Cancer Screening and Prevention 2026 vol. **000(000)** | 000–000 Epub
DOI: 10.14218/CSP.2026.00004

Consensus

Chinese Consensus on Early Screening and Surveillance for Pancreatic Cancer in High-risk Individuals (2026 Revision, Nanjing)

Pancreatic Disease Collaborative Group, Chinese Society of Digestive Endoscopy

The names and affiliations of the members of the writing group and expert panel are listed at the end of the article

Received: February 02, 2026 | **Revised:** March 30, 2026 | **Accepted:** April 29, 2026 | **Published online:** May 27, 2026

Abstract

Pancreatic cancer remains a highly lethal malignancy owing to the difficulty of early detection. In 2021, the Chinese Consensus on Early Screening and Surveillance for Pancreatic Cancer in High-risk Individuals was first established. However, the evidence landscape has evolved rapidly, necessitating an updated, evidence-based framework tailored to the Chinese healthcare context. This revised consensus aims to standardize the early screening and surveillance process for high-risk populations in China. A multidisciplinary expert panel comprising 53 specialists from 17 provincial-level regions systematically reviewed the literature using the GRADE (Grading of Recommendations Assessment, Development and Evaluation) methodology. A modified Delphi process was employed, with consensus predefined as ≥75% agreement. The panel formulated 26 evidence-based recommendations covering screening objectives, the definition of high-risk populations (hereditary susceptibility, new-onset diabetes, chronic pancreatitis, and pancreatic cystic neoplasms), age at screening initiation, surveillance intervals, imaging modalities (magnetic resonance imaging/magnetic resonance cholangiopancreatography, endoscopic ultrasound, computed tomography), surgical indications, and lifestyle modifications. Of these recommendations, 14 are strong and 12 are weak, supported by evidence levels ranging from A to D. Implementation of this consensus in clinical practice will help improve the early diagnosis of stage I pancreatic cancer and high-grade precursor lesions, thereby advancing standardized multidisciplinary care and ultimately improving patient outcomes in China.

Introduction

Pancreatic cancer is a highly malignant digestive tumor with a five-year survival rate of approximately 13%.[1] According to statistics from the National Cancer Center, pancreatic cancer ranks 8th in tumor incidence and 6th in mortality in China,[2] mainly due to the difficulty of early diagnosis. Notably, the evolution from pancreatic intraepithelial neoplasia (PanIN) to invasive carcinoma spans approximately 21 years, offering a critical window of opportunity for early detection and intervention.[3] This extended premalignant phase underscores the potential of screening to improve outcomes by identifying curable precursor lesions or early-stage disease.

Despite this opportunity, the rate of early diagnosis of pancreatic cancer in China remains considerably lower than that in developed countries, and systematic surveillance programs for high-risk populations have not yet been widely implemented.[4] In addition to the recognized benefits of early detection, a growing body of evidence has highlighted the potential harms associated with screening, including overdiagnosis, procedural risks, the psychological burden of long-term surveillance, and the risk of overtreatment.[5] These considerations underscore the importance of a balanced approach that weighs benefits against potential harms and accounts for real-world feasibility.

In 2021, the Chinese Consensus on Early Screening and Surveillance for Pancreatic Cancer in High-risk Individuals was established to provide initial guidance for clinical practice in China.[6] Given the emergence of new evidence in recent years, there is a clear need to update and refine these recommendations. This revised consensus aims to integrate the latest evidence with practical considerations regarding feasibility, resource allocation, and patient-centered care, offering a more comprehensive framework

Keywords: Pancreatic cancer; High-grade pancreatic intraepithelial neoplasia; Early diagnosis; Hereditary pancreatic cancer; New-onset diabetes; Chronic pancreatitis; Pancreatic cystic neoplasm; Screening.

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How to cite this article: Pancreatic Disease Collaborative Group, Chinese Society of Digestive Endoscopy. Chinese Consensus on Early Screening and Surveillance for Pancreatic Cancer in High-risk Individuals (2026 Revision, Nanjing). *Cancer Screen Prev* 2026;000(000):000–000. doi: 10.14218/CSP.2026.00004.

Table 1. Levels of evidence strength

Evidence strength	Definition	Research type
Strong (A)	The true effect is similar to the estimated effect	RCT; observational study upgraded by 2 levels
Moderate (B)	The true effect is likely close to the estimated effect	RCT downgraded by 1 level; observational study upgraded by 1 level
Weak (C)	The true effect may be substantially different from the estimated effect	RCT downgraded by 2 levels; observational study
Very weak (D)	The true effect is likely substantially different from the estimated effect	RCT downgraded by 3 levels; observational study downgraded by 1 level; case series and case reports

Factors for upgrading evidence quality: large effect size; potential confounding factors that would reduce the treatment effect; dose–response relationship. Factors for downgrading evidence quality: study limitations; inconsistency of results; indirectness of evidence; imprecision; publication bias. RCT, randomized controlled trial.

for early screening and surveillance in high-risk populations.

Methods

Overview and rationale

To address the unmet need for standardized guidance on early pancreatic cancer screening in China, the Pancreatic Disease Collaborative Group of the Chinese Society of Digestive Endoscopy convened a multidisciplinary panel of national experts. This consensus was developed following a systematic review of the available evidence and a modified Delphi process.

Panel composition and conflict of interest management

The expert panel comprised 53 specialists in pancreatic disease diagnosis and treatment, representing 17 provincial-level administrative regions across China. The panel included gastroenterologists (n = 45), pancreatic surgeons (n = 6), radiologists (n = 1), and pathologists (n = 1), ensuring broad multidisciplinary input. Prior to participation, all experts completed a standardized disclosure form declaring any potential conflicts of interest (financial or professional) related to the consensus topic. No expert reported a significant conflict requiring recusal from voting, and all disclosures were reviewed by the steering committee. The funding source had no role in the design, conduct, data collection, analysis, or interpretation of this consensus, nor in the writing of the report or the decision to submit the findings for publication.

