

Factors affecting the rates of adherence to surveillance recommendations for incidental pancreatic cystic lesions in a large urban safety net hospital

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ABSTRACT

Background Pancreatic cystic lesions (PCLs) are a heterogeneous group of lesions with varying degrees of malignant potential. PCLs are often incidentally detected on imaging. Management for patients without an immediate indication for resection or tissue sampling entails radiographic surveillance to assess for features concerning for malignant transformation. This study aims to determine the rates of adherence to surveillance recommendations for incidental PCLs, and identify factors associated with adherence or loss of follow-up.

Methods We conducted a single-centre retrospective study of patients at a tertiary safety net hospital with incidentally discovered asymptomatic PCLs. Follow-up was defined as having undergone repeat imaging as recommended in the radiology report. Data were analysed using logistic regression.

Results Within our cohort (n=172), 123 (71.5%) subjects completed follow-up imaging. Attending a gastroenterology appointment was most strongly associated with completing follow-up for PCLs and remained significant (p=0.001) in a multivariate logistic regression model. Subjects without a documented primary care provider were less likely to have follow-up (p=0.028). Larger cyst size was associated with completion of follow-up in univariate only (p=0.067).

Conclusion We found that follow-up of an incidentally discovered PCLs was completed in the majority of our subjects. Incomplete follow-up for PCLs occurred in up to one in three to four patients in our cohort. Access to primary care and utilisation of subspecialty gastroenterology care are associated with completion of follow-up for PCLs. If validated, our findings can guide potential interventions to improve follow-up rates for PCLs.

INTRODUCTION

Pancreatic cystic lesions (PCLs) represent a wide array of clinicopathological lesions with varying degrees of malignant potential. Advancements in the quality of cross-sectional imaging combined with the frequent utilisation of such imaging studies to investigate non-specific abdominal complaints has led to an increase in the incidental detection of small PCLs, which are estimated to be prevalent in

Summary box

What is already known about this subject?

- ▶ Pancreatic cysts are often incidentally discovered on abdominal imaging, and with varying benign and malignant potential, they often represent a diagnostic dilemma for clinicians.
- ▶ The American College of Gastroenterology recommends routine surveillance imaging in surgically fit patients with asymptomatic pancreatic cysts.
- ▶ At this point, the reduction in pancreatic cancer mortality through surveillance remains unproven.

What are the new findings?

- ▶ Access to primary care and utilisation of subspecialty gastroenterology care are associated with appropriate surveillance follow-up for pancreatic cystic lesions (PCLs) in a large safety net hospital.

How might it impact on clinical practice in the foreseeable future?

- ▶ Optimising the management of incidentally discovered pancreatic cysts will require further research to assess if detection and management of PCLs can reduce morbidity and mortality for patients.
- ▶ If validated, our findings can guide potential interventions to improve follow-up rates in vulnerable populations.

at least 15% of the population.^{1 2} Incidentally detected PCLs present a management dilemma for clinicians as their natural history is not known with certainty, but it is accepted that some of these lesions have malignant potential—such as intraductal papillary mucinous neoplasms (IPMNs) and mucinous cystic neoplasms (MCNs).³ The American Gastroenterological Association reported that the risk of malignant transformation is approximately 0.24% per year, and therefore imaging surveillance is recommended for MCNs and IPMNs, even though reduction in pancreatic cancer mortality through surveillance remains unproven.^{1 4 5} Complicating matters is the fact that there are several

published guidelines for surveillance of PCLs and they differ in their recommendations in regards to frequency and duration of surveillance.⁴⁻⁷ While recognising these limitations, it is nonetheless critical that these incidental findings undergo surveillance imaging so patients are not 'lost to follow-up'. While endoscopic ultrasound (EUS) has an important role in the diagnosis and surveillance of PCLs in some patients, it is primarily used in patients with larger cysts or those with concerning radiographic features and necessitates involvement of a gastroenterologist (GI) in the patient's care. For the purposes of this study, we elected to focus solely on adherence to radiographic surveillance recommendations.

