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HPB

ORIGINAL ARTICLE

Poor level of agreement on the management of postoperative pancreatic fistula: results of an international survey

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Abstract

Objectives: The occurrence of postoperative pancreatic fistula (POPF) is the main cause of severe complications, including death, after pancreatic surgery. This study was conduced to evaluate current practice in the management of POPF after Whipple surgery and distal pancreatectomy (DP).

Methods: An online survey endorsed by the European–African Hepato-Pancreato-Biliary Association (E-AHPBA) was conducted among surgical departments active in pancreatic surgery. A total of 108 centres were contacted by e-mail. The survey focused on the use and timing of drainage, nutrition strategies, provision of somatostatin and antibiotic therapies, imaging strategy and indications for reoperation when POPF is diagnosed after pancreatic surgery.

Results: A total of 55 centres (51%) completed the survey. Overall, responses showed poor agreement among centres (Fleiss' kappa: <0.40) on 89% of items after Whipple surgery and 78% of items after DP. There was very poor or no agreement (Fleiss' kappa: <0.1) on postoperative strategies for the management of nutrition and use of somatostatin after both procedures. In the event of POPF, 42% of centres used total oral nutrition and 22% used somatostatin after Whipple surgery, and 71% used total oral nutrition and 31% used somatostatin after DP. There were significant disagreements between units conducting, respectively, more and fewer than 50 Whipple procedures per year on drain removal after DP, and imaging strategy and patient discharge after Whipple surgery and DP.

Conclusions: This survey discloses important disagreements worldwide regarding the management of POPF after both Whipple surgery and DP. The standardized management of POPF would better facilitate the comparison of outcomes in future trials.

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Introduction

Postoperative pancreatic fistula (POPF) is one of the most commonly encountered complications after pancreatic surgery.[1] Its incidence varies considerably according to the type of pancreatic resection (Whipple, distal or central resection, or enucleation) and the definition used. Incidences of POPF range from 0% to 24%, and are reported to hover around 13% after Whipple surgery and to occur in 30–40% of patients after distal pancreatectomy (DP).[2–5] The occurrence of POPF may lead to intra-abdominal abscess, haemorrhage and sepsis, any of which may translate to a significant increase in hospital stay and costs.[6] In this setting, three steps are of primary concern; these refer to the prevention, diagnosis and management of POPF. Although the diagnosis and prevention of POPF have been extensively discussed in the literature,[7–10] data on the management of POPF once it has been diagnosed are scarce and lack standardization.[11–13]

With reference to the management of POPF, the optimal drainage of the remnant exocrine pancreas, nutritional support, use of somatostatin and antibiotics remain subject to controversy.[11,14,15] In addition, imaging strategy and indications for reoperation are paramount to the control of fistula-related complications. The principal aim in the management of POPF is to reduce the risk for

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severe fistula-related complications and to improve the nutritional condition of POPF patients, who are in a catabolic state.

Therefore, the purpose of this study was to evaluate current practice in the management of POPF after Whipple surgery and DP in hepatopancreatobiliary (HPB) centres worldwide.

Materials and methods

This survey was endorsed by the European–African Hepato-Pancreato-Biliary Association (E-AHPBA). A total of 108 HPB department heads around the world (North America, South America, Asia, Australia, New Zealand, Europe and Africa) were invited to participate in the survey by e-mail. Many HPB surgeons were personally contacted during the 2011 bi-annual E-AHPBA meeting (Cape Town, South Africa, 12–16 April 2011). The invitation letter included a direct link to the online survey available on the E-AHPBA website (http://www.e-ahpba.org/?q=pancreas-survey). Up to four reminder e-mails were sent. Data analysis and reporting were performed in an anonymized manner.

This survey covered six main aspects of current practice in the management of POPF after Whipple surgery and DP: (i) use and duration of drainage; (ii) strategies for the provision of nutrition; (iii) use of somatostatin analogues; (iv) use of antibiotics; (v) imaging strategy, and (vi) indications for reoperation. It included 15 questions for each type of procedure; only one answer could be given to each item. The survey was valid only if all of the questions had been addressed. Comments or suggestions could be added at the end of the survey.