Evidence identification and appraisal

A systematic literature search was conducted using PubMed, EMBASE, the China National Knowledge Infrastructure, and the China Science Periodical Database. The search strategy combined terms related to pancreatic ductal adenocarcinoma (PDAC), early diagnosis, new-onset diabetes, chronic pancreatitis, cystic pancreatic tumors, familial pancreatic cancer, screening, biomarkers, and risk stratification. Inclusion criteria were as follows: (1) studies involving human subjects; (2) publications in English or Chinese; and (3) original research articles (randomized controlled trials, cohort studies, case-control studies, or systematic reviews/meta-analyses). Conference abstracts and opinion pieces were excluded. Two independent reviewers screened titles and abstracts, with disagreements resolved by consensus or by a third reviewer. Full-text articles were assessed for eligibility, and data were extracted using a standardized form. The quality of evidence for each critical outcome was appraised using the GRADE (Grading of Recommendations Assessment, Development and Evaluation) framework, resulting in four certainty levels: high (A), moderate (B), low (C), and very low (D) (Table 1).

Consensus development

A modified Delphi method was employed to achieve consensus on the recommendations. The process comprised the following steps:

- *Draft preparation:* Based on the evidence summary, a writing group from the Department of Gastroenterology at Nanjing Drum Tower Hospital prepared an initial draft of the recommendations and a summary of the supporting literature.
- *First voting round:* An online questionnaire was distributed to all 53 panel members. For each statement, experts were asked: (1) "Is the statement clearly formulated?" (Yes/No); and (2) "Do you agree with the statement?" (Strongly Agree, Agree, Uncertain, Disagree, Strongly Disagree). Experts could abstain from voting on any statement with which they felt unfamiliar. Statements for which >5% of respondents considered the formulation unclear were revised by the writing group.
- *Second voting round:* The revised draft, along with anonymized results from the first round, was circulated to all panel members for a second vote. A total of 27 experts participated in the second round.
- *Definition of consensus:* Consensus was defined a priori as ≥75% agreement (either Strongly Agree + Agree ≥75%, or Strongly Disagree + Disagree ≥75%) among voting members. Statements not reaching this threshold after the second round were either revised based on qualitative feedback or excluded.

Formulation of recommendations

In formulating the final recommendations, the panel considered not only the certainty of the evidence (GRADE) but also the balance between benefits and harms, the burden of interventions on patients, the diversity of patient values and preferences, the costs and rational use of healthcare resources, and the equity and feasibility of implementation in the Chinese healthcare context. Each recommendation was rated as either "strong" or "weak" based on the GRADE framework.[7] A strong recommendation indicates that most informed patients would choose the recommended course of action and that the recommendation can be adopted as policy in most circumstances (Table 2). Table 3 summarizes all recommendations along with their evidence strength and recommendation strength.

Results

Goals of early screening for pancreatic cancer

Recommendation 1: The detection of stage I pancreatic cancer and high-grade PanIN is the goal of early pancreatic

Table 2. Levels of recommendation strength

Recommendation strength	Definition
Strong	The intervention clearly demonstrates that benefits outweigh harms or harms outweigh benefits
Weak	The balance between benefits and harms is uncertain or equivalent

cancer screening. (Evidence strength: A; Recommendation strength: Strong recommendation)

Stage I pancreatic cancer is defined as disease confined to the pancreas, with a maximum tumor diameter ≤4 cm and no evidence of lymph node or distant metastasis. These tumors are considered resectable, and radical resection followed by adjuvant chemotherapy has been shown to significantly improve overall survival.[8] Prospective cohort studies have demonstrated that the majority of pancreatic cancers detected through surveillance of high-risk individuals are resectable at diagnosis.[9–11] These findings underscore early screening as a key strategy to enhance both survival and cure rates for pancreatic cancer.[12]

PanIN represents a well-established precursor lesion of pancreatic cancer.[13] Most cases of PDAC, whether sporadic or hereditary, are thought to arise from PanIN lesions.[14] The pathogenesis typically involves acinar-to-ductal metaplasia (ADM) driven by genetic and environmental factors, progressing through PanIN to invasive carcinoma—a central sequence in pancreatic carcinogenesis, although an alternative pathway of direct ductal cell origin has also been proposed.[15,16] Under the current binary classification, PanIN is categorized as low-grade or high-grade based on histological progression.[17] Low-grade PanIN carries minimal malignant potential,[16] whereas high-grade PanIN is an irreversible precancerous lesion frequently associated with invasive cancer and is therefore a key target for early detection.[15] Based on the current evidence, this consensus identifies both stage I pancreatic cancer and high-grade PanIN as the primary targets for early screening, as they represent curable stages and critical intervention points to improve patient outcomes.

Target groups for early screening of pancreatic cancer

Recommendation 2: Do not screen asymptomatic non-high-risk individuals for pancreatic cancer. (Evidence strength: C; Recommendation strength: Weak recommendation)
Recommendation 3: Early screening for pancreatic cancer is recommended in the following high-risk populations: individuals at high risk for hereditary pancreatic cancer, patients with new-onset diabetes, patients with chronic pancreatitis, and individuals with pancreatic cystic neoplasms. (Evidence strength: B; Recommendation strength: Strong recommendation)

The incidence of pancreatic cancer is not high in China, with an annual incidence of approximately 8.41/100,000.[4] There are currently no reports on the benefits of pancreatic cancer screening in the general population. Early pancreatic cancer screening may increase the psychological burden on screened populations.[18] Therefore, based on cost-effectiveness considerations, pancreatic cancer screening is not recommended for asymptomatic, non-high-risk individuals.