There are few studies that have explored what factors influence PCL surveillance follow-up. In a recent cohort study of 100 patients with newly diagnosed incidental cysts, 53% did not receive the recommended follow-up.⁸ Another study looked at 445 subjects with IPMNs and found that 33% failed to undergo surveillance imaging within 2 years of diagnosis.⁹ In this study, the majority of patients (over 50%) were white English speaking males with mid-to-high household incomes. At this point in time, no study has explored adherence rates of PCL surveillance in a large urban safety net hospital serving a diverse population comprising a significant proportion of non-white, non-English speaking patients. Hence, our study aims to determine the rates of adherence to surveillance recommendations for incidental pancreatic cysts at our institution and identify factors associated with adherence or loss of follow-up.

METHODS

We hypothesised that demographic factors, social determinants of health and cyst characteristics would be associated with adherence to surveillance recommendations for PCLs. We conducted a single-centre retrospective observational study of patients at a tertiary safety net hospital with incidentally discovered asymptomatic PCLs. Patients with incidental PCLs found on imaging from 1/1/2010 to 7/1/2018 were included. We considered adherence to surveillance to be complete if a follow-up imaging study for the PCL had been performed within 1 year of the surveillance interval recommended in the radiology report. Subjects with known pancreatic cancer, pseudocysts from acute or chronic pancreatitis or symptomatic PCLs were excluded.

We collected the following demographic data: age at initial PCL detection, sex, race, ethnicity, country of origin, language, employment status, education, insurance type, primary care physician (PCP) affiliation and follow-up with a GI. We also collected the following radiographic data: cyst location, size and number and the presence of pancreatic duct dilation. Size was dichotomised to larger than 1.5 cm or not, based on previous data, suggesting that this cut-off was relevant for further workup and detection of malignancy.¹⁰

Logistic regression was used to identify factors associated with completion of follow-up. We first performed univariate logistic regression of the variables above with completion of follow-up. Factors that were significantly ($p < 0.05$) associated with completion of follow-up were included in a multivariate logistic regression model. Analyses were performed with the R programming language, V.3.4.1.

RESULTS

During the study period, 262 patients were identified by data query. Of these, 90 subjects were excluded due to findings of pseudocysts ($n=29$), imaging not within the study timeline ($n=25$), unobtainable radiographic studies ($n=24$), metastatic or pancreaticobiliary malignancy at time of PCL diagnosis ($n=5$), cystic lesions removed at outside hospitals ($n=3$), patients declining follow-up imaging ($n=3$) and one subject who died during the admission when the PCL was discovered. Subsequently, 172 subjects met inclusion criteria as having asymptomatic, incidentally discovered PCLs with a radiology report recommending follow-up. In terms of the imaging modalities used in these incidental findings, 111 were captured by CT, 55 by MRI, 3 by abdominal ultrasound and 2 by EUS.

Of these 172 subjects, 123 (71.5%) successfully completed follow-up imaging (median age 64.3, 70% female). Within this cohort, 74 (43%) were white and 84 (48.8%) were black; 33 (19.7%) were Hispanic. English speaking and subjects born in the USA accounted for 131 (75.7%) and 101 (58.4%), respectively. Additionally, 137 subjects (79.2%) had a PCP and 106 (61.3%) had been seen in the GI clinic for any reason prior to the incidental PCL finding or within 1 year of discovery. In terms of medical insurance, 61 (35.3%) had federal, 79 (45.7%) state, 29 (16.8%) commercial and 4 (2.3%) had no insurance. In terms of education, 34 (19.7%) completed college, 79 (46%) completed high school and 59 (34.1%) did not complete high school or have formal schooling. Associated cyst characteristics of size, location, pancreatic duct dilation and number of cysts are reported in [table 1](#).

