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ORIGINAL RESEARCH

# Identification of Educational Gaps Among Oncologists Who Manage Patients with Pancreatic Cancer

Justin A. Barnes[1] · Melissa L. Ellis[1] · Sharon Hwang[1] · Joan Emarine[2] · Patti Merwin[2] · Gregory D. Salinas[1] · Benjamin L. Musher[3]

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## Abstract

**Introduction** Pancreatic ductal adenocarcinoma (PDA) is associated with poor outcomes and presents oncologists with a myriad of clinical challenges. This study was conducted to assess oncologists' practice patterns and to identify the greatest areas of need for future PDA continuing medical education (CME) programs.

**Methods** Case vignettes have been validated as an effective tool to assess how physicians approach and treat a wide array of diseases. In order to assess practice patterns for resectable, locally advanced unresectable, and metastatic PDA, an online case vignette survey was distributed to practicing medical oncologists.

**Results** Responses from 150 US-practicing oncologists were analyzed, and several key opportunities for future CME programs were identified. For case 1 (patient with resectable PDA), 44% of oncologists did not select an evidence-based adjuvant chemotherapy regimen. For case 2 (patient with locally advanced PDA who develops metastases and neuropathy after first-line nab-paclitaxel/gemcitabine followed by chemoradiation), 57% of oncologists did not select an evidence-based second-line chemotherapy regimen, and 35% selected a regimen containing oxaliplatin, a chemotherapeutic known to cause neuropathy. For case 3 (patient with a pancreatic mass and liver metastases), only 34% of oncologists recommended a biopsy, chest imaging, and liver function tests which should be standard of care assessments with this presentation. For all three cases, clinical trial referral was selected by fewer than 5% of respondents.

**Conclusions** This study identified appreciable discrepancies between oncologists' recommendations and standard evidence-based guidelines. Well-designed CME programs may help to bridge the educational gaps identified and improve adherence to practice guidelines.

**Keywords** Pancreatic cancer · Educational needs assessment · Medical oncologist · Survey

## Introduction

Pancreatic ductal adenocarcinoma (PDA) is the fourth-most common cause of cancer-related deaths in the USA, with only 7.7% of patients surviving beyond 5 years [1, 2]. An estimated 53,000 new cases will be diagnosed and nearly 42,000 people are expected to die of PDA in 2016. Incidence rates of PDA have been increasing while mortality rates have remained steady [3–7].

PDA presents oncologists with many challenges, including initial detection of the disease, determination of resection eligibility, and selection of treatment modality. Both the American Society of Clinical Oncology and the National Comprehensive Cancer Network have developed guidelines to assist oncologists with PDA diagnosis and management [2, 8–10]. Studies have demonstrated that guideline adherence leads to better outcomes for patients with PDA; however, adherence to evidence-based recommendations is suboptimal [11, 12].

Continuing medical education (CME) has been shown to improve physician performance in a variety of

✉ Justin A. Barnes
justin.barnes@ceoutcomes.com

[1] CE Outcomes, LLC, 2101 Highland Ave. South, Ste. 300A, Birmingham, AL 35205, USA

[2] Celgene Corporation, Summit, NJ, USA

[3] Baylor College of Medicine, Houston, TX, USA

common diseases [13–17]. In order to design effective educational programs targeting PDA, one must first investigate oncologists' attitudes and approaches to diagnosing and treating PDA, the discrepancies between their practice patterns and evidence-based standard guidelines, and the challenges they face while managing their patients [18]. The primary aim of this study was to inform the design of CME programs in PDA by documenting practice patterns and educational gaps among US-practicing medical oncologists who manage patients with PDA.

## Methodology

### Oncologist Survey Design and Distribution

A case vignette survey instrument was developed and fielded in late June and early July 2016 to assess practice patterns among American oncologists who treat PDA. Prior research has shown that case vignettes can accurately measure processes of care employed in clinical practice while also being more cost-effective and less invasive than other means of measurement [19–22].

The survey instrument included three vignettes of patients diagnosed with PDA at different stages:

Case 1 presents an active 50-year-old man with left upper quadrant pain and weight loss. A CT scan shows a 4-cm mass in the pancreatic tail with enlarged peripancreatic nodes but no evidence of distant metastases. An endoscopic ultrasound (EUS)-guided biopsy of the pancreatic mass reveals adenocarcinoma. The patient's Eastern Cooperative Oncology Group (ECOG) performance status (PS) is 0. The patient undergoes distal pancreatectomy with pathological evaluation revealing T3N1 (Stage IIB) disease, with negative resection margins.