Statistical methods

Continuous variables were compared using the Mann–Whitney *U*-test. Differences among proportions derived from categorical data were compared using Fisher's exact test. Agreement among the participating centres was assessed according to Fleiss' kappa statistic. Fleiss' kappa assesses the reliability of agreement among a number of raters (three or more) when assigning categorical ratings to a number of items.[16] Cohen's kappa was used to assess agreement between practices after Whipple surgery and DP, respectively, on items 7a to 15b (questions are available at http://www.e-ahpba.org/?q=pancreas-survey). The measure calculates the degree of agreement in classification over that which would be expected by chance and is scored as a number between 0 and 1. Kappa values of 0.41–1.0 indicate 'good' agreement, 0–0.40 'poor' agreement, and statistics of <0 indicate no agreement among participating centres. The continuous variable 'Number of Whipple procedures performed per year' was dichotomized by using the arbitrary 50th quartile (i.e. the median) as a cut-off point to discriminate a participating centre as a high- or low-throughput unit for pancreatic surgery.[17] All *P*-values were two-sided and were considered to indicate statistical significance at values of ≤ 0.05. Statistical analysis was performed using IBM SPSS Statistics Version 20 for Mac (IBM SPSS, Inc., Chicago, IL, USA).

Results

Fifty-five HPB centres (51%) completed the online survey. The majority of the institutions were located in Europe ($n = 40$, 73%). The other participating centres were situated in the Americas ($n = 8$), Asia ($n = 5$), Australia ($n = 1$) and Africa ($n = 1$). Overall, a median of 50 Whipple procedures [interquartile range (IQR): 25–65] and 20 DPs (IQR: 12–30) were performed each year in the various participating institutions. A total of 69% of respondents ($n = 38$) reported that they performed pancreaticojejunostomy during Whipple surgery. A total of 82% ($n = 45$) reported suturing the pancreatic stump in DP. Use of postoperative prophylactic drainage was reported by 93% of centres ($n = 51$) after Whipple surgery and 91% ($n = 50$) after DP.

Level of agreement among participating centres

Table 1 lists all items on the questionnaire related to the management of POPF after Whipple surgery and DP and shows the level of agreement among centres. Agreement among centres on the management of POPF was poor or absent on 89% of items pertaining to Whipple surgery and 78% of items pertaining to DP. In particular, the level of agreement among centres was very poor ($\kappa < 0.1$) on the management of nutrition after Whipple surgery and on the use of somatostatin after both Whipple surgery and DP. Total oral nutrition was used by 42% of centres after Whipple surgery and 71% after DP. The decision to start oral feeding was not based on the status of POPF in 46% of centres after Whipple surgery and 49% after DP. Use of somatostatin was reported by 91% of centres after Whipple surgery and 80% after DP. The most common duration of use of somatostatin was 7 days after both Whipple surgery (44%) and DP (35%).

More than 90% of centres reported the use of antibiotics after both Whipple surgery and DP. More than 80% of centres reported that the prophylactic drain was removed in the event of low output of amylase-rich fluid with (16%) or without (73%) previous imaging after both Whipple surgery and DP. Finally, patients were reportedly discharged once the fistula was draining well (drain *in situ*) and oral nutrition was well tolerated by 76% of centres after Whipple surgery and 84% after DP.

Level of agreement on management after Whipple surgery and DP

For 93% of items on the questionnaire, agreement among centres on the management of POPF was good when Whipple surgery was compared to DPs (Table 1). The lowest level of agreement referred to the type of nutrition used: 42% of centres reported the use of total oral nutrition after Whipple surgery, whereas 71% reported its use after DP; 29% of centres reported the use of no oral nutrition and total parenteral nutrition (TPN) after Whipple surgery, compared with 20% after DP, and 29% of centres reported the use of no oral nutrition and the provision of total enteral nutrition using a feeding tube after Whipple surgery, compared with 9% after DP.

Table 1 Items on the questionnaire related to the management of postoperative pancreatic fistula after pancreatic surgery and answers from participating centres (n = 55)