Several well-established risk factors are associated with an increased risk of pancreatic cancer, including hereditary susceptibility,[19] new-onset diabetes mellitus,[20,21] chronic pancreatitis,[22,23] and pancreatic cystic neoplasms.[24–26] For individuals presenting with these factors, the risk of developing pancreatic cancer is substantially higher than that of the general population, underscoring the particular importance of early screening in this context. Screening targeted at these four high-risk populations has been shown to improve detection rates while also reducing overall screening costs and enhancing societal benefits.[27]

Individuals at high risk for hereditary pancreatic cancer

Recommendation 4: Early screening for pancreatic cancer is recommended for individuals with a family history of pancreatic cancer, defined as having at least two first-degree relatives affected by pancreatic cancer. (Evidence strength: B; Recommendation strength: Strong recommendation)
Recommendation 5: Early screening for pancreatic cancer is recommended for all patients with Peutz–Jeghers syndrome (germline *STK11* pathogenic variant carriers) and all germline *CDKN2A* pathogenic variant carriers, irrespective of family history of pancreatic cancer. (Evidence strength: A; Recommendation strength: Strong recommendation)
Recommendation 6: Early screening for pancreatic cancer is recommended for pathogenic variant carriers of *BRCA1, BRCA2, PALB2, ATM, MLH1, MSH2, MSH6,* or *APC* who have at least one first-degree relative affected by pancreatic cancer. (Evidence strength: B; Recommendation strength: Strong recommendation)

Individuals at high risk for hereditary pancreatic cancer are defined as those with a family history of pancreatic cancer or those who have been confirmed to carry germline pathogenic variants in pancreatic cancer susceptibility genes (hereinafter referred to as mutation carriers).[10] A family history is typically defined as having at least two first-degree relatives affected by pancreatic cancer.[28] Data from familial pancreatic cancer registries indicate that risk increases with the number of affected relatives, the closeness of genetic relatedness, and the earlier age of onset among affected family members.[28,29] Compared with the general population, individuals with one affected first-degree relative have a 4- to 6-fold increased risk, and those with three or more affected first-degree relatives face a 17- to 32-fold increased risk.[30,31] Given this substantially increased and lifelong risk, early screening is recommended for individuals with a family history of pancreatic cancer.

Several genetic syndromes have also been linked to an increased risk of pancreatic cancer. Patients with Peutz–Jeghers syndrome (*STK11* gene mutation carriers) have a 132-fold increased risk of developing pancreatic cancer compared with the general population, with a mean age at onset of 40.8 years.[32] Germline *CDKN2A* pathogenic variant carriers face a 13- to 39-fold increased risk.[33,34] Long-term follow-up of high-risk individuals has confirmed a higher detection rate of pancreatic cancer among carriers of these high-risk gene mutations.[10] Therefore, this consensus recommends

Table 3. Consolidated table of all recommendations

	Recommendations	Evidence strength	Recommendation strength
Recommendation 1	The detection of stage I pancreatic cancer and high-grade PanIN is the goal of early pancreatic cancer screening	A	Strong recommendation
Recommendation 2	Do not screen asymptomatic non-high-risk individuals for pancreatic cancer	C	Weak recommendation
Recommendation 3	Early screening for pancreatic cancer is recommended in the following high-risk populations: individuals at high risk for hereditary pancreatic cancer, patients with new-onset diabetes, patients with chronic pancreatitis, and individuals with pancreatic cystic neoplasms	B	Strong recommendation
Recommendation 4	Early screening for pancreatic cancer is recommended for individuals with a family history of pancreatic cancer, defined as having at least two first-degree relatives affected by pancreatic cancer	B	Strong recommendation
Recommendation 5	Early screening for pancreatic cancer is recommended for all patients with Peutz–Jeghers syndrome (germline *STK11* pathogenic variant carriers) and all germline *CDKN2A* pathogenic variant carriers, irrespective of family history of pancreatic cancer	A	Strong recommendation
Recommendation 6	Early screening for pancreatic cancer is recommended for pathogenic variant carriers in *BRCA1, BRCA2, PALB2, ATM, MLH1, MSH2, MSH6,* or *APC* who have at least one first-degree relative affected by pancreatic cancer	B	Strong recommendation
Recommendation 7	Early screening for pancreatic cancer is recommended in patients with new-onset diabetes who are over 50 years of age and present with a BMI below 25 kg/m^2 and/or unexplained weight loss exceeding 3.6 kg within 2 years	B	Weak recommendation
Recommendation 8	Early screening for pancreatic cancer is recommended in individuals with new-onset diabetes who are at high risk for hereditary pancreatic cancer, irrespective of age	C	Weak recommendation
Recommendation 9	Early screening for pancreatic cancer is recommended for patients with hereditary chronic pancreatitis who carry *PRSS1* mutations. It is not recommended for those with hereditary chronic pancreatitis due to other genetic mutations or for patients with sporadic chronic pancreatitis	C	Weak recommendation
Recommendation 10	For patients with chronic pancreatitis of unknown etiology, gene mutation testing, especially *PRSS1* mutation testing, is recommended	C	Weak recommendation
Recommendation 11	Patients with BD-IPMN should undergo pancreatic cancer screening upon diagnosis. Patients with MCN, SPN, cNET, MD-IPMN, or MT-IPMN should be referred for MDT discussion and considered for elective surgical resection	C	Weak recommendation
Recommendation 12	For individuals with a family history of pancreatic cancer, screening should begin at age 50 or 10 years younger than the age of diagnosis of the youngest affected first-degree relative, whichever is earlier. For those with Peutz-Jeghers syndrome, screening is recommended to start at age 35. *CDKN2A* mutation carriers should begin screening at age 40. For carriers of pathogenic variants in *BRCA1, BRCA2, PALB2, ATM, MLH1, MSH2, MSH6,* or *APC*, the recommended starting age is 50, or 10 years earlier than the youngest affected first-degree relative, whichever comes first	B	Strong recommendation
Recommendation 13	For patients with new-onset diabetes who meet the criteria for monitoring, enrollment in a surveillance program is recommended immediately following diagnosis	C	Weak recommendation
Recommendation 14	For patients with chronic pancreatitis who meet the criteria for monitoring, screening for pancreatic cancer should begin at age 40	C	Weak recommendation
Recommendation 15	For BD-IPMN, early screening for pancreatic cancer should be initiated immediately following diagnosis, irrespective of age at diagnosis	C	Weak recommendation