Case 2 features a 75-year-old male smoker with well-controlled diabetes and hypertension, presenting with painless jaundice. CT imaging shows intrahepatic and extrahepatic ductal dilation; a 3-cm mass in the head of the pancreas abutting the portal vein and superior mesenteric vein and encasing the superior mesenteric artery (> 270°); and no evidence of distant metastases. An EUS-guided biopsy of the pancreatic mass reveals moderately differentiated adenocarcinoma, and a metal biliary stent normalizes the bilirubin. In all, the patient has lost 10 pounds, cannot engage in vigorous exercise, but is able to perform daily activities. The patient's ECOG PS is 1 and he denies any symptoms of sensory neuropathy. The patient receives 4 cycles of gemcitabine with nab-paclitaxel, which yields a minor radiographic response, but the tumor is still encasing the superior mesenteric artery. He then undergoes standard 5FU-based chemoradiation, and CT imaging shows stable but still unresectable disease. He resumes nab-paclitaxel/gemcitabine, but after another 4 cycles, CT shows liver metastases. The patient now has painful grade 1 neuropathy in his hands and feet. His weight has stabilized and his functional status is still good, with an ECOG PS 1.

Case 3 describes a 55-year-old woman with no significant past medical history but a 3-month history of progressive abdominal pain and weight loss. She complains of mild fatigue but is still extremely active, working full-time, and exercising three times per week. A CT scan shows a 4-cm mass in the pancreatic body involving the splenic artery/vein but not involving the superior mesenteric, celiac, or hepatic vasculature; enlarged peripancreatic lymph nodes; and five hypodensities in the liver, the largest measuring 2.7 cm.

Each vignette included multiple-choice questions designed to elicit management decisions as the case progressed. Options were purposely varied to determine whether respondents' clinical decisions were in-line with evidence-based, standard-of-care practice and, in turn, to identify educational gaps. Most questions had multiple answer options that were evidence-based and considered appropriate. The question flow and case information presented as the vignettes progressed did not change based on respondent choices in preceding questions.

Surveys were distributed to a representative random sample of academic and community oncologists practicing in the USA. Quotas were placed to limit the number of respondents to 150. Contact information of potential respondents was randomly obtained from the AMA MasterFile and from lists of physicians who had previously "opted-in" to participate in similar survey-based studies. Physicians were issued up to three invitations to participate in the survey via email, and a monetary incentive ($50 online gift card) was offered for survey completion. Respondents to the invitations accessed the survey through the online survey platform Qualtrics (Provo, Utah). Inclusion criteria for this study were implemented with screening questions on the first page of the online survey and ensured that all respondents were oncologists who treat one or more patients with PDA per month in a community or academic setting.

### Statistical Analysis

Data were cleaned to remove duplicate, incomplete, or false entries before being included for analysis. Survey data were compiled and analyzed with IBM SPSS Statistics 22. Descriptive statistics, such as frequencies and means, were calculated on all questions in the survey to examine overall responses and related trends among the survey questions.

## Results

Data from 150 surveys were collected and analyzed. As shown in Table 1, the sample respondents saw a median of 80 total patients per week and treated a median of 10 pancreatic cancer patients per month. Nearly all respondents (92%) practiced in an urban or suburban environment, and 19% were affiliated with an academic center. The oncologists in this sample reported that almost two-thirds of their pancreatic cancer patients receive second-line therapy.

Several important educational gaps were identified when survey responses were compared to evidence-based national guidelines available at the time the survey was fielded [2]. For Case 1, in which a patient undergoes surgical resection of localized PDA and respondents are then asked to select an adjuvant chemotherapy regimen, 32% respondents selected single-agent chemotherapy (31% gemcitabine, 1% 5-fluorouracil [5FU]), 65% selected combination chemotherapy (21% gemcitabine/capecitabine, 20% gemcitabine/nab-paclitaxel, and 24% FOLFIRINOX/modified FOLFIRINOX), and 3% selected a clinical trial (Fig. 1). Overall, 44% of respondents did not select an evidence based regimen or clinical trial. Of note, the ESPAC-4 trial results supporting the use of gemcitabine/capecitabine as adjuvant therapy were released several weeks prior to the survey being fielded and this treatment option was considered an evidence-based choice [23].

Respondents were asked to select a second-line chemotherapy regimen for Case 2, in which a patient with locally advanced PDA develops metastases and painful neuropathy after 4 cycles of gemcitabine/nab-paclitaxel, 5FU-based chemoradiation, and four additional cycles of gemcitabine/nab-paclitaxel, 23% of respondents selected 5FU/LV/liposomal irinotecan, 66% selected a different 5FU-based chemotherapy regimen, and 5% selected a clinical trial. Of those who selected a 5FU-based regimen other than 5FU/LV/liposomal irinotecan, 55% (35% of all respondents) chose a regimen containing oxaliplatin (Fig. 2) despite the fact that the patient had developed painful neuropathy during first-line therapy.

