytic enzymes

↓

- Pancreatic parenchymal edema

↓

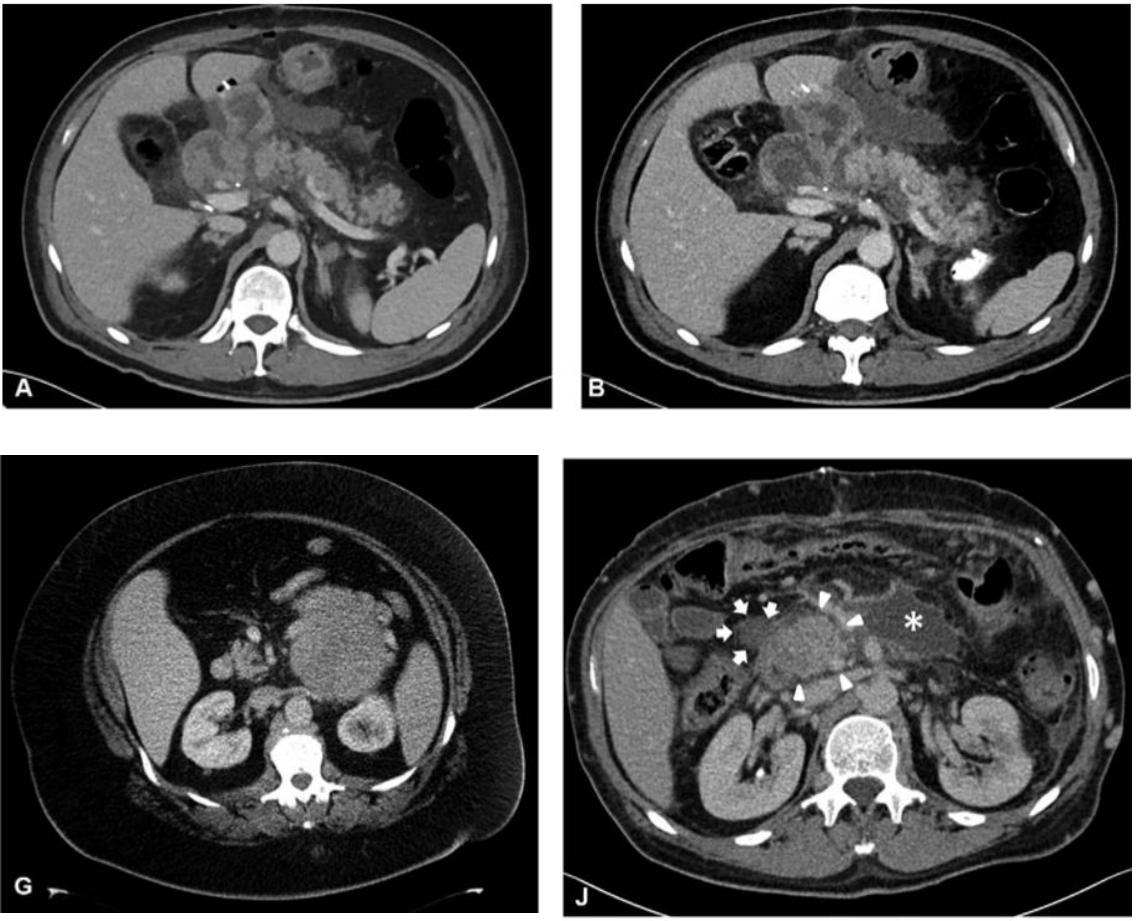
- Peripancreatic inflammation

↓

- SIRS

Postpancreatectomy Acute Pancreatitis (PPAP)

Definition and Grading From the International Study Group for Pancreatic Surgery (ISGPS)



Sustained (that persists for at least 48 hours) serum amylase activity > the Institutional upper limit of normal

↓

Post-operative serum hyperamylasemia (POH)

↓

Radiologic features of post-pancreatectomy acute pancreatitis[54]

(diffuse (or localized) inflammatory enlargement of the pancreatic remnant, interstitial parenchymal edema, inflammatory changes of the peripancreatic fat, intra/peripancreatic fluid collections, parenchymal/peripancreatic necrosis)

