Updates in Surgery (2020) 72:155–161
https://doi.org/10.1007/s13304-020-00707-8

ORIGINAL ARTICLE

Implementation of a strategic preoperative surgical meeting to improve the level of care at a high-volume pancreatic center: a before–after analysis of 1000 consecutive cases

Niccolò Surci[1] · Marco Ramera[1] · Alex Borin[1] · Giovanni Marchegiani[1] · Roberto Salvia[1] · Claudio Bassi[1] · SPaRo Group

Received: 22 August 2019 / Accepted: 16 January 2020 / Published online: 5 February 2020

Abstract
The indication, planning, and risk analysis of a pancreatic surgical procedure have recently become increasingly complex. In December 2015, the "Pancreas Round" (PR) meeting was established at our institution to preoperatively review all scheduled cases with a specific focus on surgical indications and technical issues. The present study aims to determine the impact of the PR on the clinical practice in terms of avoiding unrequested laparotomies and anticipating intraoperative pitfalls. A "before–after" study was conducted by retrospectively comparing a pre-intervention period (9/2014–11/2015) to a prospectively assessed post-intervention one (12/2015–3/2017). Outcomes considered were explorative laparotomy (EL) occurrence and a "mismatch" between what was preoperatively expected by the PR and what was intraoperatively found. Of the 1057 patients included in the present study, 531 underwent surgery in the pre- and 526 in the post-intervention period, respectively. The EL rate was comparable between the two periods (15.4% vs. 12.2%, $p=0.123$), despite the significant increase of surgical explorations after neoadjuvant chemotherapy during the post-intervention period (27% vs. 18%, $p<0.001$). The "mismatch" rate between preoperative planning and intraoperative findings was significantly reduced in the post-intervention period (12.2% vs. 8.4%, $p=0.038$) compared to the pre-PR period. In the setting of a high-volume center, a preoperative surgical meeting designed to review all cases scheduled for surgical exploration can enhance the level of care by addressing intraoperative pitfalls.

Keywords Pancreatic surgery · Preoperative planning · Surgical team meeting · Before–after study

Introduction

Pancreatic surgery is still rife with uncertainties concerning correct indications, intraoperative strategies, and the anticipation of pitfalls. Unlike many other solid tumors, pancreatic neoplasms are rarely accompanied by well-defined surgical indications. Moreover, pancreatic cysts and neuroendocrine tumors do not require upfront resection, as the risk of malignancy is usually lower than that of the surgical morbidity [1, 2]. On the other hand, pancreatic ductal adenocarcinoma (PDAC) requires meticulous resectability assessment, which becomes even more demanding after the use of neoadjuvant therapy (NAT). In this regard, it has been demonstrated that a multidisciplinary team (MDT) discussion leads to a relevant improvement in the care of patients with cancer, often changing the medical and surgical management approach, with considerable benefits in terms of outcome [3–5].

Regarding intraoperative planning and risk assessment, the optimal treatment strategy needs to carefully address each tumor's specific characteristics and case-specific vascular anatomy. Many different approaches have been described over the past decades, aimed to minimize intraoperative morbidity and maximize oncological outcome. Again, the use of preoperative NAT (i.e., chemotherapy ± radiotherapy) has strongly influenced this aspect by increasing the technical difficulties and the risk of severe accidents [6].

In December 2015, a weekly "Pancreas Round" (PR) meeting was established in the General and Pancreatic Surgery Department at the University and Hospital Trust of

✉ Claudio Bassi
claudio.bassi@univr.it

[1] Department of General and Pancreatic Surgery, Pancreas Institute, University and Hospital Trust of Verona, "GB Rossi" Hospital, University of Verona, Piazzale L.A. Scuro, 10, 37134 Verona, Italy

Verona. The purpose of this additional preoperative surgical meeting was twofold: to review the indications of scheduled surgical interventions, and to anticipate potential technical complications that could unexpectedly arise during the procedure.

The present study aims to determine the impact of the PR on the clinical practice in terms of identifying the most appropriate surgical indications for each patient and anticipating intraoperative concerns. The hypothesis is that the improved patient selection provided by the PR reduces the occurrence of explorative laparotomies (ELs) and unexpected intraoperative findings.