In a univariate model, sex, language, PCP affiliation, follow-up in GI clinic and cyst size were significantly associated with follow-up or lack thereof. Education status, insurance type, ethnicity and race were not statistically significant. Male subjects ($p=0.0207$), subjects without a PCP ($p=0.0276$) or with a PCP not affiliated with our centre ($p=0.0469$) were less likely to complete follow-up. Subjects with a cyst smaller than 1.5 cm ($p=0.0513$) were marginally less likely to complete follow-up. Gastroenterology clinic follow-up was strongly associated with completion of follow-up ($p < 0.0001$). In comparison with English speaking subjects, those that spoke a language other than English or Spanish were more likely to complete follow-up ($p=0.0429$). In the multivariate model including these variables ([table 2](#)), follow-up with GI ($p=0.0019$ and speaking a language other than English

Table 1 Patient and pancreatic cyst characteristics

	Cysts with follow-up (n=123)	Cysts without follow-up (n=49)	All cysts (n=172)
Age, median (range)	64.3, 21.3–91.4	59.1, 27.4–87	62.4, 21.3–91.4
Female, n (%)	86 (70%)	25 (51%)	112 (65%)
Size, median (range), cm	1.4, 0.2–10	1, 0.3–10.6	1.2, 0.2–10.6
Location, n (%)			
Head	30 (24%)	10 (20%)	40 (23%)
Uncinate	14 (11%)	6 (12.2%)	20 (12%)
Neck	3 (2%)	0 (0%)	3 (2%)
Body	28 (23%)	11 (22%)	39 (23%)
Tail	27 (22%)	14 (28%)	41 (24%)
More than one location, n (%)	21 (17%)	8 (16%)	29 (17%)
Pancreatic duct dilation, n (%)	18 (15%)	7 (14%)	25 (14%)
Single (vs multiple) cysts, n (%)	83 (67%)	38 (78%)	122 (71%)

or Spanish ($p=0.0423$ remained significantly associated with completion of follow-up, whereas having no PCP remained significantly associated with loss of follow-up ($p=0.0286$) in comparison with subjects that had a PCP at our medical centre.

DISCUSSION

This study found that the majority (71.5%) of subjects completed the recommended surveillance as indicated in the radiology report. Interestingly, GI clinic follow-up for any reason was the most significant predictor of completed PCL surveillance in our cohort. Although we did not explore whether PCL surveillance was the primary reason for GI clinic follow-up or whether it was

the GI who ordered the surveillance imaging study, this association would suggest that rates of adherence to surveillance can be improved by ensuring patients with PCLs are seen in specialty clinic. Our institution had previously conducted a similar study on follow-up of pulmonary nodules, which culminated in the creation of a ‘Lung Nodule Clinic’ staffed by pulmonologists, nurses and health navigators. Others have demonstrated that a multidisciplinary approach to lung nodule management improves care and adherence to follow-up recommendation.¹¹ As such, optimising the management of incidental PCLs will require further research to assess if detection and management of PCLs can reduce morbidity and/or mortality for patients.

Few studies have explored adherence rates of incidental PCL surveillance, and in particular whether social determinants of health or other demographic factors have an impact.^{8,9} Tabrizian *et al* reported that socioeconomic disparities did not influence surveillance compliance; instead, they found that patients with major comorbidities were less likely to be compliant with follow-up imaging, reasoning that their medical comorbidities took priority over surveillance of an incidental radiographic abnormality.⁹ In comparison to the study population in the work by Tabrizian *et al*. (predominately white, English-speaking males), 65% of our subjects were female, 48.5% were black, 19.6% were Hispanic, 41% were not born in the USA, 24% did not speak English and 34% did not complete high school or have formal schooling. Yet, in our study, we also did not find statistically significant socioeconomic or demographic factors that impacted surveillance rates, other than the somewhat unexpected finding that non-English/non-Spanish language was a predictor of surveillance on multivariate analysis. It is important to highlight that this group was small (18 patients) and very heterogenous (primary languages included Haitian Creole, Portuguese, Chinese and Vietnamese), making it difficult to draw firm

Table 2 Multivariate logistic regression of variables associated with completion of incompleteness of follow-up for pancreatic cyst surveillance

Variable	OR (95% CI)	P value
Sex (male)	0.66 (0.303 to 1.47)	0.301
Language		
English	Reference	
Spanish	1.56 (0.519 to 5.43)	0.448
Other	8.92 (1.59 to 169)	0.042*
Primary care provider		
Academic centre	Reference	
Affiliated	0.55 (0.16 to 2.04)	0.350
Non-affiliated	0.40 (0.16 to 1.03)	0.057
No PCP	0.32 (0.11 to 0.89)	0.028*
Occurrence of GI follow-up	3.26 (1.55 to 6.95)	0.001*
Cyst size (<1.5 cm)	0.45 (0.19 to 1.04)	0.071

* p-values <0.05.