AND

Clinically relevant change in management:

- *Acute medical treatment (e.g. nutritional support, antibiotics)*
- *Interventional radiology and / or endoscopic-guided drainage and/or angiographic procedures.*

↓

GRADE B Post-pancreatectomy acute pancreatitis (PPAP)

↓

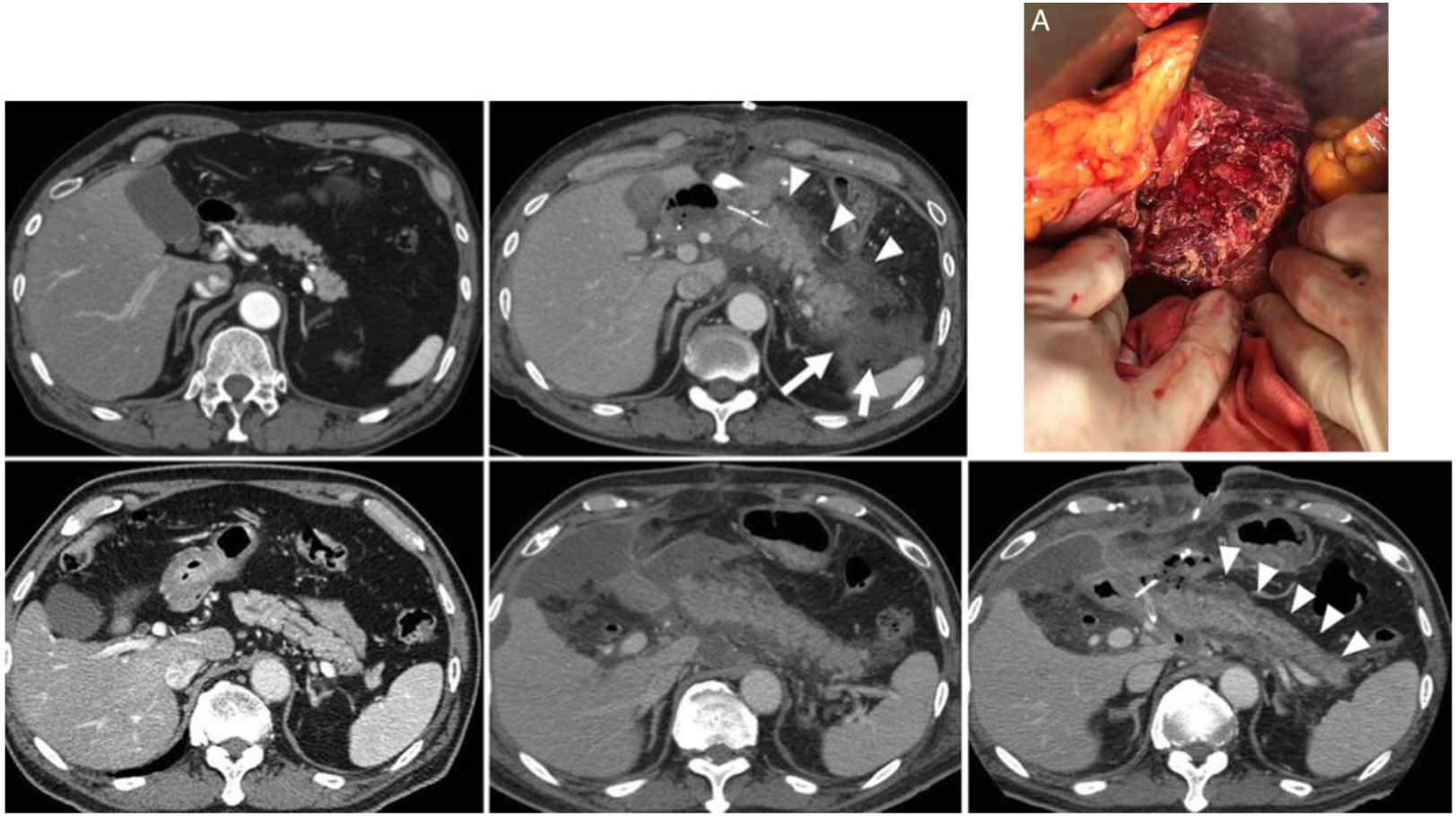
- Persistent Single\ or multiple Organ Failure (of at least 48 hours) possibly leading to intensive care admission,
- Reoperation
- Death