Materials and methods

Study design and data collection

This retrospective, uncontrolled, before–after study analyzed the candidates for surgery at the General and Pancreatic Surgery of Verona from September 2014 to March 2017, including 15 months before (pre-PR period) and 15 months after the introduction of the PR (PR period) (Fig. 1). Data were obtained from the institution's prospectively maintained patient registry. For the PR period, patients' data were additionally extended to include all of the relevant clinical and surgical information, considerations, and technical advice that emerged during the PR discussion. From this population were excluded: (1) patients not operated on as a consequence of a PR-made decision; (2) patients undergoing surgery for a palliative or bioptic purpose; and (3) patients with insufficient data for statistical analysis.

The institutional patient registry was approved by the Ethics Committee for Clinical Research of the provinces of Verona and Rovigo (protocol n° 1101cesc) and registered with ClinicalTrials.gov (ClinicalTrials.gov identifier: NCT03807687). Statistical analyses were conducted using SPSS Statistic software version 21.0 (IBM Corporation, Armonk, NY, USA).

The Pancreas Round (PR)

Historically, all patients referred to the Department of General and Pancreatic Surgery of the Verona University Hospital are evaluated by a surgeon specializing in pancreatic diseases and, if deemed eligible for surgery, scheduled for the indicated procedure. The preoperative pathway is then handled by a "control tower" team of doctors and nurses, who perform the required pre-surgery preparation (e.g., collection of a patient's complete history, physical exam, standard preoperative tests, specific imaging procedures).

Since the introduction of the PR in December 2015, every case scheduled for surgery underwent an additional review in the presence of the entire pancreatic surgery staff. This meeting was held every week and the cases were usually discussed 2 weeks before the operation. Therefore, after an accurate analysis of the patient's history and the imaging data, test results, and exam reports, the PR staff would either confirm, modify, or even withdraw the surgical indication. Furthermore, the technical aspects of the operation tailored to each case were examined during the meeting, for example, the need for vascular resection and the choice of the most appropriate surgical approach (e.g., open vs. minimally invasive; uncinate-first vs. artery-first).

Outcomes

For this study, the main surgical outcome was the rate of surgical explorations not followed by surgical resection with a radical purpose (primary outcome: EL). Furthermore, to obtain more accurate surgical parameters, the concept of "mismatch" was introduced (secondary outcome). A

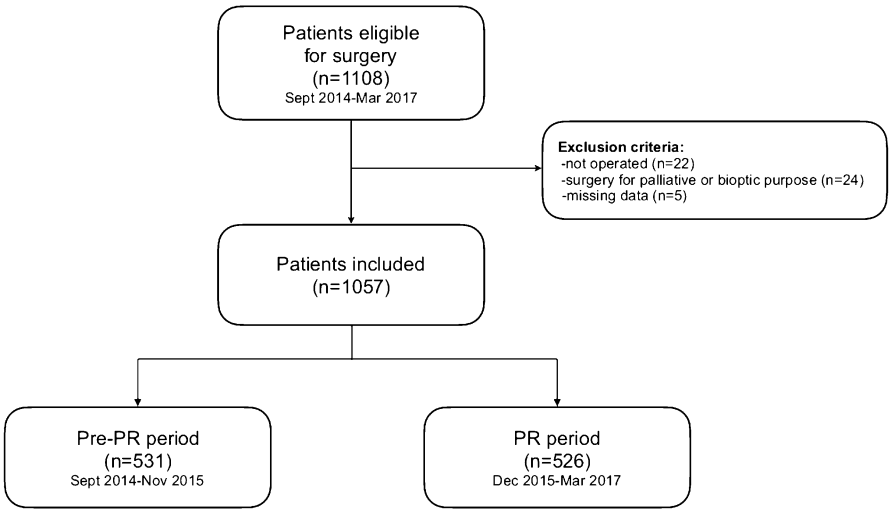

Fig. 1 Study population—inclusion and exclusion criteria (STROBE compliant flowchart)

mismatch indicates a difference between what was preoperatively expected and what was found intraoperatively. An unexpected intraoperative event can require diverting from the preoperative plan and initiating a new operative course (e.g., radical surgery vs. EL ± palliative procedures).