Items	Answer options	Whipple procedure		Fleiss' κ-value[a]	Distal pancreatectomy		Fleiss' κ-value[a]	Cohen's κ-value[b]
		n	%		*n*	%		
Criteria for drain removal	No specific criteria	6	11%	0.339	7	13%	0.337	0.832
	Low output of amylase-rich fluid	40	73%		40	73%		
	Low output of amylase-rich fluid and no residual collection on imaging	9	16%		8	15%		
Nutrition after fistula diagnosis	No oral nutrition and total enteral nutrition using a feeding tube	16	29%	–0.002	5	9%	0.318	0.471
	No oral nutrition and TPN	16	29%		11	20%		
	Total oral nutrition	23	42%		39	71%		
Oral feeding after TPN	This decision is not based on the status of the PF	25	46%	0.080	27	49%	0.161	0.843
	When the PF is healed	7	13%		3	6%		
	When the PF output decreases	23	42%		25	46%		
Somatostatin use	Intraoperatively in all cases	11	20%	0.038	10	18%	0.019	0.675
	Intraoperatively in cases of soft pancreas only	20	36%		13	24%		
	Never	5	9%		11	20%		
	Once a PF appears	12	22%		17	31%		
	Preoperatively in all cases	7	13%		4	7%		
Somatostatin duration	7 days	24	44%	0.079	19	35%	0.026	0.759
	<7 days	10	18%		9	16%		
	>7 days	6	11%		5	9%		
	Never use it	5	9%		10	18%		
	Until the PF heals	10	18%		12	22%		
Antibiotics	In cases of suspected infection	29	53%	0.241	29	53%	0.208	0.936
	Never prescribe antibiotics	3	6%		4	7%		
	Systematically after surgery (prophylactic)	22	40%		20	36%		
	Systematically when PF appears	1	2%		2	4%		
Imaging strategy	Before removing the prophylactic drains	3	6%	0.282	3	6%	0.305	0.961
	In all cases, once a PF has been diagnosed	15	27%		14	26%		
	Only when an infected intra-abdominal collection is suspected	37	67%		38	69%		
Criteria for re-laparotomy	High PF output	0	0%	0.893	0	0%	0.945	0.658
	Symptomatic collection which is undrainable by interventional radiology	53	96%		54	98%		
	For both cases	2	4%		1	2%		
Patient discharge	Once the PF is draining well (drain *in situ*) and oral nutrition is well tolerated	42	76%	0.265	46	84%	0.442	0.775
	Once the PF has completely healed	13	24%		9	16%		

[a]Agreement among 55 responding centres on each question after Whipple surgery or distal pancreatectomy.
[b]Agreement in the contexts of Whipple surgery and distal pancreatectomy on each question.
PF, pancreatic fistula; DP, distal pancreatectomy; TPN, total parenteral nutrition.

Level of agreement according to number of Whipple procedures performed per year

A total of 28 centres (51%) reported that they performed more than 50 Whipple procedures per year. In centres performing more or fewer than 50 Whipple procedures per year (high- and low-volume centres, respectively), the median numbers of procedures performed were 65 (IQR: 58–80) and 25 (IQR: 20–35), respectively. Table 2 lists responses to items on the survey according to

Table 2 Items on the questionnaire and answers from centres performing more or fewer than 50 Whipple procedures per year