For Case 3, in which a patient presents with suspected, but not biopsy-proven, metastatic PDA, 88% of respondents recommended a biopsy (67% liver biopsy, 21% EUS-guided biopsy of pancreatic mass), 46% recommended one or more forms of chest imaging (22% chest CT, 3% chest x-ray, 28% PET), and 35% recommended liver function tests (Fig. 3). Of note, 12% of oncologists did not recommend a biopsy at all, and only 34% of respondents recommended all three components of a standard diagnostic evaluation for presumed metastatic PDA (biopsy, chest imaging, and liver function tests). Lastly, very few oncologists indicated they would enroll patients in clinical trials, as 5% or fewer opted to refer patients to clinical trials in all three stages of disease (Figs. 1 and 2).

## Discussion

PDA presents numerous diagnostic and therapeutic challenges, and improved patient outcomes have been associated with adherence to evidence-based guidelines [1, 2], such as those published by the American Society of Clinical Oncology [8–10] and the National Comprehensive Cancer Network [2]. Multiple studies have demonstrated suboptimal adherence to national guidelines among practicing clinicians [11, 12]; however, many of these studies have addressed only one aspect or modality of care [24] and/or have examined data gathered from outdated cancer registries [25, 26]. CME courses can potentially improve physician performance [13–17], but in order for such programs to be effective, they must target areas of greatest need [18] based on current practice patterns. We therefore assessed current PDA practice patterns among medical oncologists to inform the design of future educational initiatives.

Only 15–20% of patients with PDA present with resectable disease, and 10% of patients who undergo resection without adjuvant chemotherapy survive 5 years. Adjuvant chemotherapy has been shown to improve outcomes over observation alone (10% absolute improvement in 5-year overall survival), and level I evidence supports the administration of either single-agent gemcitabine or single-agent 5-fluorouracil (5FU) as postoperative therapy [27–29]. In Case 1 of our study, only 32% of respondents chose a standard evidence-based option of single-agent gemcitabine or 5FU. It is important to note that, only weeks before this study was conducted, the results of ESPAC-4, a European trial that demonstrated benefit of gemcitabine/capecitabine over gemcitabine alone in patients with resected PDA, were reported. Since we were unable to ascertain whether the 21% of respondents who chose the combination of gemcitabine/capecitabine were aware of the ESPAC-4 results, we decided to include this group in the respondents who chose an evidence-based regimen (56% overall). Although FOLFIRINOX and nab-paclitaxel/gemcitabine have both been proven to yield superior outcomes when compared to single-agent gemcitabine in metastatic PDA [30, 31], neither regimen has been proven to be superior to single-agent chemotherapy in the adjuvant setting, although clinical trials to assess these questions are on-going. Nevertheless, 44% of our respondents recommended FOLFIRINOX or nab-paclitaxel/gemcitabine for the patient in Case 1 (Fig. 1), indicating either lack of familiarity with, or purposeful deviation from, evidence-based guidelines published by ASCO and NCCN. The significant discrepancy between our respondents' recommendations and national guidelines justifies implementing CME initiatives to increase awareness of evidence-based recommendations for adjuvant chemotherapy following resection of PDA.

The fact that respondents administer second-line chemotherapy to approximately two-thirds of their PDA patients

**Table 1** Sample demographics

| | Oncologists ($N = 150$) |
|---|---|
| Patients seen per week, median | 80 |
| Patients with pancreatic cancer treated per month, median | 10 |
| Patients with pancreatic cancer receiving second-line therapy (%) | 64% |
| Location of practice | |
| Urban | 51% |
| Suburban | 41% |
| Rural | 7% |
| Present employment | |
| Solo practice | 7% |
| Group practice | 61% |
| Academic setting | 19% |
| Non-government hospital | 12% |
| Government hospital | 2% |
| Other | 1% |