(continued)

Table 3. *(continued)*

	Recommendations	Evidence strength	Recommendation strength
Recommendation 16	For high-risk individuals (hereditary risk, new-onset diabetes, or chronic pancreatitis) undergoing surveillance, the monitoring interval is 12 months in the absence of pancreatic abnormalities, and 3–6 months if worrisome features are present (solid lesion <10 mm, uncertain lesion size, main pancreatic duct dilation 5–9 mm, or dilation ≥6 mm without an obvious solid lesion)	C	Weak recommendation
Recommendation 17	For patients with BD-IPMN without worrisome features, surveillance intervals are determined by cyst size: 12 months for cysts <2 cm and 6 months for cysts 2–3 cm. If worrisome features develop, including new-onset diabetes, recurrent IPMN-related pancreatitis, cyst ≥3 cm, enhancing mural nodules <5 mm, thickened cyst walls, main pancreatic duct 5–9.9 mm, duct changes with distal atrophy, elevated CA19-9, rapid growth (>5 mm/2 years), or lymphadenopathy, the interval should be shortened to 3–6 months. These features constitute relative indications for surgery, which may be undertaken after multidisciplinary discussion and consideration of patient preferences	B	Strong recommendation
Recommendation 18	For postoperative patients, annual surveillance is recommended if no residual lesion remains. For those with low-grade dysplasia at surgical margins, CA19-9 testing and imaging should be performed at least twice yearly	B	Strong recommendation
Recommendation 19	For initial screening, the combined use of fasting blood glucose and/or HbA1c, serum CA19-9, and MRI/MRCP, EUS, or CT is recommended	C	Weak recommendation
Recommendation 20	During follow-up, regular monitoring of fasting blood glucose and/or HbA1c, and serum CA19-9 is recommended, along with the alternating use of MRI/MRCP, EUS, or CT. Pancreatoscopy is recommended for all IPMN patients with evidence of MPD involvement	C	Weak recommendation
Recommendation 21	During follow-up monitoring, if a solid pancreatic lesion, a pancreatic cystic tumor with worrisome features or high-risk stigmata, or asymptomatic main pancreatic duct stenosis (with or without a mass) is detected, EUS-FNA is recommended	B	Strong recommendation
Recommendation 22	For patients in whom EUS-FNA pathology results are malignant or suspicious for malignancy, scheduled surgical resection is strongly recommended after MDT discussion	A	Strong recommendation
Recommendation 23	For patients with a solid lesion >10 mm in diameter or main pancreatic duct narrowing or dilation ≥10 mm whose lesion nature cannot be definitively determined by EUS-FNA, MDT discussion and surgical exploration are recommended to clarify the diagnosis, with resection performed if indicated	B	Strong recommendation
Recommendation 24	For patients with BD-IPMN with high-risk stigmata, including a solid lesion, tumor-related obstructive jaundice, enhancing mural nodules ≥5 mm, or a main pancreatic duct ≥10 mm, surgical resection is recommended following MDT discussion	B	Strong recommendation
Recommendation 25	Patients are advised to quit smoking and drinking, maintain a balanced and healthy diet, engage in moderate physical exercise, and avoid obesity	B	Strong recommendation
Recommendation 26	Pancreatic cancer monitoring for the four high-risk populations that meet the screening criteria should be conducted at pancreatic specialty centers	C	Strong recommendation

BD, branch duct; BMI, body mass index; cNET, cystic neuroendocrine tumor; CT, computed tomography; EUS, endoscopic ultrasound; FNA, fine-needle aspiration; IPMN, intraductal papillary mucinous neoplasm; MCN, mucinous cystic neoplasm; MD, main duct; MDT, multidisciplinary team; MPD, main pancreatic duct; MRCP, magnetic resonance cholangiopancreatography; MRI, magnetic resonance imaging; MT, mixed type; SPN, solid pseudopapillary neoplasm.

Table 4. Risk of pancreatic cancer for carriers of specific gene mutations

Gene mutations	Representative diseases	Risk of pancreatic cancer
STK11	Peutz-Jeghers syndrome	RR = 132 (95% CI, 44–261)[32]
CDKN2A	Familial atypical multiple mole melanoma syndrome	RR = 13–39[33,34]
BRCA1, BRCA2	Hereditary breast and ovarian cancer syndrome	RR = 2–9[38,40]
PALB2	Fanconi anemia	RR = 2.37 (95% CI, 1.24- 4.50)[39]
ATM	Ataxia-telangiectasia	RR = 6.5 (95% CI, 4.5–9.5)[41]
MLH1, MSH2, MSH6	Lynch syndrome	HR = 8.6 (95% CI, 4.7- 15.7)[36]
APC	Familial adenomatous polyposis	RR = 4.46 (95% CI, 1.2–11.4)[42]

CI, confidence interval; HR, hazard ratio; RR, relative risk.

early screening for pancreatic cancer for all patients with Peutz–Jeghers syndrome and *CDKN2A* pathogenic variant carriers, regardless of family history.