↓

GRADE C Post-pancreatectomy acute pancreatitis (PPAP)

Ann Surg 2022

Clinical significance of postpancreatectomy acute pancreatitis defined by the International Study Group for Pancreatic Surgery



Pre – OP

Day 5th

Day 7th

J Gastrointest Surg 2022

Clinical significance of postpancreatectomy acute pancreatitis defined by the International Study Group for Pancreatic Surgery

	Non-POH (n = 223)	POH (n = 24)	*P* value
Clavien–Dindo (≥IIIA)	41 (18.4%)	10 (41.7%)	.0142*
POPF (≥grade B)	32 (14.4%)	9 (37.5%)	.0079*
BL or POPF	86 (38.6%)	20 (83.3%)	<.0001*
DGE (≥grade B)	33 (14.8%)	2 (8.3%)	.5447
PPH (≥grade B)	2 (0.9%)	1 (4.2%)	.2651
Abscess	30 (13.5%)	8 (33.3%)	.0172*
In-hospital mortality	0	1 (9.4%)	.0972
Postoperative hospitalization (days)	19 (16–33)	22 (17–35)	.1164

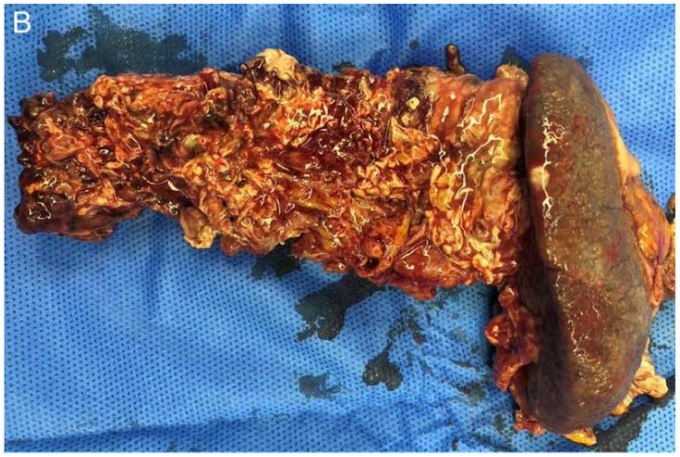
J Gastrointest Surg 2022

Postpancreatectomy Acute Pancreatitis After Pancreaticoduodenectomy

A Distinct Clinical Entity

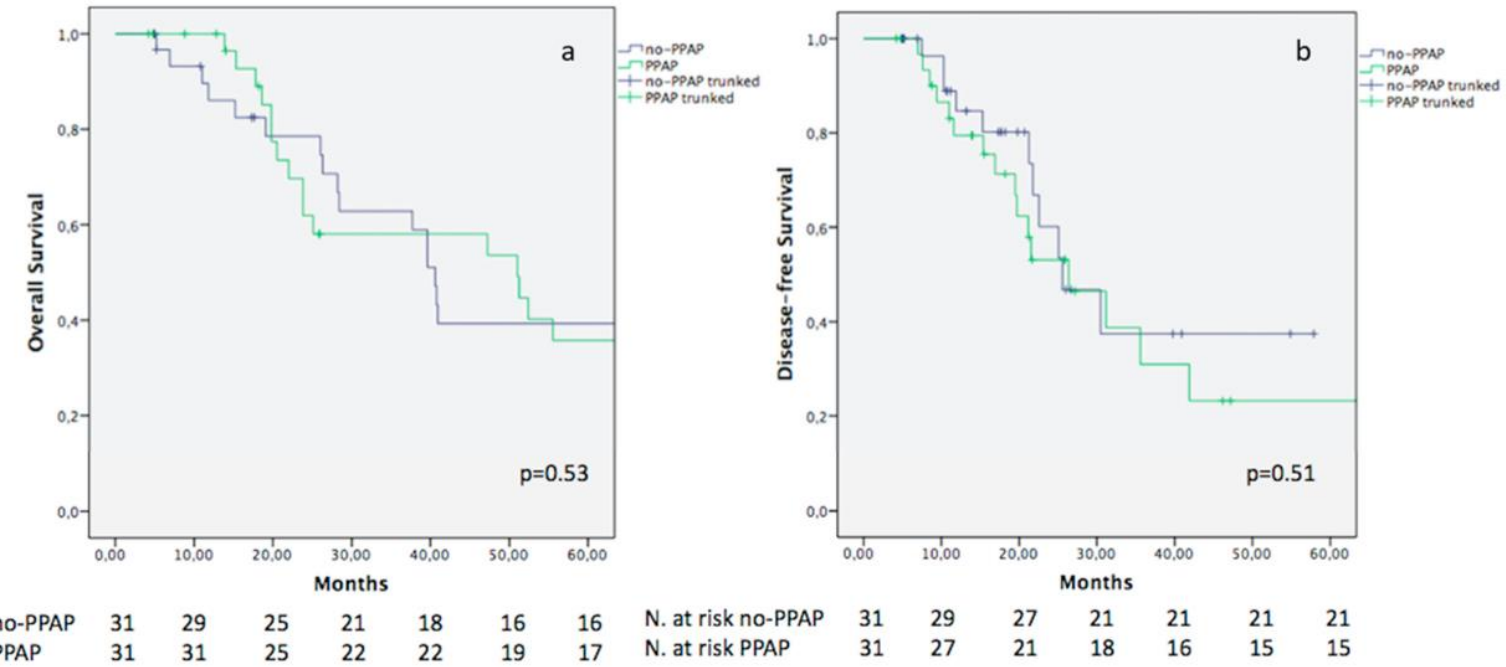
Ann Surg 2023

	PPAP, n (%)		
	No (N = 564)	Yes (N = 152)	*P*
POPF	66 (11.7)	62 (40.8)	**< 0.001**
Major complication	39 (6.9)	24 (15.8)	**0.001**
Biliary leak	26 (4.6)	18 (11.8)	**0.001**
PPH	31 (5.5)	10 (6.6)	0.610
