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A cost analysis of a pancreatic cancer screening protocol in high-risk populations

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Abstract

BACKGROUND: Pancreatic cancer is the 4th leading cause of cancer death in the United States. A screening protocol is needed to catch early-stage, resectable disease. This study suggests a protocol for high-risk individuals and assesses the cost in the context of the Affordable Care Act.

METHODS: Medicare and national average pricing were used for cost analysis of a protocol using magnetic resonance imaging/MRCP biannually in high-risk groups.

RESULTS: Costs per year of life added" based on Medicare and national average costs, respectively, are as follows: $638.62 and $2,542.37 for Peutz–Jeghers syndrome, $945.33 and $3,763.44 for hereditary pancreatitis, $1,141.77 and $4,545.45 for familial pancreatic cancer and "p16-Leiden" mutations, and $356.42 and $1,418.92 for new-onset diabetes over age 50 with weight loss or smoking.

CONCLUSIONS: A screening program using magnetic resonance imaging/MRCP is affordable in high-risk populations. The United States Preventive Services Task Force must re-evaluate its pancreatic cancer screening guidelines to make screening more cost-effective for the individual.
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Pancreatic cancer (PC) was the 10th most common cancer in the United States in 2013 but the 4th leading cause of cancer death.[1] It maintains a dismal prognosis, owing to a lack of effective treatment and a usual late stage at diagnosis. A screening program for asymptomatic high-risk individuals (HRI) is needed to detect early-stage PC or precursor lesions, such as intraductal papillary mucinous neoplasms (IPMN) and pancreatic intraepithelial neoplasias (PanIN). Cost estimates of such a screening protocol can be calculated, based on current average pricing for screening modalities.

Current United States Preventive Services Task Force (USPSTF) guidelines give asymptomatic screening for PC a D rating.[2] Under the Affordable Care Act (ACA), this leaves the patient with the expense, making compliance much less likely.[3] A screening protocol must be adopted for those at high risk for PC, and USPSTF guidelines must be updated to reflect these advancements.

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Methods

Literature search

A literature search was conducted using PubMed via EndNote with the search terms "pancreatic cancer," "screening," "MRI," "magnetic resonance imaging," "MRCP," "cost," "cancer," "Affordable Care Act," "US Preventive Services," "policy," "prevention," and "preventive services."

Studies regarding imaging were restricted to English language, human studies, and published dates from 2006 to 2013 to include only recent data (n = 43). They were further restricted to those that focused on screening HRI for PC using presumed validated methods (n = 15). Studies were required to have greater than 20 subjects, to maintain large sample size, and subjects had to be asymptomatic for PC. This is because PC symptoms usually do not appear until unresectable stages of disease. Additionally, because the aim of this article is to recommend the efficacy of MRI/MRCP and not present a systematic review of all imaging techniques, only studies that employed MRI/MRCP as a screening method were retained (n = 12). After removal of overlaps, 6 studies remained. Three used MRI in conjunction with other screening modalities, but only 2 provided the results of each modality, separately. This yielded 5 studies with data relating to efficacy of MRI/MRCP, alone. Eight reviews were kept for reference.

Articles pertaining to cost were restricted to English language, human studies, and published dates from 2006 to 2013 (n = 22) and were further restricted to only those that centrally focused on the cost of screening for PC (n = 4). Articles regarding the ACA were restricted to English language, human studies, with published dates from 2010 to 2013, as the ACA was passed in 2010 (n = 27). They were further restricted to articles that focused on PC specifically, or cancer in general, leaving 13 articles.

Creation of screening protocol

Based on a recently conducted risk analysis, a screening protocol was developed for individuals with the greatest known risk for developing PC, including those with genetic risk factors (5% to 10% of PC sufferers) and those with idiopathic risk factors (90% to 95% of PC sufferers).[4] Genetic risk factors that confer the greatest risk for PC include familial pancreatic cancer (FPC) (>2 first-degree relatives with PC), Peutz–Jeghers syndrome (PJS), hereditary pancreatitis (HP), and "p16-Leiden" mutations. The greatest risk factor for idiopathic PC is new-onset diabetes over the age of 50 with weight loss or smoking history (Table 1).

Screening age in FPC kindreds was chosen to be age 50, at the latest, or 10 years younger than the earliest PC diagnosis in an affected blood relative.[5] Screening ages for the other risk factors were chosen as approximately 10 years younger than reported mean ages of diagnosis.[6–10] Screening in the diabetic high-risk group was chosen to begin at the time of diabetes diagnosis and terminate after 3 years, as findings indicate that PC-associated diabetes precedes PC diagnosis by 36 months or fewer.[4,11,12]

MRI/MRCP was chosen as the best imaging modality based on the reviewed literature. Screening frequency was chosen to be 6 months, with follow-up MRI/MRCP and Ca19-9 performed within 3 months of abnormal findings. These parameters were chosen because of the aggressive nature of the disease.[13]

Cost data collection

Pricing data for imaging techniques were obtained from the "Medicare Physician Fee Schedule" search tool, located in the Centers for Medicare and Medicaid Services website, and included both the professional and technical fees.[14] Additional data were obtained from Norton Healthcare Billing Services in Louisville, KY, and the medical cost comparison website "New Choice Health," which averages pricing data across the United States but does not specify the details of what is included in those prices.[15] Pricing data for anesthesia fees came from Norton Healthcare Anesthesia Billing Services.

Population and pancreatic cancer statistics

Life expectancy information was taken from the CDC's most recent available data.[16] PC statistics were taken from

Table 1 Screening protocol parameters based on risk factor

Risk factor	Increased risk	Mean age at PC dx	Age at which screening should begin	Total years of screening
Peutz–Jeghers syndrome	132x	40.8	30	20
Hereditary pancreatitis	87x	54.2	45	20
p16-Leiden mutation	48x	59	50	20
Familial PC (>2 first-degree relatives with PC)	32x	NA	50, or 10 years before youngest PC dx in blood relative	20
New-onset diabetes greater than age 50, with hx of weight loss or smoking	8x	71*	Time of diabetes dx	3

dx = diagnosis; hx = history; PC = pancreatic cancer; SEER = Surveillance Epidemiology and End Results.
*SEER median age of PC diagnosis in general population.

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