GI, gastroenterologist; PCP, primary care physician.



conclusions on this issue, although it is possible that our hospital's extensive patient education and navigation services could have played a role in ensuring follow-up care for these patients. When comparing our findings to other cancer surveillance practices, the results are mixed. A study from the National Cancer Screening Program in South Korea found that adherence rates to follow-up after a positive faecal occult blood test were associated with being a younger male of high socioeconomic status.¹² For cervical cancer screening, it has been reported that English fluency and number of years in the USA were positively associated with adherence rates.¹³ Thus, it is critical for clinicians to recognise these differences, for which interventions may help reduce health-care disparities.

In a study with a similar aim as ours, Schenck *et al* studied surveillance adherence rates over a 2-year period at a tertiary care centre and found that over 50% of subjects received no follow-up.⁸ Their study identified the following four predictors of PCL surveillance: (1) the radiology report mentioned a cyst and (2) recommended follow-up in the conclusion of the report, (3) presence of main pancreatic duct dilation and (4) absence of multiple cysts.⁸ This study limited their cohort to subjects that lived in one of four zip codes near the hospital and had at least two outpatient clinical encounters after detection of the PCL—criteria which should have served to enhance the likelihood of follow-up. In our univariate analysis, not having a PCP affiliated with our centre was associated with a lower likelihood of surveillance. A possible explanation could be that the PCPs for these subjects were less likely to receive the radiology report or recommendations for PCL surveillance. Ensuring that PCPs are alerted to the detection of a PCL via closed-loop communication may be a way to improve surveillance rates. This finding needs to be validated in additional cohorts and/or prospectively because it highlights a potential area for quality improvement and clinical intervention to improve surveillance rates.

Last, in terms of cyst characteristics, our analysis showed that patients with cysts smaller than 1.5 cm were marginally less likely to complete follow-up, although this did not achieve statistical significance. While size <1.5 cm is considered a lower risk category, malignant transformation can still occur, so surveillance is still recommended in order to document stability over time and exclude the development of worrisome or high-risk features such as enhancing nodules or main pancreatic duct dilation. In contrast to our findings, Schenck *et al* found that pancreatic duct dilation and the absence of multiple cysts were predictors for higher rates of surveillance, while size and location were not.⁸ Taken together, our studies would indicate that patients with multiple, small (<1.5 cm) cysts without pancreatic duct dilation are at increased risk for loss of follow-up and may benefit from intervention to ensure surveillance is completed.

There are a few limitations of our study to highlight. First, the duration of the study occurred over an 8-year

period in which surveillance and management guidelines were updated more than once.^{14514–16} We are unable to say with certainty if evolving guidelines influenced radiology recommendations at time of diagnosis. Second, we do not know if patients received follow-up elsewhere. This could have influenced subjects who had a non-affiliated PCP, where follow-up scans may have not been available in our database. Third, the strong association with GI follow-up may be confounded by a patient-intrinsic quality that we are unable to capture. One could posit that patients who attend GI appointments and follow-up with clinical recommendations (ie, imaging surveillance) have higher rates of adherence than patients who are lost to follow-up. Plus, we were unable to ascertain which patients were not referred to GI. Finally, this study was retrospective and conducted at a single institution where our results may not be applicable to other practice and regional settings.

In conclusion, we found that follow-up of an incidentally discovered PCLs was completed in the majority of our patients. Access to primary care and utilisation of subspecialty GI care were associated with completion of follow-up for PCLs and represent potential areas of intervention to improve surveillance rates. Further studies are needed to validate these findings as well as further explore other potential factors that impact surveillance rates.

Contributors AC: conception and design; data collection; analysis and interpretation of the data; drafting of the article; critical revision of the article for important intellectual content; final approval of the article. AM: analysis and interpretation of the data; drafting of the article; final approval of the article. JT: conception and design; final approval of the article. CH: conception and design; analysis and interpretation of the data; drafting of the article; critical revision of the article for important intellectual content; final approval of the article.

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