DGE	18 (3.2)	7 (4.6)	0.399
Chyle leak	19 (3.4)	4 (2.6)	0.647
Interventional drains	26 (4.6)	19 (12.5)	**< 0.001**
Relaparotomy	8 (1.4)	8 (5.3)	**0.004**
90-d mortality	8 (1.4)	4 (2.6)	0.301
Postoperative stays, d	16 (12–21)	20 (14–28)	**< 0.001**
Discharged with drain	122 (21.6)	57 (37.5)	**< 0.001**
Serum amylase on POD 1, U/mL	85 (34–199)	417 (281–607)	**< 0.001**
Serum amylase on POD 2, U/mL	50 (22–128)	275 (196–395)	**< 0.001**



The Impact of Post-Pancreatectomy Acute Pancreatitis (PPAP) on Long-Term Outcomes after Pancreaticoduodenectomy: A Single-Center Propensity-Score-Matched Analysis According to the International Study Group of Pancreatic Surgery (ISGPS) Definition

> 1000 PDs



Cancers 2024

Failure to Rescue After Pancreatoduodenectomy

A Transatlantic Analysis

Elizabeth M. Gleeson, MD, MPH, Henry A. Pitt, MD,†✉ Tara. M. Mackay, MD, PhD,‡ Ulrich F. Wellner, MD, PhD,§ Caroline Williamsson, MD, PhD,¶ Olivier R. Busch, MD, PhD,‡ Bas Groot Koerkamp, MD, PhD, MSc,|| Tobias Keck, MD, PhD,§ Hjalmar C. van Santvoort, MD, PhD,# Bobby Tingstedt, MD, PhD,¶ and Marc G. Besselink, MD, PhD, MSc‡, for the Global Audits on Pancreatic Surgery Group (GAPASURG)*

Failure to rescue (FTR) is defined:

- as the number of patients who die after developing a major complication divided by the number of patients with a major complication

- Metric used to evaluate treatment quality

Ann Surg 2021

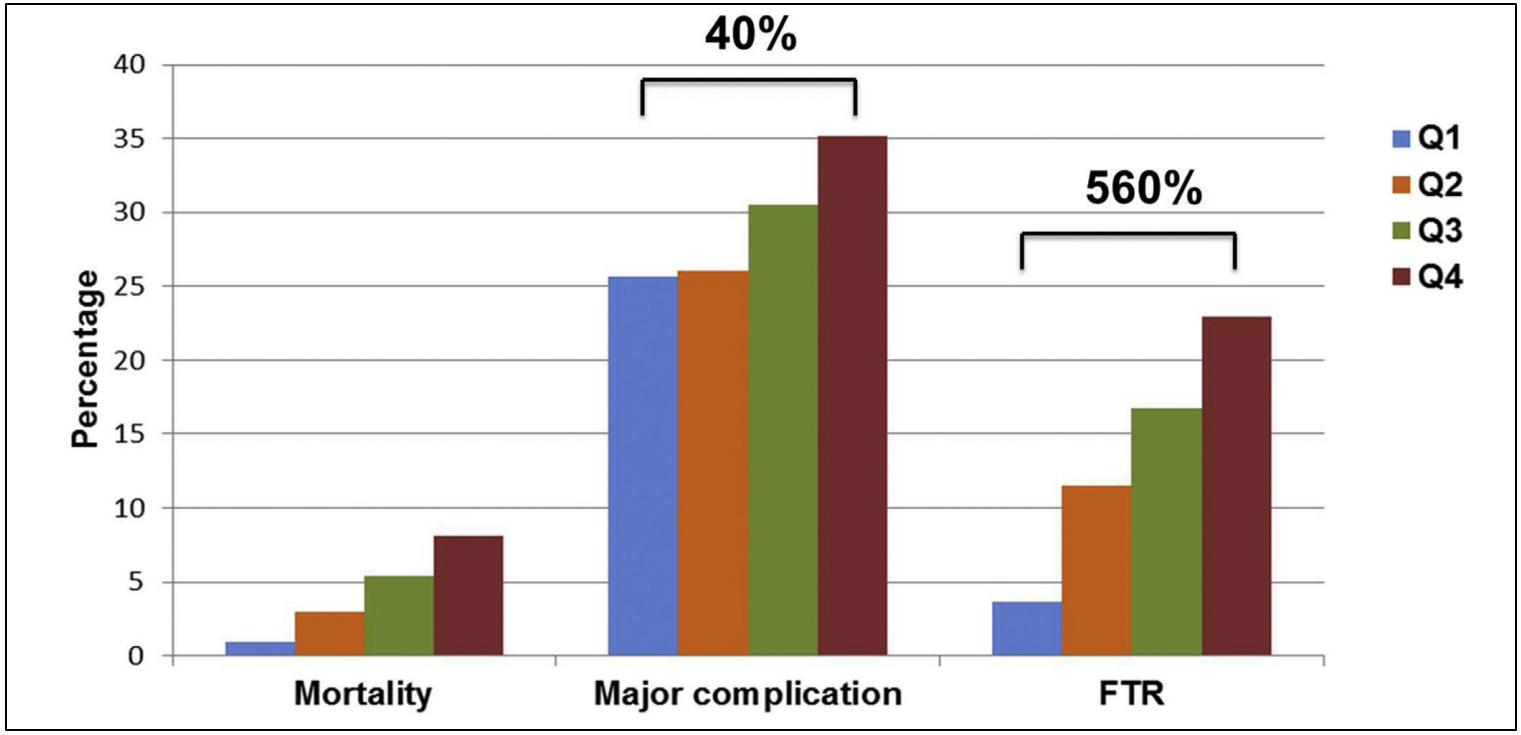
https://doi.org/10.1016/j.hpb.2018.02.640 HPB

ORIGINAL ARTICLE

Variation in hospital mortality after pancreatoduodenectomy is related to failure to rescue rather than major complications: a nationwide audit