Items	Answer options	Centres performing >50 Whipple procedures per year (*n* = 28)		Centres performing <50 Whipple procedures per year (*n* = 27)		*P*-value
		n	%	*n*	%	
Type of anastomosis during Whipple procedure	Pancreaticojejunostomy	22	79%	16	59%	0.085
	Pancreaticogastrostomy	4	14%	3	11%	
	Both	2	7%	8	30%	
Pancreatic stump treatment during DP	Simple closure of the main pancreatic duct	9	32%	17	63%	0.031
	Suture of the pancreatic stump	24	86%	21	78%	0.503
	Pancreaticojejunostomy	0	0%	2	7%	0.236
	Stapling	14	50%	10	37%	0.418
	Omental plug	3	11%	2	7%	1.000
Use of prophylactic drains after Whipple procedure	No	2	7%	2	7%	0.452
	Yes, with an active vacuum suction	8	29%	12	44%	
	Yes, with free drainage	18	64%	13	48%	
Use of prophylactic drains after DP	No	3	11%	2	7%	0.622
	Yes, with an active vacuum suction	8	29%	11	41%	
	Yes, with free drainage	17	61%	14	52%	
Criteria for removing drain after Whipple procedure	No specific criteria	3	11%	3	11%	0.148
	When output of amylase-rich fluid is low	23	82%	17	63%	
	When output of amylase-rich fluid is low and imaging shows no residual collection	2	7%	7	26%	
Criteria for removing drain after DP	No specific criteria	3	11%	4	15%	0.044
	When output of amylase-rich fluid is low	24	86%	16	59%	
	When output of amylase-rich fluid is low and imaging shows no residual collection	1	4%	7	26%	
Nutrition after fistula diagnosis (after Whipple procedure)	No oral nutrition and total enteral nutrition using a feeding tube	7	25%	9	33%	0.732
	No oral nutrition and TPN	8	29%	8	30%	
	Total oral nutrition	13	46%	10	37%	
Nutrition after fistula diagnosis (after DP)	No oral nutrition and total enteral nutrition using a feeding tube	2	7%	3	11%	0.437
	No oral nutrition and TPN	4	14%	7	26%	
	Total oral nutrition	22	79%	17	63%	
Oral feeding after TPN (after Whipple procedure)	This decision is not based on the status of the PF	14	50%	11	41%	0.424
	When the PF is healed	2	7%	5	18%	
	When the PF output decreases	12	43%	11	41%	
Oral feeding after TPN (after DP)	This decision is not based on the status of the PF	15	54%	12	44%	0.706
	When the PF is healed	1	4%	2	7%	
	When the PF output decreases	12	43%	13	48%	
Somatostatin use (after Whipple procedure)	Intraoperatively in all cases	4	14%	7	26%	0.491
	Intraoperatively in cases of soft pancreas only	9	32%	11	41%	
	Never	4	14%	1	4%	
	Once a PF appears	7	25%	5	18%	
	Preoperatively in all cases	4	14%	3	11%	
Somatostatin use (after DP)	Intraoperatively in all cases	3	11%	7	26%	0.511
	Intraoperatively in cases of soft pancreas only	6	21%	7	26%	
	Never	6	21%	5	18%	
	Once a PF appears	11	39%	6	22%	
	Preoperatively in all cases	2	7%	2	7%	
Somatostatin duration (after Whipple procedure)	7 days	12	43%	12	44%	0.679
	<7 days	5	18%	5	18%	
	>7 days	3	11%	3	11%	
	Never use it	4	14%	1	4%	
	Until the PF heals	4	14%	6	22%	

Table 2 *Continued*

Items	Answer options	Centres performing >50 Whipple procedures per year (*n* = 28)		Centres performing <50 Whipple procedures per year (*n* = 27)		*P*-value
		n	%	*n*	%	
Somatostatin duration (after DP)	7 days	9	32%	10	37%	0.676
	<7 days	4	14%	5	18%	
	>7 days	3	11%	2	7%	
	Never use it	7	25%	3	11%	
	Until the PF heals	5	18%	7	26%	
Antibiotics (after Whipple procedure)	In cases of suspected infection	15	54%	14	52%	0.628
	Never prescribe antibiotics	2	7%	1	4%	
	Systematically after surgery (prophylactic)	11	39%	11	41%	
	Systematically when PF appears	0	0%	1	4%	
Antibiotics (after DP)	In cases of suspected infection	15	54%	14	52%	0.999
	Never prescribe antibiotics	2	7%	2	7%	
	Systematically after surgery (prophylactic)	10	36%	10	37%	
	Systematically when PF appears	1	4%	1	4%	
Imaging strategy (after Whipple procedure)	Before removing the prophylactic drains	0	0%	3	11%	0.033
	In all cases, once a PF has been diagnosed	5	18%	10	37%	
	Only when an infected intra-abdominal collection is suspected	23	82%	14	52%	
Imaging strategy (after DP)	Before removing the prophylactic drains	0	0%	3	11%	0.030
	In all cases, once a PF has been diagnosed	5	18%	9	33%	
	Only when an infected intra-abdominal collection is suspected	23	82%	15	56%	
Criteria for re-laparotomy (after Whipple procedure)	High PF output	0	0%	0	0%	0.491
	Symptomatic collection which is undrainable by interventional radiology	26	93%	27	100%	
	For both cases	2	7%	0	0%	
Criteria for re-laparotomy (after DP)	High PF output	0	0%	0	0%	1.000
	Symptomatic collection which is undrainable by interventional radiology	27	96%	27	100%	
	For both cases	1	4%	0	0%	
Patient discharge (after Whipple procedure)	Once the PF is draining well (drain *in situ*) and oral nutrition is well tolerated	25	89%	17	63%	0.029
	Once the PF has completely healed	3	11%	10	37%	
Patient discharge (after DP)	Once the PF is draining well (drain *in situ*) and oral nutrition is well tolerated	26	93%	20	74%	0.063
	Once the PF has completely healed	2	7%	7	26%	

PF, pancreatic fistula; DP, distal pancreatectomy; TPN, total parenteral nutrition.