The mismatches fall into three main categories: the intraoperative finding of metastatic disease (liver or peritoneal) that was not previously detected upon imaging; an unexpectedly extended burden of the local disease (especially in patients treated with NAT) with venous or arterial vascular involvement that prevents safe resection and replacement; other uncommon and unexpected situations (e.g., local massive inflammation following oligosymptomatic acute pancreatitis in the preoperative period). All of these circumstances result in the inability to perform a complete surgical resection.

Results

A total of 1057 patients fulfilled the study criteria and were eventually included in the analysis (Fig. 1).

Table 1 presents the overall features of the study population with a comparison between patients in the pre-PR ($n = 531$) and PR period ($n = 526$). No differences in terms of sex, age-at-diagnosis, procedure performed, surgical approach, or histological diagnosis were found. However, during the PR period, a significant increase in patients

Table 1 Study population—overall features

	Tot.	Pre-PR period	PR period	*p* value
No.	1057	531	526	
Sex				
M	560 (53.0%)	275 (51.8%)	285 (54.2%)	*0.436*
F	497 (47.0%)	256 (48.2%)	241 (45.8%)	
Age at diagnosis	61.68 (± 12.40)	61.76 (± 12.05)	61.59 (± 12.75)	*0.824*
NAT				
Yes	243 (23.0%)	97 (18.3%)	146 (27.8%)	*<0.001*
No	814 (77.0%)	434 (81.7%)	380 (72.2%)	
Of whom: preoperative RT				
Yes	29 (2.7%)	14 (2.6%)	15 (2.9%)	*0.830*
No	1028 (97.3%)	517 (97.4%)	511 (97.1%)	
Type of surgery				
PPPD	482 (45.7%)	229 (43.1%)	253 (48.0%)	*0.151*
DP	278 (26.3%)	147 (27.7%)	131 (24.9%)	
TP	91 (8.6%)	38 (7.2%)	53 (10.1%)	
Atypical	29 (2.7%)	17 (3.2%)	12 (2.3%)	
Other	31 (2.9%)	18 (3.4%)	13 (2.5%)	
EL	146 (13.8%)	82 (15.4%)	64 (12.2%)	
MIS				
Yes	86 (8.1%)	41 (7.7%)	45 (8.6%)	*0.620*
No	971 (91.9%)	490 (92.3%)	481 (91.4%)	
Vascular resection				
Yes	83 (7.9%)	30 (5.6%)	53 (10.1%)	*0.007*
No	974 (92.1%)	501 (94.4%)	473 (89.9%)	
Pat. diagnosis				
PDAC	588 (55.6%)	286 (53.9%)	302 (57.4%)	*0.194*
pNET	132 (12.5%)	68 (12.8%)	64 (12.2%)	
PT	105 (9.9%)	46 (8.7%)	59 (11.2%)	
PCN	132 (12.7%)	77 (14.5%)	57 (10.8%)	
CP	23 (2.2%)	15 (2.8%)	8 (1.5%)	
Other	75 (7.1%)	39 (7.3%)	36 (6.8%)	

NAT neoadjuvant therapy, *RT* radiotherapy, *PPPD* pylorus-preserving pancreatoduodenectomy, *DP* distal pancreatectomy, *TP* total pancreatectomy, *Atypical* atypical resections (enucleation, middle pancreatectomy etc.), *EL* explorative laparotomy, *MIS* minimally invasive surgery, *PDAC* pancreatic ductal adenocarcinoma, *pNET* pancreatic neuroendocrine tumors, *PT* periampullary tumors, *PCN* pancreatic cystic neoplasms, *CP* chronic pancreatitis

undergoing NAT (18.3% vs. 27.8%; $p < 0.001$) and vascular resections (5.6% vs. 10.1%; $p = 0.007$) were detected compared to the pre-PR period. The rate of ELs (primary outcome, Table 2) remained comparable between the two periods (15.4% vs. 12.2%; $p = 0.123$).

A significant decrease of mismatch cases, those with discrepancies between what was preoperatively expected and what was intraoperatively found, was detected in the PR period (12.2% vs. 8.4%; $p = 0.038$) relative to the pre-PR period. The same analysis conducted for PDAC cases only generated similar results (Table 3).

The main intraoperative findings leading to mismatch in the pre-PR and PR periods are reported in Table 4.