Lennart B. van Rijssen[1], Maurice J. Zwart[1], Susan van Dieren[2], Thijs de Rooij[1], Bert A. Bonsing[3], Koop Bosscha[4], Ronald M. van Dam[5], Casper H. van Eijck[6], Michael F. Gerhards[7], Josephus J. Gerritsen[8], Erwin van der Harst[9], Ignace H. de Hingh[10], Koert P. de Jong[11], Geert Kazemier[12], Joost Klaase[8], Berendina M. van der Kolk[13], Cornelis J. van Laarhoven[13], Misha D. Luyer[10], Isaac Q. Molenaar[14], Gijs A. Patijn[15], Coen G. Rupert[16], Joris J. Scheepers[17], George P. van der Schelling[18], Alexander L. Vahrmeijer[3], Olivier R.C. Busch[1,*], Hjalmar C. van Santvoort[19,*], Bas Groot Koerkamp[6,*], Marc G. Besselink[1*] for the Dutch Pancreatic Cancer Group

HPB 2018



https://doi.org/10.1016/j.hpb.2018.07.022 HPB

ORIGINAL ARTICLE

Patient-specific predictors of failure to rescue after pancreaticoduodenectomy

Elizabeth M. Gleeson[1], John R. Clarke[1], William F. Morano[1], Mohammad F. Shaikh[3], Wilbur B. Bowne[1] & Henry A. Pitt[2]

Risk Factor	Beta coefficients	*p* value	Odds ratio (95% CI)	Score
Albumin $\leq$3.5 g/dL	0.378	0.01	1.46 (1.10–1.95)	1
Age $\geq$ 65	0.692	<0.001	2.00 (1.45–2.74)	2
Shock	0.896	<0.001	2.45 (1.74–3.45)	2
Renal failure	1.703	<0.001	5.49 (3.59–8.39)	5
Reintubation	1.852	<0.001	6.37 (4.58–8.86)	5
Maximum score				15

HPB (Oxford) 2019

https://doi.org/10.1016/j.hpb.2018.07.022 HPB

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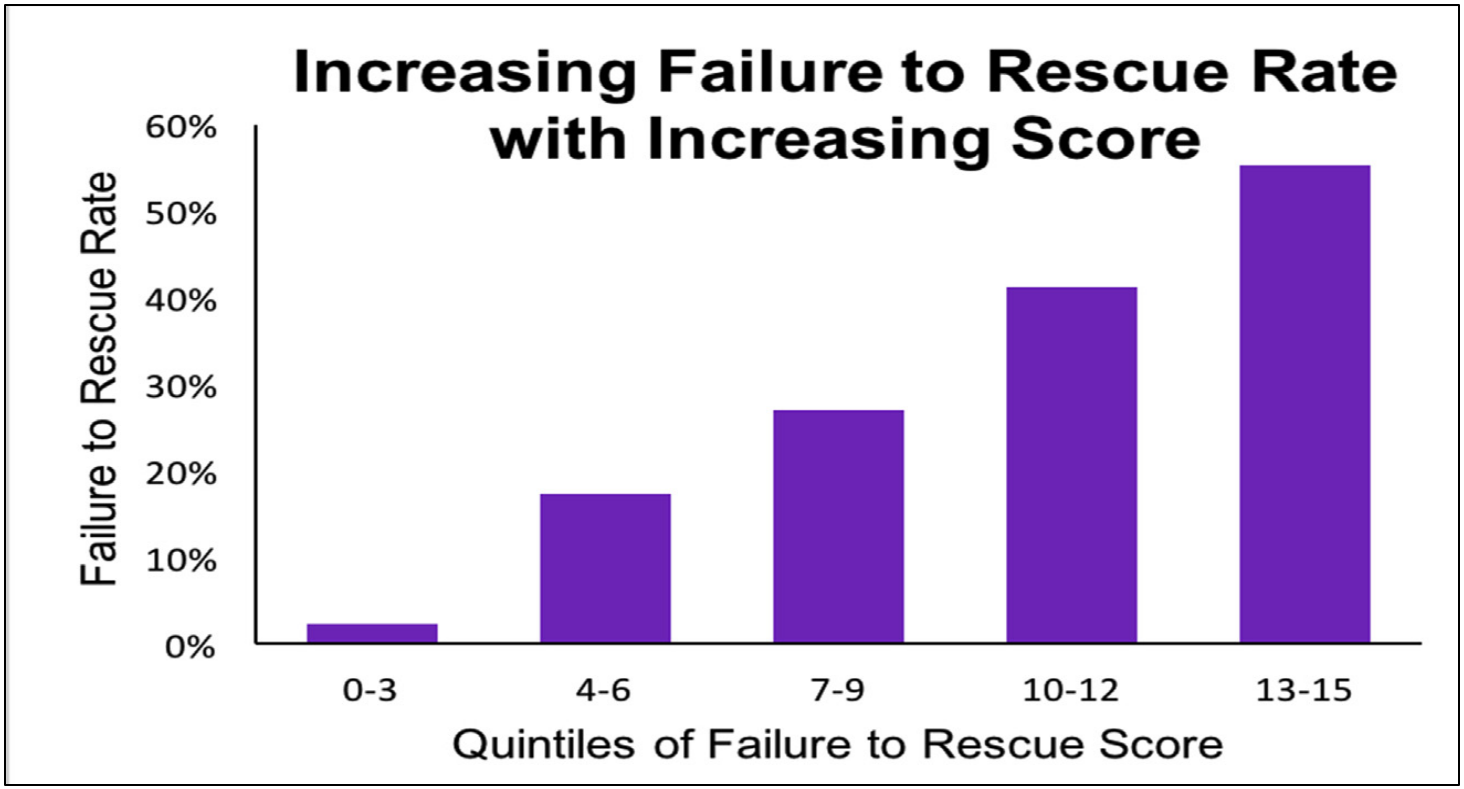