Clinical studies have evaluated the pancreatic cancer risk associated with other susceptibility genes, including *BRCA1*, *BRCA2*, *PALB2*, *ATM*, *MLH1*, *MSH2*, *MSH6*, and *TP53* (Table 4).[32–42] The magnitude of risk varies across genes: *BRCA1/2* and *PALB2* carriers have a 2- to 9-fold increased risk;[38–40] *ATM* carriers have a 6.5-fold increased risk[41]; mismatch repair gene (*MLH1*, *MSH2*, *MSH6*) carriers face an 8.6- to 11-fold increased risk; and *APC* carriers have a more than 5-fold increased risk.[42] Of note, a recent large-scale Chinese cohort study reported that 9.3% of unselected pancreatic cancer patients carried germline pathogenic variants, with 5.2% harboring variants with therapeutic implications, predominantly in homologous recombination genes including BRCA1/2, PALB2, and ATM.[43] Family history remains an important modifier of risk among carriers of these susceptibility genes.[44] For *BRCA1/2* specifically, a meta-analysis reported that first-degree relatives of mutation carriers have a 2.26- to 10-fold increased risk of pancreatic cancer.[44] Accordingly, this consensus recommends early screening for pancreatic cancer in pathogenic variant carriers of *BRCA1, BRCA2, PALB2, ATM, MLH1, MSH2, MSH6,* or *APC* who have at least one affected first-degree relative.

New-onset diabetes

Recommendation 7: Early screening for pancreatic cancer is recommended in patients with new-onset diabetes who are over 50 years of age and present with a BMI below 25 kg/m^2 and/or unexplained weight loss exceeding 3.6 kg within 2 years. (Evidence strength: B; Recommendation strength: Weak recommendation)

Recommendation 8: Early screening for pancreatic cancer is recommended in individuals with new-onset diabetes who are at high risk for hereditary pancreatic cancer, irrespective of age. (Evidence strength: C; Recommendation strength: Weak recommendation)

A growing body of evidence indicates that new-onset diabetes can serve as an early clinical manifestation of occult pancreatic cancer. Currently, there is no universally accepted definition for new-onset diabetes in the context of pancreatic cancer screening. Based on the available evidence,[20,45,46] new-onset diabetes may be defined as meeting the following criteria: (1) recent attainment of diabetes diagnostic criteria (a single HbA1c measurement ≥6.5% or fasting plasma glucose ≥7.0 mmol/L [126 mg/dL]); (2) at least one glycemic measurement within the preceding two years that did not meet the diagnostic threshold for diabetes; and (3) no prior clinical diagnosis of or treatment for diabetes. A prospective observational study, which monitored the electronic health records of 18,838 patients with glycemically defined new-onset diabetes, found a high 3-year cumulative incidence of pancreatic cancer (0.62% after race adjustment), with new-onset diabetes diagnosis preceding clinical confirmation by an average of 8 months.[47] Notably, delays in identifying new-onset diabetes can significantly underestimate pancreatic cancer risk, and a six-month delay in diagnosis is sufficient to introduce bias into risk assessment.[47,48]

While screening all patients with new-onset diabetes for pancreatic cancer is limited by low absolute risk and unfavorable cost-effectiveness, accumulating evidence supports the use of additional risk factors to enrich screening populations. Patients aged over 50 years with new-onset diabetes are considered to be at high risk for sporadic pancreatic cancer,[49] with approximately 0.85% diagnosed within three years, which is a risk 6- to 10-fold higher than that in the general population.[21] In addition, declining BMI and/or unexplained weight loss further stratify risk, as they often signal underlying cachexia or metabolic disturbance induced by occult pancreatic cancer.[20,50] A large population-based study demonstrated that among individuals with new-onset diabetes, unintentional weight loss exceeding 3.6 kg within 2 years was associated with a markedly increased risk of pancreatic cancer (HR = 6.75), with the risk being particularly pronounced in those with a pre-weight-loss BMI below 25 kg/m^2.[51] Several risk prediction models have been developed and validated to enhance the detection of pancreatic cancer in individuals with new-onset diabetes. The Enriching New-Onset Diabetes for Pancreatic Cancer (END-PAC) model, which integrates age, changes in body weight, and glycemic trajectory at the time of diabetes diagnosis, has emerged as a valuable tool for identifying new-onset diabetes patients at increased risk of underlying pancreatic cancer.[52,53] Using an END-PAC score ≥3 as the threshold for high risk, the model demonstrates a pooled sensitivity of 55.8% and specificity of 82.0% for predicting pancreatic cancer within three years of new-onset diabetes diagnosis.[52] External validation in diverse populations has confirmed its clinical utility, though performance may vary across racial and ethnic groups.[53] A large population-based cohort study from Hong Kong incorporating a broader set of clinical variables—including history of acute pancreatitis, medication use, and laboratory parameters such as alkaline phosphatase and estimated glomerular filtration rate—demonstrated high predictive accuracy, with an AUC of 0.90 for 1-year risk and 0.81 for 3-year risk.[54] Collectively, these evolving risk stratification strategies represent a broader paradigm shift toward multidimensional approaches aimed at improving the ef-

ficiency and accuracy of early pancreatic cancer detection in the new-onset diabetes population.

A prospective study following individuals at high risk for hereditary pancreatic cancer who were screened for pancreatic cancer found that 20% of these screened high-risk individuals had abnormal fasting glucose, and one patient was diagnosed with new-onset diabetes.[55] If a patient has a family history of pancreatic cancer, a history of diabetes, and a history of smoking, the risk of developing pancreatic cancer is more than 10 times that of the general population.[56] Therefore, this consensus recommends that patients with new-onset diabetes among individuals at high risk for hereditary pancreatic cancer should undergo early screening for pancreatic cancer.