During the PR period, 53 patients (10.1%) eventually underwent a vascular resection for a radical purpose. Of these vascular resections, 26 (49%) were predicted during the first outpatient clinic visit by the single pancreatic surgeon. After the PR discussion, the rate of preoperatively predicted vascular resections increased to 79.3% ($n = 42$ cases).

Regarding the PR period, in 22 cases (4.2%) the meeting rejected the previously recommended surgical treatment (see exclusion criteria, Fig. 1). Among these 22 patients, 59% were found to have radiological evidence of hepatic metastases ($n = 6$) and locally advanced disease ($n = 7$). For the remaining nine patients (41%), the altered treatment course recommended in the PR was due to a variety of reasons. For the three cases with pancreatic cystic neoplasms, the PR suggested a follow-up program, postponing the potential surgical intervention. In another four patients, diagnostic uncertainty and/or comorbidities led the surgeons to reconsider surgery and to recommend additional radiological or clinical investigations. For the remaining two patients, the PR recommended preoperative palliation of obstructive jaundice.

Table 2 Primary and secondary outcomes

	Tot.	Pre-PR period	PR period	*p* value	OR (95% CI)
No.	1057	531	526		
Explorative lap. (EL)					
Yes	146 (13.8%)	82 (15.4%)	64 (12.2%)	*0.123*	*1.32 (0.93–1.87)*
No	911 (86.2%)	449 (84.6%)	462 (87.8%)		
Mismatch					
Yes	109 (10.3%)	65 (12.2%)	44 (8.4%)	*0.038*	*0.65 (0.43–0.98)*
No	948 (89.7%)	466 (87.8%)	482 (91.6%)		

Table 3 Primary and secondary outcomes (PDAC-specific)

	Tot.	Pre-PR period	PR period	*p* value	OR (95% CI)
No.	588	286	302		
Explorative lap. (EL)					
Yes	132 (22.4%)	72 (25.2%)	60 (19.9%)	*0.123*	*1.36 (0.92–2.00)*
No	456 (77.6%)	214 (74.8%)	242 (80.1%)		
Mismatch					
Yes	100 (17.0%)	58 (20.3%)	42 (13.9%)	*0.040*	*0.63 (0.41–0.98)*
No	488 (83.0%)	228 (79.7%)	260 (86.1%)		

Table 4 Causes of mismatch

Mismatches	Tot.	Pre-PR period	PR period
	109	65	44
Causes			
Peritoneal carcinosis	26 (23.9%)	11 (16.9%)	15 (34.1%)
Unexpectedly extended burden of local disease*	11 (10.1%)	6 (9.2%)	5 (11.4%)
Massive vascular infiltration**	23 (21.1%)	14 (21.5%)	9 (20.5%)
Hepatic metastases	43 (39.4%)	29 (44.6%)	14 (31.8%)
Severe acute pancreatitis	6 (5.5%)	5 (7.7%)	1 (2.3%)

*e.g. infiltration of mesocolon, Treitz ligament, hepatic hilum

**arterial or venous infiltration, not allowing resection and/or safe replacement

Discussion

The present study suggests that, in a high-volume setting, a preoperative, systematic review of patients' clinical history and medical documentation by an MDT improves the level of care. This finding is explained by the more accurate selection of patients undergoing surgery and the more targeted anticipation of intraoperative pitfalls.