HPB (Oxford) 2019

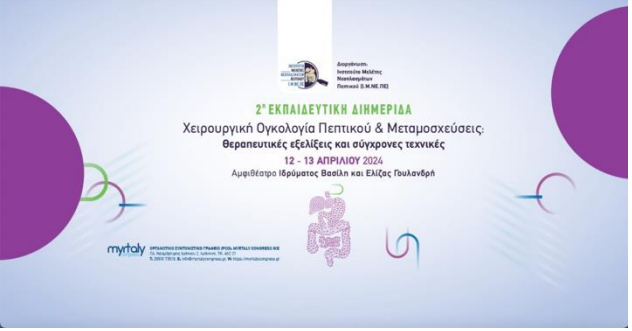
Hospital Characteristics Associated with Failure to Rescue from Complications after Pancreatectomy

Amir A Ghaferi, MD, MS, Nicholas H Osborne, MD, MS, John D Birkmeyer, MD, FACS, Justin B Dimick, MD, MPH, FACS

Hospital characteristic	Hospitals, %	
	Very low mortality	Very high mortality
High hospital technology	80.7	28.6
Teaching hospital	84.3	42.1
Increased nurse-to-patient ratio, median ratio	9.4	7.3
Hospital size > 200 beds	97.1	87.2
Average daily census > 50% capacity	98.2	96.6

Hospital characteristic	Odds ratio (95% CI) adjusted for hospital characteristic	Proportion of failure to rescue explained, %
All characteristics	6.6 (3.7–11.9)	36.0
High hospital technology	7.7 (4.3–13.6)	24.0
Teaching hospital	7.8 (4.5–13.6)	23.0
Increased nurse-to-patient ratio	8.3 (4.7–14.6)	17.0
Hospital size > 200 beds	8.9 (5.1–15.3)	11.0
Average daily census > 50% capacity	9.6 (5.6–16.4)	3.0

JACS 2010



Conclusion

- Incidence of post pancreatectomy complications remains high
- POPF, PPH, DGE, Bile Leakage, Chyle Leak, PPAP

- ISGPS:
    a. Standardized Definitions
    b. Clinical Grading Systems

- Comparison of intraop techniques and management decisions
- High-volume specialized units
- Multidisciplinary experience - FTR
- Personalized treatment