Chronic pancreatitis

Recommendation 9: Early screening for pancreatic cancer is recommended for patients with hereditary chronic pancreatitis who carry *PRSS1* mutations. It is not recommended for those with hereditary chronic pancreatitis caused by other genetic mutations or for patients with sporadic chronic pancreatitis. (Evidence strength: C; Recommendation strength: Weak recommendation)

Recommendation 10: For patients with chronic pancreatitis of unknown etiology, genetic mutation testing, especially *PRSS1* mutation testing, is recommended. (Evidence strength: C; Recommendation strength: Weak recommendation)

Chronic pancreatitis is an inflammatory process in which the pancreatic parenchyma is gradually replaced by fibrous tissue, causing irreversible changes in pancreatic function and morphology.[57] For patients with chronic pancreatitis, the risk of developing pancreatic cancer is approximately seven times that of unaffected individuals.[58,59] A multicenter retrospective study initiated by the Chinese Chronic Pancreatitis Research Group found that the prevalence of chronic pancreatitis increased year by year from 1996 to 2003, rising from 3.08 to 13.52 per 100,000 population,[60] which is consistent with trends observed in Western countries.[57] Patients with chronic pancreatitis in China are mainly idiopathic (76.6%), followed by alcoholic (18.8%), abnormal pancreatic duct anatomy (2.9%), and hereditary (1.2%) etiologies.[61] Pancreatic inflammation and injury can drive acinar-to-ductal metaplasia and gradually progress to pancreatic cancer.[23] A large 1993 multicenter cohort study of 1,552 patients with chronic pancreatitis across six countries reported cumulative pancreatic cancer risks of 1.8% at 10 years and 4% at 20 years.[62] In the Chinese population, the cumulative incidence rates were 0.6%, 1.0%, and 1.3% at 3, 5, and 10 years, respectively.[63,64] Notably, an episode of acute pancreatitis, regardless of etiology, significantly increases the risk of pancreatic cancer within 3–10 years,[65] and when acute pancreatitis is the initial presentation of pancreatic cancer, it often manifests as mild or recurrent episodes.[66] The risk rises with increasing frequency of acute pancreatitis episodes and is further amplified in the presence of chronic pancreatitis.[65] In addition, new-onset diabetes in patients with chronic pancreatitis is an important warning sign. Such diabetes may precede pancreatic cancer, with a particularly high carcinogenic risk in elderly patients presenting with sudden weight loss and severe hyperglycemia.[58,67] Given these associations, chronic pancreatitis should be considered a high-risk condition warranting inclusion in early pancreatic cancer screening programs.

Genetic etiologies accounted for approximately 8.7% of chronic pancreatitis cases.[68] with an estimated prevalence of 0.13–0.57 per 100,000 individuals.[69,70] In China, it represents just 1.2% of all chronic pancreatitis etiologies.[61] Hereditary pancreatitis is characterized by earlier disease onset and a substantially higher risk of pancreatic cancer compared with other etiologies. It follows an autosomal dominant inheritance pattern, with 65–100% of cases attributable to functional mutations in *PRSS1*, most commonly p.R122H and p.N29I.[71] Among *PRSS1* mutation carriers, the cumulative risk of pancreatic cancer reaches 44% within 70 years after symptom onset.[22] Hereditary pancreatitis should be strongly suspected in patients with chronic pancreatitis who have a family history of pancreatitis or in whom no clear etiology can be identified through routine clinical evaluation (excluding alcoholic, biliary, hyperlipidemic, drug-induced, and congenital causes). Peripheral blood genetic testing is recommended for such patients, particularly to assess for *PRSS1* mutations.[72]

Approximately 51.4% of patients with chronic pancreatitis carry susceptibility gene mutations.[73] In addition to *PRSS1*, these include chymotrypsin C (*CTRC*),[74] cystic fibrosis transmembrane conductance regulator (*CFTR*),[75] carboxypeptidase A1 (*CPA1*),[76] and serine protease inhibitor Kazal type 1 (*SPINK1*),[77] all of which are strongly associated with early-onset chronic pancreatitis. A recent study identified *SEC16A* as a susceptibility gene for chronic pancreatitis in Chinese patients. Carriers of *SEC16A* variants developed chronic pancreatitis approximately five years earlier than noncarriers, a predisposition mediated by disrupted ER-to-Golgi transport and ER stress.[78] In addition, the carboxyl ester lipase (*CEL*)-*HYB* hybrid gene was recently identified as a risk factor for chronic pancreatitis,[79] but *CEL-HYB* and *CPA1* do not appear to contribute to disease susceptibility in Asian populations.[80,81] A prospective study in a Chinese cohort showed that among patients with chronic pancreatitis, *SPINK1* mutation carriers did not have an increased risk of pancreatic cancer compared with noncarriers.[64] Currently, aside from *PRSS1*, there is insufficient evidence linking other susceptibility genes, including *SPINK1, CFTR, CTRC, CPA1*, *SEC16A*, and *CEL-HYB*, to pancreatic cancer risk.[82,83] Therefore, routine pancreatic cancer screening is not recommended for patients carrying mutations in these genes.

Pancreatic cystic tumors

Recommendation 11: Patients with branch duct (BD)-intraductal papillary mucinous neoplasms (IPMN) should undergo pancreatic cancer screening upon diagnosis. Patients with mucinous cystic neoplasms (MCN), solid pseudopapillary neoplasms (SPN), cystic neuroendocrine tumors (cNET), main duct (MD)-IPMN, or mixed type (MT)-IPMN should be referred for multidisciplinary team (MDT) discussion and considered for elective surgical resection. (Evidence strength: C; Recommendation strength: Weak recommendation)

With the widespread use of imaging examinations, the detection rate of asymptomatic pancreatic cystic tumors has been increasing year by year, especially among elderly individuals.[84,85] Patients with pancreatic cystic tumors have a higher risk of developing pancreatic cancer compared with the general population, with a relative risk that may be as high as 22.5 (95% CI: 11.0–45.3).[24,26] The malignant potential of these tumors varies widely across different histological types.[86] Mucinous pancreatic cystic neoplasms, including IPMN and MCN, are considered to carry a higher risk of malignant transformation and are estimated to account for up to 15%

of pancreatic cancers.[25] IPMN originates from the main pancreatic duct or its major branches and is characterized by papillary proliferation with abundant mucin secretion. Beyond its own capacity for stepwise progression to invasive carcinoma, IPMN also increases the risk of developing conventional PDAC elsewhere in the pancreas, a phenomenon termed concomitant PDAC.[87] Based on anatomical involvement, IPMN is classified into MD-IPMN, BD-IPMN, and MT-IPMN.[86] The reported malignant risk for MD-IPMN and MT-IPMN ranges from 38% to 68%, whereas the risk for BD-IPMN remains less clearly defined, with estimates varying between 11% and 30% in the literature.[88] In addition, certain rare pancreatic cystic tumors, such as SPN and cNET, also harbor malignant potential.[89] Several other pancreatic cystic lesions, including serous cystadenomas, lymphoepithelial cysts, and pancreatic duplication cysts, are considered benign with no or extremely low malignant potential and therefore generally do not require surveillance or surgical intervention unless they become symptomatic because of mass effect.[90]