The advantages provided by the introduction of MDTs and multidisciplinary meetings (MDTMs) in oncology settings are widely reported in the literature [7]. The implementation of a team approach to oncologic surgery improves the quality of care in terms of consistency, continuity, coordination, and cost-effectiveness, with a considerable positive impact on clinical outcomes [4]. MDTMs facilitate the standardization of clinical decisions according to the referral guidelines, thereby reducing the individual variability that often influences the decision-making process [8]. They also represent an opportunity to implement communication between different specialists and between trainees and expert practitioners [9]. Basta et al. recently conducted a systematic review to assess the impact of MDTs and MDTMs on the treatment of patients affected by GI malignancies [10]. They concluded that the adoption of interdisciplinarity in surgical practice provides many advantages for both physicians and patients: better adherence to guidelines, more accurate diagnoses, optimization of treatment plans, and better quality of care. Furthermore, they found that, after MDTM discussions, changes in diagnosis and treatment can occur in a significant number of evaluated patients (18.4–26.9% and 23.0–41.7%, respectively). The present study adds to this knowledge that a multidisciplinary approach in pancreatic surgery can be enacted through the addition of a pre-surgery meeting to reach a consensus on the best therapeutic strategy for each patient. Another recent study conducted by Kirkegård et al. demonstrated that the most difficult task for MDTs pertains to resectability assessment, substantially based on the tumor stage (TNM) and its relationship with major vessels (resectable, borderline resectable, or locally advanced tumor) [11]. In line with this evidence, the PR represents an additional instrument that optimizes the surgical indication allowing for the most appropriate selection of patients. The PR is indeed a fundamental checkpoint for all surgery candidates. It represents an additional opportunity to review each case from a surgically oriented perspective and plays an important educational role for fellows, residents, and medical students.

The primary outcome of the present study was the rate of ELs. Despite this parameter could ideally evaluate correctly the success of a meeting aimed to enhance the quality of a surgical practice, a word of caution must be used. An EL is not always reflective of a wrong surgical indication or a failure in patient selection. This is particularly true in the setting of PDAC and in the era of NAT. For example, surgical exploration may be indicated in patients with locally advanced disease who have completed neoadjuvant therapy and in whom imaging can no longer predict unresectability. For this reason, the concept of mismatch was introduced, as explained in the Methods section. After establishing the PR, we recorded a reduction to both ELs (15.4% vs. 12.2%; $p = 0.123$) and mismatches (12.2% vs. 8.4%; $p = 0.038$). These results become even more solid when considering only PDAC cases and should be scaled with the specific features of the two considered periods (before and after the introduction of PR). In particular, we found a considerable increase in the rates of patients undergoing NAT (18.3% vs. 27.8%; $p < 0.001$) and vascular resections (5.6% vs. 10.1%; $p = 0.007$) in the PR- period. Resection after chemotherapy, with or without radiotherapy, has become increasingly popular and is the standard of care for localized, non-upfront, resectable PDAC [6]. Furthermore, the goal of reaching a curative resection in this specific case has led to the growing adoption of vascular resections for radical purposes [12–14]. Taken together, these factors reflect the growing complexity of cases requiring surgical intervention. The PR discussion was able to not only mitigate the potentially detrimental effect of this increased complexity but also to effectively reduce the rate of unexpected intraoperative events.

By systematically analyzing the PR reports, we found that the main discussion topics were: the appropriateness of the surgical indication previously given, the requirement of further investigation, the correct timing for the surgery, the examination of potential surgical pitfalls, and the accurate analysis of the technical aspects. In this regard, the influence of the PR can be evaluated at its best by the anticipation of vascular resections. We found that, in patients who underwent surgery with an associated venous resection (SMV or portal vein resection, type 1–4 according to ISGPS) [12], the PR predicted the vascular phase in 79.3% of the cases compared to 49% in the pre-PR period. The role of the PR in this regard is not intended as a mere tool for predicting whether or not a vascular resection will be performed. Rather, the PR represents an opportunity to share knowledge and experience among surgeons allowing to anticipate potentially critical situations such as vascular resection.

Another key aspect is the radiological assessment of PDAC resectability regarding vascular involvement after NAT [15]. Many studies have shown that restaging after NAT is often not accurate. In particular, CT tends to overestimate the local extent of PDAC after NAT [16, 17]. To perform surgery after NAT in borderline resectable PDAC is advised, independently from the presence of residual signs of vascular involvement [18]. The ability to better anticipate the need for a vascular resection can be interpreted as an added value of the PR, owed to the discussion between

surgeons with different areas of expertise. Additional studied are needed to unequivocally establish whether the PR improved the resectability assessment of the CT scan after NAT.

Additional evidence of this meeting's utility is derived from cases in which surgery was contraindicated. Seven patients eventually did not undergo surgery due to evidence, uncovered during the PR, of a more locally advanced disease, and six for the suspicion of liver metastasis. All of these six cases were later biopsy-confirmed and should, therefore, be labeled as avoided ELs. The two patients for which the PR suggested jaundice palliation had bilirubin serum levels > 9 mg/dL. Despite the controversies existing in the literature about preoperative biliary drainage, with particular focus on its infectious complications [19, 20], a recent study conducted at our institution suggests that patients with bilirubin levels equal to or higher than 7.5 mg/dL have higher postoperative morbidity and reoperation rates because of impaired liver function [21]. Consequently, the PR improved the quality of care in these cases as well.