whether the responding centre performed more or fewer than 50 Whipple procedures per year. Almost all centres reported the use of postoperative drainage after Whipple surgery and DP regardless of the volume of cases (93% in both high- and low-volume centres after Whipple surgery, and 89% and 93% in high- and low-volume centres, respectively, after DP). After DP, high-volume centres were more likely to remove drainage when the output of amylase-rich fluid was low without any imaging (86% versus 59%), whereas after Whipple surgery, low-volume centres more often used imaging prior to drain removal (11% versus 0%). Similarly, low-volume centres were more likely to perform imaging as soon as a POPF was diagnosed after Whipple surgery and DP (37% versus 18% after Whipple surgery; 33% versus 18% after DP), whereas high-volume centres used imaging modalities only when an infected intra-abdominal collection was suspected (82% versus 52% after Whipple surgery; 82% versus 56% after DP). Finally, low-volume centres were more likely to discharge patients only when the fistula had completely healed after Whipple surgery, whereas high-volume centres tended to discharge patients as soon as the fistula was draining well and oral nutrition was well tolerated (89% versus 59% after Whipple surgery; 93% versus 74% after DP).

European versus non-European centres

Only three items on the questionnaire resulted in significant differences in responses between European and non-European

centres: (i) pancreaticojejunostomy after DP was more commonly performed in non-European centres (13% versus 0%; $P = 0.019$); (ii) European centres were more likely to use prophylactic drainage with free drainage after both Whipple surgery and DP (70% versus 20%; $P = 0.004$), and (iii) non-European centres used somatostatin more often after both Whipple surgery and DP when a fistula occurred [47% versus 13% after Whipple surgery ($P = 0.027$); 60% versus 20% after DP (0.048)].

Discussion

Overall, this survey disclosed poor agreement on the management of POPF after Whipple surgery and DP. At least six aspects of current practice in the management of POPF are associated with poor or no agreement among HPB centres worldwide: (i) the removal of prophylactic drainage; (ii) type of nutrition; (iii) use of somatostatin analogues; (iv) use of antibiotics; (v) imaging strategy, and (vi) hospital discharge. Compared with centres performing fewer than 50 Whipple procedures per year, high-volume units appeared to be less conservative regarding hospital discharge and imaging strategy. Overall, the management of POPF in European versus non-European centres was similar.

The current management of POPF includes prophylactic drainage of pancreatic exocrine secretions, the provision of nutritional support and the prevention of fistula-related complications.[11,14,15] It is noteworthy that 70% of cases of POPF resolve spontaneously.[14] The best therapeutic approach for the management of POPF is still highly debated and most publications dealing with this issue lack standardization.[18–20] One of the most striking findings of this survey is that >80% of items on the questionnaire achieved poor or no agreement among centres after both Whipple surgery and DP, confirming a lack of consensus.

On the basis of a recent review of randomized controlled trials (RCTs), the value of prophylactic drainage and strategies for its management after pancreatic surgery remain unclear.[21] Interestingly, >90% of centres participating in the present survey used prophylactic drainage in both Whipple surgery and DP. Although the criteria for drain removal represented a point of poor agreement among HPB centres, 73% of respondents indicated that drainage was removed once the output of amylase-rich fluid was low. Until now, there has been no consensus on the optimal timing of the removal of prophylactic drainage after pancreatic surgery when POPF is diagnosed, which is consistent with the results of the present survey.

The second aspect of management to garner poor agreement among centres concerned nutrition. Nutritional support is one of the key elements of conservative therapy in patients with POPF as most of these patients are in a catabolic state. In this setting, three options are currently used, involving the provision of: (i) no oral nutrition and total enteral nutrition using a feeding tube; (ii) no oral nutrition and TPN, and (iii) total oral nutrition. Although half of the respondents to the present survey reported using the first two options, 40% used total oral nutrition when POPF was diagnosed after Whipple surgery or DP. Only one RCT has compared the efficacy and safety of enteral versus parenteral nutrition in the conservative management of POPF.[22] The authors concluded that enteral nutrition is associated with significantly higher closure rates and a shorter time to closure of POPF. By contrast, according to a recent prospective study, enteral nutrition combined with parenteral nutrition is associated with fewer complications compared with enteral nutrition alone after pancreatic surgery.[23] The decision to start oral feeding after TPN has not been previously addressed in any study, which probably explains the poor agreement on this issue among centres responding to this survey. Thus, these data reflect a significant lack of consensus on the nutritional management of POPF. Interestingly, responses to this survey on the management of POPF were fairly similar in the contexts of both Whipple surgery and DP, except on issues related to nutrition. Indeed, 71% of participating centres reported using total oral nutrition after DP, whereas only 42% reported doing so after Whipple surgery. In patients who have undergone DP, POPF originates from the raw pancreatic surface rather than from an anastomotic leak.