(Table 1) underscores the importance of considering all factors, including evidence-based guidelines and chemotherapy-related toxicity, into treatment algorithms. The patient in Case 2 develops progressive disease and painful neuropathy while receiving gemcitabine plus nab-paclitaxel. Only a minority (23%) of respondents to our survey chose 5FU/LV plus liposomal irinotecan, the only chemotherapy regimen with level I evidence to demonstrate survival benefit after progression on gemcitabine-based therapy [2, 32]. An additional 66% of respondents chose a different 5-fluorouracil-based chemotherapy regimen, and more than half (55%) of these respondents chose a regimen containing oxaliplatin, which would pose a significant risk of progressive neuropathy and ultimately compromised function and quality of life for the patient in Case 2. This case therefore raises two important issues facing any oncologist offering second-line therapy to a PDA patient: (1) adherence to evidence-based guidelines, which may increase potential benefit and (2) assessment of residual toxicity from prior regimens, which may improve tolerability and maintain quality of life. The relatively low adherence to evidence-based guidelines for advanced PDA reported in this study is consistent with other reports in the literature [12], and the relatively high percentage of respondents choosing oxaliplatin raises concerns

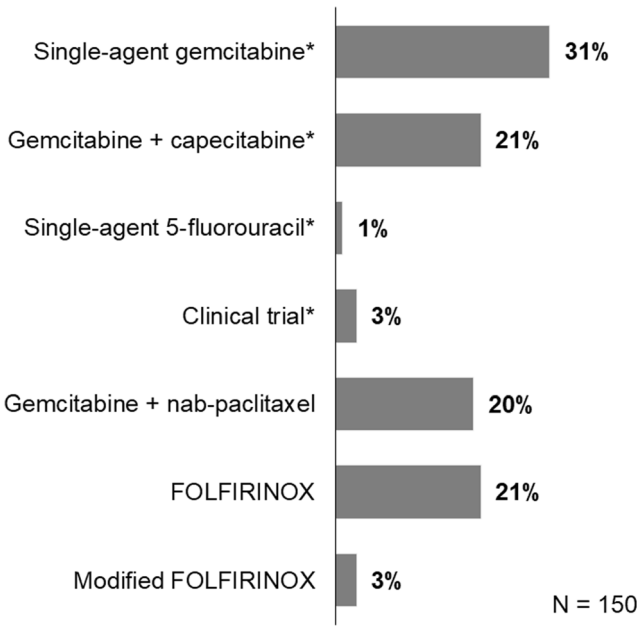


**Fig. 1** Choice of adjuvant therapy for resectable disease.Oncologists were asked to select a post-operative adjuvant chemotherapy regimen for a 50-year-old man diagnosed with resectable disease in the pancreatic tail (Case 1). Evidence-based regimens are indicated with an asterisk

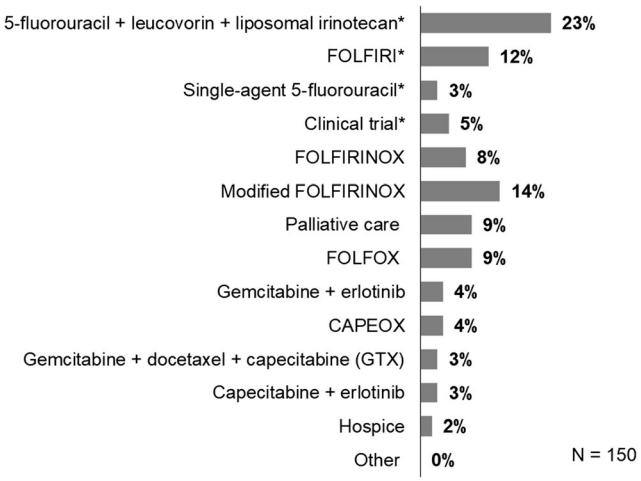


**Fig. 2** Choice of second-line therapy for unresectable locally advanced disease. Oncologists were asked to select a second-line chemotherapy regimen for a 75-year-old man diagnosed with unresectable locally advanced disease (Case 2), who developed new metastases and neuropathy while receiving first-line treatment. Evidence-based regimens are indicated with an asterisk

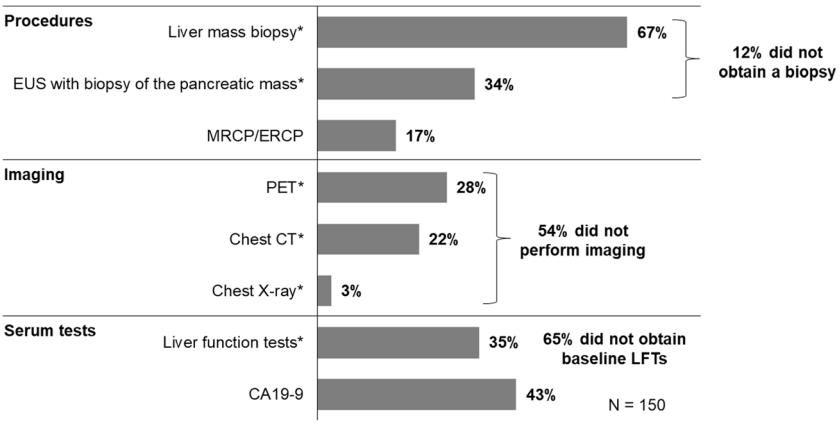


**Fig. 3** Diagnostic work-up for suspected metastatic PDA. Oncologists were asked to indicate their preferred work-up for a 55-year-old woman presenting with signs and imaging consistent with metastatic PDA (Case 3). Evidence-based testing recommendations are indicated with an asterisk. Only one of the available options is needed in each of the procedure and imaging categories to satisfy guideline recommendations