In seven additional patients, the PR led to the reconsideration of the surgical indication for various diagnostic, clinical, or therapeutic matters. Three of these cases were intraductal papillary mucinous neoplasms (IPMNs). Pancreatic cyst neoplasms represent a very wide spectrum of pathologies and their differential diagnosis is often challenging [22], confounded by consequent management disparities existing between established guidelines [23–25]. Lennon et al. reported that their multidisciplinary dedicated pancreatic cyst clinic altered the clinical management course for approximately 30% of the patients assessed [26]. Despite additional evidence still being required, the PR likely plays a similar role at our institution by better selecting cases for surgery through collegial discussion.

To our knowledge, this is the first study to assess the potential benefits derived from a mono-disciplinary meeting in surgical oncology and, in particular, in the field of pancreatic surgery. Despite the potential bias associated with the study design, efforts have been made to define objective parameters assessing the impact of this meeting. The PR suggests a different type of preoperative approach to pancreatic surgical cases, an effective combination of the integrated vision of cancer provided by MDTs with the technical, highly specialized perspectives of pancreatic surgeons.

In conclusion, in the setting of a high-volume center, a specific preoperative surgical meeting designed to review all cases scheduled for surgical exploration can anticipate intraoperative pitfalls and reduce potential single-observer mistakes. Therefore, it should be globally recommended to implement the level of care.

Acknowledgements SPaRo Group (Surgical Pancreas Round Group) members: Prof. C. Bassi, Prof R. Salvia, L. Casetti MD, A. Esposito MD, M. Fontana MD, L. Landoni MD, G. Malleo MD, G. Marchegiani MD, S. Paiella MD, A. Pea MD, M. Tuveri MD, M. De Pastena MD, H. Impellizzeri MD, L. Maggino MD, R. Piccolo MD, V. Todaro MD, F. Accordini MD, V. Allegrini MD, S. Andrianello MD, A. Bunicci MD, I. Damoli MD, E. Marrano MD, M. Miotto MD, A. Pulvirenti MD, M. Ramera MD, A. Borin MD, C. Dal Borgo MD, G. Perri MD, E.Viviani MD, C.C. Zingaretti MD, E. Bannone MD, A. Balduzzi MD, D. Ciprani MD, L. Crepaz MD, T. Giuliani MD, G. Masini MD, C. Nessi MD, N. Surci MD, L. Bertoldi MD, C. Bortolato MD, F. Casciani MD, A. Di Gioia MD, S. Nobile MD, E. Sereni MD. Special guests of the Meeting as "visiting Professor" during the present study period: Prof. M. Adham (University of Lyon), Prof. H. Friess (University of Munich), Prof. J.P. Neoptolemos (University of Heidelberg), Prof. C.L. Wolfgang (Johns Hopkins University School of Medicine-Baltimore).

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Human and animal rights This article does not contain any studies with animals performed by any of the authors. As this study is designed as a retrospective study, formal consent is not required.

Informal consent As data were collected as part of a regular hospital stay and analyzed retrospectively, informed consent was not obtained. The study was approved by the local ethics committee and registered with ClinicalTrial.gov. Trial registration number: NCT03807687.