The use of synthetic somatostatin analogues (e.g. octreotide) following pancreatic surgery is still under debate.[24] The poor agreement among participating centres on the use of somatostatin mirrors the controversies related to its efficiency in preventing POPF. A meta-analysis of 17 RCTs showed that somatostatin analogues reduce perioperative complications, but do not reduce perioperative mortality in pancreatic surgery.[25] A more recent meta-analysis concluded that the use of somatostatin analogues does not result in a higher rate of POPF closure compared with other treatments.[26] With regard to the timing and duration of somatostatin analogues, most studies reported that a first dose given before surgery and for 7 days thereafter, as is the most common practice in Europe, was associated with a positive effect.[27,28]

Patients who experience any complications after pancreatic surgery are associated with a three-fold increase in costs over those without complications.[6] It is of note that most of the complications that occur after pancreatic surgery are related to POPF. In the present study, although 76% of participating centres reported the discharge of patients once the fistula was draining well (drain *in situ*) and oral nutrition was well tolerated, 24% of centres claimed to discharge patients only once the POPF had completely healed. This may further contribute to a major increase in cost, particularly in units with lower pancreatic surgery activity. Indeed, low-volume centres tended to be more conservative in the management of POPF: 37% of those centres, compared with 11% of high-volume centres, discharged patients only when the POPF had completely healed. In addition, one third of low-volume centres used abdominal imaging in all instances of diagnosed POPF. By contrast, high-volume units were more likely to discharge patients even without the complete healing of the POPF and without imaging, thereby promoting a cost reduction strategy.

Half of the respondents to the present survey reported the use of antibiotics in patients with suspected infection and the other half reported the use of antibiotics in a systematic manner after surgery and with a prophylactic purpose. Infectious complications occur in up to 17% of patients after pancreatic surgery,[10] which compromises outcomes and markedly increases costs.[29] Pancreatic fistula-related infection accounts for only 5–16% of all types of infection occurring after pancreatic surgery.[29–31] There are no data in the literature supporting the systematic use of antibiotics after pancreatic surgery. However, in patients with pancreatic cancer and obstructive jaundice, preoperative biliary drainage was associated with an increased rate of postoperative infectious complications.[32,33] In this setting, the use of antibiotics should be evaluated in further prospective trials.

Although the consensus statement of the International Study Group on Pancreatic Fistula (ISGPF) provides definitions and a system of grading POPF according to treatment options and patient outcomes,[8] it seems that each centre adopts its own policy for the management of POPF regardless of the definition used. As there is no consensus on the optimal management of POPF and no standardized treatment, interpretations of the definitions of POPF proposed by the ISGPF vary considerably according to the treatment adopted to manage the issue.

Based on the current literature, very few firm statements can be made. The criteria for drain removal, imaging strategy and the timing of hospital discharge once POPF is diagnosed remain unclear and should be evaluated in further prospective trials.[8,21] The use of enteral nutrition should be preferred over TPN.[22] There is no solid evidence that somatostatin analogues result in a higher rate of closure of POPF than other treatments.[26] There is no evidence to support the systematic use of antibiotics except in patients with cancer and preoperative biliary drainage.[32,33]

One of the limitations of this survey is that 73% of participating centres were based in Europe. However, whereas the use of a prophylactic drain with free drainage was more frequent in Europe, the use of somatostatin when POPF occurs was more common in non-European centres. In addition, as this survey included units with high levels of pancreatic surgery activity, it is possible that its findings reflect current practice in a 'super-select' group of centres.

In conclusion, the findings of this survey offer opportunities for the evaluation of current practice and the initiation of a further process evaluation of the management of POPF. The high variability in definitions of and management strategies for POPF mirrors the lack of consensus. For this purpose, an international consensus based on the Danish/Zurich model and providing statements and guidelines for the management of POPF that could be accepted and applied internationally would be helpful.[34,35] This would allow for the better comparison of future trials and might perhaps reduce the markedly high costs associated with complications related to POPF.

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Conflicts of interest

None declared.

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