about oncologists' failure to consider toxicity and quality of life when recommending subsequent lines of chemotherapy. Designing CME courses that teach oncologists to consider potential benefit and risk across all lines of chemotherapy could minimize both acute and cumulative chemotherapy-related toxicity, thereby allowing patients to be treated with optimal chemotherapy doses, and potentially improve disease outcomes.

The patient in Case 3 presents with symptoms and radiographic imaging suspicious for PDA metastasized to the liver. According to the NCCN guidelines [2], appropriate evaluation of a patient with suspected PDA should include a biopsy of either the primary mass or a metastatic site (if present), chest imaging with either CT (preferred) or x-ray, and liver function tests. The vast majority (88%) of respondents to our survey appropriately chose a biopsy, but only 67% chose a liver biopsy, which is recommended in the NCCN guidelines for the dual purposes of tissue diagnosis and staging. Surprisingly, 12% of respondents would not have pursued a tissue diagnosis at all. Although the clinical scenario described in the vignette is highly suggestive of adenocarcinoma of the pancreas, tissue diagnosis should be pursued to rule out other possible diagnoses (e.g., neuroendocrine tumor of the pancreas, lymphoma, or metastatic carcinoma from a primary site other than the pancreas), given that these other diseases carry their own prognoses and treatment strategies. Slightly more than half of all respondents (53%) would have ordered some form of chest imaging, which is generally recommended to assess overall disease burden and potential site-specific clinical sequelae, and only 35% recommended liver function tests, which are needed to determine a patient's candidacy for chemotherapy. Overall, only a minority (34%) of oncologists would have performed the evaluation recommended by NCCN (biopsy, chest imaging, liver function tests). These findings demonstrate clear gaps between national guidelines and practice patterns and are consistent with other studies that have addressed the challenge of standardizing PDA diagnostic algorithms [32]. Future CME initiatives to reinforce recommended algorithms for diagnosing PDA and to review the rationale underlying each diagnostic component may help medical oncologists diagnose and stage PDA more efficiently and, in doing so, expedite initiation of appropriate therapy.

Given the dismal prognosis of PDA regardless of stage at diagnosis and the reality that outcomes will improve only with the advent of novel therapies and streamlined multi-modal approaches to care, national guidelines encourage strong consideration of clinical trial accrual for localized, locally advanced, and metastatic disease alike. In our survey, all questions eliciting treatment recommendations included a clinical trial option, but for all three clinical vignettes only 5% or fewer of respondents chose a clinical trial (Figs. 1 and 2, additional data not shown). Our findings parallel national data, which show that only 5% of patients with PDA enroll into clinical trials [33]. Multiple barriers continue to compromise accrual into PDA clinical trials. Patient-specific factors include lack of awareness of trials, misconceptions regarding clinical trials in general, prohibitive distance from high-volume centers, poor performance status, and comorbidities. Provider-specific factors include lack of time, knowledge, and resources to find suitable trials for their patients, dissatisfaction with the burdensome process of referring their patients to academic centers or large community practices that participate in clinical trials, and financial incentive to keep patients in their practice [25, 34, 35]. By familiarizing medical oncologists with resources that can help them direct PDA patients to clinical trials and by informing those oncologists that participate in clinical trials of the challenges that their colleagues face when considering referrals for their patients, future CME programs could help mitigate barriers to participation and increase enrollment of PDA patients into clinical trials.

In conclusion, our study identifies clear discrepancies between evidence-based national guidelines and oncologists' recommendations for managing PDA at all stages of disease. These findings justify the creation of CME programs that review and reinforce evidence-based guidelines, with the overarching goal of improving quality of care for PDA patients. Finally, our data show that clinical trial accrual remains greatly underused among practicing oncologists. CME

designed to raise awareness and improve communication among medical oncologists could potentially increase clinical trial accrual and ultimately improve outcomes in this lethal disease.

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**Compliance with Ethical Standards**

**Conflicts of Interest** All remaining authors have no conflicts to disclose.

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