Given the variable malignant potential of pancreatic cystic tumors, standardized management is essential, although optimal strategies remain an area of ongoing debate. Drawing on current domestic and international guidelines,[91–94] this consensus recommends early pancreatic cancer screening for patients with cystic lesions at elevated risk of malignant transformation, including MCN, SPN, cNET, and IPMN. For patients with MCN, SPN, cNET, MD-IPMN, and MT-IPMN, MDT discussions are advised to determine the timing and extent of elective surgical resection. Patients with BD-IPMN should be enrolled in active surveillance programs. Accurate subtyping of pancreatic cystic tumors remains clinically challenging, and follow-up strategies for certain lesions continue to be debated. Therefore, it is recommended that any patient diagnosed with a pancreatic cystic tumor undergo early evaluation at a high-volume pancreatic center, where a personalized surveillance plan can be formulated through MDT discussions.

Starting age for early screening of pancreatic cancer

Recommendation 12: For individuals with a family history of pancreatic cancer, screening should begin at age 50 or 10 years younger than the age at diagnosis of the youngest affected first-degree relative, whichever is earlier. For those with Peutz–Jeghers syndrome, screening is recommended to start at age 35. *CDKN2A* mutation carriers should begin screening at age 40. For carriers of pathogenic variants in *BRCA1, BRCA2, PALB2, ATM, MLH1, MSH2, MSH6,* or *APC*, the recommended starting age is 50, or 10 years earlier than the age at diagnosis of the youngest affected first-degree relative, whichever comes first. (Evidence strength: B; Recommendation strength: Strong recommendation)

Recommendation 13: For patients with new-onset diabetes who meet the criteria for monitoring, enrollment in a surveillance program is recommended immediately following diagnosis. (Evidence strength: C; Recommendation strength: Weak recommendation)

Recommendation 14: For patients with chronic pancreatitis who meet the criteria for monitoring, screening for pancreatic cancer should begin at age 40. (Evidence strength: C; Recommendation strength: Weak recommendation)

Recommendation 15: For BD-IPMN, early screening for pancreatic cancer should be initiated immediately following diagnosis, irrespective of age at diagnosis. (Evidence strength: C; Recommendation strength: Weak recommendation)

For individuals with a family history of pancreatic cancer (without known susceptibility gene mutations), most cases are diagnosed after the age of 55, although the average age at diagnosis is earlier than that of individuals without a family history.[9,35,95] Some experts suggest that screening for this group can begin at age 55.[19] For individuals with *CDKN2A* mutations or Peutz–Jeghers syndrome, the average age at pancreatic cancer diagnosis is even younger. Among *CDKN2A* mutation carriers, 16% are diagnosed before age 45, while patients with Peutz–Jeghers syndrome are typically diagnosed in their 30s to 40s.[28] Long-term surveillance of high-risk individuals has revealed a cumulative incidence of pancreatic cancer of 9.3% in susceptibility gene mutation carriers, including *CDKN2A, LKB1/STK11, BRCA2, BRCA1, PALB2, TP53, MLH1, MSH2, MSH6,* and *ATM*, with a median age at diagnosis of 61 years (range: 50–78 years).[10]

Several prospective cohort studies have confirmed that new-onset diabetes is an early manifestation of pancreatic cancer, with over 25% of patients developing new-onset diabetes within 1–3 years prior to cancer diagnosis.[96,97] Studies have shown that the median latency from new-onset diabetes to clinical diagnosis of pancreatic cancer is 8.1 months, with 30.5% of patients diagnosed within 0–4 months and 31.3% within 4–12 months following diagnosis of new-onset diabetes.[47] The median delay from onset of new-onset diabetes to clinical diagnosis is 6.5 months, and approximately 33% of cases remain unrecognized prior to the diagnosis of pancreatic cancer.[96]

For patients with chronic pancreatitis, the current international consensus is to start pancreatic cancer screening after age 40, particularly for those with *PRSS1* mutations.[98] One study found that among 402 chronic pancreatitis patients, 5 developed pancreatic cancer, with an average age at diagnosis of 50.9 ± 10.1 years.[99] Another study involving 581 chronic pancreatitis patients identified six cases of pancreatic cancer, with an average interval of approximately 5.0 years from chronic pancreatitis diagnosis to pancreatic cancer diagnosis.[100] According to the European Registry of Hereditary Pancreatitis and Pancreatic Cancer study, 26 of 418 cases (6%) in a cohort of hereditary pancreatitis patients were diagnosed with pancreatic cancer, and risk increased from age 40.[22] A follow-up study of 497 hereditary pancreatitis patients found that 19 developed pancreatic cancer, with only 3 cases occurring before age 40, all of whom were smokers.[101] These findings suggest that there is limited benefit in conducting pancreatic cancer screening in chronic pancreatitis patients younger than 40 years, and therefore screening is not recommended in this age group.