References

1. Crippa S, Bassi C, Salvia R, Malleo G, Marchegiani G, Rebours V, Levy P, Partelli S, Suleiman SL, Banks PA, Ahmed N, Chari ST, Fernandez-Del Castillo C, Falconi M (2017) Low progression of intraductal papillary mucinous neoplasms with worrisome features and high-risk stigmata undergoing non-operative management: a mid-term follow-up analysis. Gut 66(3):495–506. https://doi.org/10.1136/gutjnl-2015-310162
2. Falconi M, Eriksson B, Kaltsas G, Bartsch DK, Capdevila J, Caplin M, Kos-Kudla B, Kwekkeboom D, Rindi G, Kloppel G, Reed N, Kianmanesh R, Jensen RT, Vienna Consensus Conference p (2016) ENETS consensus guidelines update for the management of patients with functional pancreatic neuroendocrine tumors and non-functional pancreatic neuroendocrine tumors. Neuroendocrinology 103(2):153–171. https://doi.org/10.1159/000443171
3. Pawlik TM, Laheru D, Hruban RH, Coleman J, Wolfgang CL, Campbell K, Ali S, Fishman EK, Schulick RD, Herman JM, Johns Hopkins Multidisciplinary Pancreas Clinic T (2008) Evaluating the impact of a single-day multidisciplinary clinic on the management of pancreatic cancer. Ann Surg Oncol 15(8):2081–2088. https://doi.org/10.1245/s10434-008-9929-7
4. Fleissig A, Jenkins V, Catt S, Fallowfield L (2006) Multidisciplinary teams in cancer care: are they effective in the UK?

Lancet Oncol 7(11):935–943. https://doi.org/10.1016/S1470-2045(06)70940-8
5. Meguid C, Schulick RD, Schefter TE, Lieu CH, Boniface M, Williams N, Vogel JD, Gajdos C, McCarter M, Edil BH (2016) The multidisciplinary approach to gi cancer results in change of diagnosis and management of patients. Multidisciplinary care impacts diagnosis and management of patients. Ann Surg Oncol 23(12):3986–3990. https://doi.org/10.1245/s10434-016-5343-8
6. Hackert T (2018) Surgery for pancreatic cancer after neoadjuvant treatment. Ann Gastroenterol Surg 2(6):413–418. https://doi.org/10.1002/ags3.12203
7. Pillay B, Wootten AC, Crowe H, Corcoran N, Tran B, Bowden P, Crowe J, Costello AJ (2016) The impact of multidisciplinary team meetings on patient assessment, management and outcomes in oncology settings: a systematic review of the literature. Cancer Treat Rev 42:56–72. https://doi.org/10.1016/j.ctrv.2015.11.007
8. Vinod SK, Sidhom MA, Delaney GP (2010) Do multidisciplinary meetings follow guideline-based care? J Oncol Pract 6(6):276–281. https://doi.org/10.1200/JOP.2010.000019
9. Ruhstaller T, Roe H, Thurlimann B, Nicoll JJ (2006) The multidisciplinary meeting: an indispensable aid to communication between different specialities. Eur J Cancer 42(15):2459–2462. https://doi.org/10.1016/j.ejca.2006.03.034
10. Basta YL, Bolle S, Fockens P, Tytgat K (2017) The value of multidisciplinary team meetings for patients with gastrointestinal malignancies: a systematic review. Ann Surg Oncol 24(9):2669–2678. https://doi.org/10.1245/s10434-017-5833-3
11. Kirkegard J, Aahlin EK, Al-Saiddi M, Bratlie SO, Coolsen M, de Haas RJ, den Dulk M, Fristrup C, Harrison EM, Mortensen MB, Nijkamp MW, Persson J, Soreide JA, Wigmore SJ, Wik T, Mortensen FV (2019) Multicentre study of multidisciplinary team assessment of pancreatic cancer resectability and treatment allocation. Br J Surg 106(6):756–764. https://doi.org/10.1002/bjs.11093
12. Bockhorn M, Uzunoglu FG, Adham M, Imrie C, Milicevic M, Sandberg AA, Asbun HJ, Bassi C, Buchler M, Charnley RM, Conlon K, Cruz LF, Dervenis C, Fingerhutt A, Friess H, Gouma DJ, Hartwig W, Lillemoe KD, Montorsi M, Neoptolemos JP, Shrikhande SV, Takaori K, Traverso W, Vashist YK, Vollmer C, Yeo CJ, Izbicki JR, International Study Group of Pancreatic S (2014) Borderline resectable pancreatic cancer: a consensus statement by the International Study Group of Pancreatic Surgery (ISGPS). Surgery 155(6):977–988. https://doi.org/10.1016/j.surg.2014.02.001
13. Hackert T, Schneider L, Buchler MW (2015) Current state of vascular resections in pancreatic cancer surgery. Gastroenterol Res Pract 2015:120207. https://doi.org/10.1155/2015/120207
14. Klose J, Hackert T, Buchler MW, Ulrich A (2016) Vascular resection and reconstruction techniques in pancreatic surgery. Chirurg 87(2):94–99. https://doi.org/10.1007/s00104-015-0134-5
15. Zins M, Matos C, Cassinotto C (2018) Pancreatic adenocarcinoma staging in the era of preoperative chemotherapy and radiation therapy. Radiology 287(2):374–390. https://doi.org/10.1148/radiol.2018171670
16. Cassinotto C, Sa-Cunha A, Trillaud H (2016) Radiological evaluation of response to neoadjuvant treatment in pancreatic cancer. Diagn Interv Imaging 97(12):1225–1232. https://doi.org/10.1016/j.diii.2016.07.011
17. Kim YE, Park MS, Hong HS, Kang CM, Choi JY, Lim JS, Lee WJ, Kim MJ, Kim KW (2009) Effects of neoadjuvant combined chemotherapy and radiation therapy on the CT evaluation of resectability and staging in patients with pancreatic head cancer. Radiology 250(3):758–765. https://doi.org/10.1148/radiol.2502080501
18. Beleu A, Calabrese A, Rizzo G, Capelli P, Bellini N, Caloggero S, Calbi R, Tinazzi Martini P, De Robertis R, Carbognin G, Marchegiani G, Scarpa A, Salvia R, Bassi C, D'Onofrio M (2019) Preoperative imaging evaluation after downstaging of pancreatic ductal adenocarcinoma: a multi-center study. Cancers (Basel). https://doi.org/10.3390/cancers11020267
19. Strom TJ, Klapman JB, Springett GM, Meredith KL, Hoffe SE, Choi J, Hodul P, Malafa MP, Shridhar R (2015) Comparative long-term outcomes of upfront resected pancreatic cancer after preoperative biliary drainage. Surg Endosc 29(11):3273–3281. https://doi.org/10.1007/s00464-015-4075-3
20. Costi R, De Pastena M, Malleo G, Marchegiani G, Butturini G, Violi V, Salvia R, Bassi C (2016) Poor results of pancreatoduodenectomy in high-risk patients with endoscopic stent and bile colonization are associated with *E. coli*, diabetes and advanced age. J Gastrointest Surg 20(7):1359–1367. https://doi.org/10.1007/s11605-016-3158-3
21. De Pastena M, Marchegiani G, Paiella S, Malleo G, Ciprani D, Gasparini C, Secchettin E, Salvia R, Gabbrielli A, Bassi C (2018) Impact of preoperative biliary drainage on postoperative outcome after pancreaticoduodenectomy: an analysis of 1500 consecutive cases. Dig Endosc 30(6):777–784. https://doi.org/10.1111/den.13221
22. Farrell JJ (2017) Pancreatic cysts and guidelines. Dig Dis Sci 62(7):1827–1839. https://doi.org/10.1007/s10620-017-4571-5
23. European Study Group on Cystic Tumours of the P (2018) European evidence-based guidelines on pancreatic cystic neoplasms. Gut 67(5):789–804. https://doi.org/10.1136/gutjnl-2018-316027
24. Farrell JJ, Fernandez-del Castillo C (2013) Pancreatic cystic neoplasms: management and unanswered questions. Gastroenterology 144(6):1303–1315. https://doi.org/10.1053/j.gastro.2013.01.073
25. Del Chiaro M, Verbeke C, Salvia R, Kloppel G, Werner J, McKay C, Friess H, Manfredi R, Van Cutsem E, Lohr M, Segersvard R, European Study Group on Cystic Tumours of the P (2013) European experts consensus statement on cystic tumours of the pancreas. Dig Liver Dis 45(9):703–711. https://doi.org/10.1016/j.dld.2013.01.010
26. Lennon AM, Manos LL, Hruban RH, Ali SZ, Fishman EK, Kamel IR, Raman SP, Zaheer A, Hutfless S, Salamone A, Kiswani V, Ahuja N, Makary MA, Weiss MJ, Hirose K, Goggins M, Wolfgang CL (2014) Role of a multidisciplinary clinic in the management of patients with pancreatic cysts: a single-center cohort study. Ann Surg Oncol 21(11):3668–3674. https://doi.org/10.1245/s10434-014-3739-x