Large cohort studies have demonstrated that BD-IPMNs carry a measurable risk of malignant progression that warrants surveillance from the time of diagnosis. A competing risk analysis of 926 presumed BD-IPMNs without worrisome features or high-risk stigmata found a 5-year cumulative incidence of relevant changes (including development of worrisome features, high-risk stigmata, or pancreatic malignancy) of 17.83%, with 1.6% developing pancreatic malignancy during follow-up.[102] Importantly, while age and comorbidities significantly influence competing mortality risks, malignant potential exists across all age groups, supporting surveillance initiation at diagnosis regardless of age. Another long-term cohort study demonstrated that the risk of progression to worrisome features or high-risk stigmata is evident at 1 year (3.7%), with cumulative rates reaching 23.4% at 5 years and 43.3% at 10 years after diagnosis.[103]

Follow-up intervals for individuals at high risk for pancreatic cancer

Recommendation 16: For high-risk individuals (hereditary risk, new-onset diabetes, or chronic pancreatitis) undergoing

surveillance, the monitoring interval is 12 months in the absence of pancreatic abnormalities, and 3–6 months if worrisome features are present (solid lesion <10 mm, indeterminate lesion size, main pancreatic duct dilation of 5–9 mm, or dilation ≥6 mm without an obvious solid lesion). (Evidence strength: C; Recommendation strength: Weak recommendation)

Recommendation 17: For patients with BD-IPMN without worrisome features, surveillance intervals are determined by cyst size: 12 months for cysts <2 cm and 6 months for cysts 2–3 cm. If worrisome features develop, including new-onset diabetes, recurrent IPMN-related pancreatitis, cyst ≥3 cm, enhancing mural nodules <5 mm, thickened cyst walls, main pancreatic duct dilation of 5–9.9 mm, ductal changes with distal atrophy, elevated carbohydrate antigen 19–9 (CA19-9), rapid growth (>5 mm/2 years), or lymphadenopathy, the interval should be shortened to 3–6 months. These features constitute relative indications for surgery, which may be undertaken after multidisciplinary discussion and consideration of patient preferences. (Evidence strength: B; Recommendation strength: Strong recommendation)

Recommendation 18: For postoperative patients, annual surveillance is recommended if no residual lesion remains. For those with low-grade dysplasia at surgical margins, CA19-9 testing and imaging should be performed at least twice yearly. (Evidence strength: B; Recommendation strength: Strong recommendation)

Several guidelines, including those from the American Gastroenterological Association, the American College of Gastroenterology, and the International Cancer of the Pancreas Screening Consortium, unanimously recommend annual surveillance for high-risk individuals with genetic susceptibility.[19,28,104] Regarding surveillance intervals in chronic pancreatitis, there is currently a lack of high-quality randomized controlled trials, meta-analyses, or consensus guidelines. However, due to the high cost of screening, it is recommended that hereditary pancreatitis patients without suspicious lesions at initial evaluation undergo follow-up every 1–2 years.[105] If worrisome features are identified during follow-up, including a solid lesion <10 mm, a suspicious solid lesion, a main pancreatic duct diameter of 5–9.9 mm, or ductal narrowing or dilation ≥6 mm without an obvious lesion, close follow-up at 3–6 month intervals should be performed.

The follow-up strategy for BD-IPMN remains controversial. Existing guidelines define worrisome features and high-risk stigmata.[91–94] Worrisome features include new-onset diabetes, recurrent pancreatitis caused by IPMN, cyst diameter ≥3 cm, enhancing mural nodules <5 mm, thickened or enhancing cyst walls, main pancreatic duct diameter of 5–9.9 mm, ductal caliber changes with distal pancreatic atrophy, elevated CA19-9, cyst growth >5 mm over 2 years, and lymph node enlargement. High-risk stigmata include obstructive jaundice, enhancing mural nodules ≥5 mm, main pancreatic duct diameter ≥10 mm, and malignant or suspicious cytology on endoscopic ultrasound (EUS)-guided fine-needle aspiration (FNA). For BD-IPMN patients, the presence of worrisome features warrants close surveillance at 3–6 month intervals. These features are considered relative surgical indications, and elective resection may be considered after MDT discussion and integration of patient preferences. In contrast, high-risk stigmata constitute absolute surgical indications, and surgery is recommended following MDT evaluation. For patients with cysts <3 cm and no worrisome features or high-risk stigmata, surveillance should be stratified by cyst size: 12-month intervals for cysts <2 cm and 6-month intervals for cysts measuring 2–3 cm.[106] Surveillance should be guided by cyst size and morphological changes observed during the initial 6-month follow-up. For patients with small cysts (<20 mm) without morphological changes during the first 5 years, discontinuation of surveillance may be considered in those who are not surgical candidates or whose life expectancy is ≤10 years.[107] In patients with presumed BD-IPMN without worrisome features or high-risk stigmata, the risk of pancreatic malignancy after 5 years of stable surveillance is comparable to that of the general population, adjusted for cyst size and age. Discontinuation of surveillance may be justified in individuals aged >75 years with cysts <30 mm, as well as those aged ≥65 years with cysts ≤15 mm, provided stability is maintained over the initial 5-year follow-up period.[108]

For postoperative patients, follow-up should be guided by surgical approach and pathology. For patients with negative surgical margins, annual surveillance with magnetic resonance imaging (MRI) of the residual pancreas is recommended.[92] In patients with low-grade PanIN at the surgical margins, CA19-9 testing combined with imaging (MRI/magnetic resonance cholangiopancreatography (MRCP), EUS, or computed tomography (CT)) is recommended at least twice per year.[109] This strategy is supported by a 2025 prospective multinational study demonstrating that routine imaging surveillance is associated with improved overall survival compared with symptom-triggered follow-up.[110] Accordingly, this consensus recommends annual CA19-9 testing and imaging for postoperative patients without residual lesions, and at least twice-yearly testing for those with low-grade PanIN at surgical margins.

Screening modalities for pancreatic cancer in high-risk individuals

Recommendation 19: For initial screening, combined use of fasting blood glucose and/or HbA1c, serum CA19-9, and MRI/MRCP, EUS, or CT is recommended. (Evidence strength: C; Recommendation strength: Weak recommendation)

Recommendation 20: During follow-up, regular monitoring of fasting blood glucose and/or HbA1c, and serum CA19-9 is recommended, along with the alternating use of MRI/MRCP, EUS, or CT. Pancreatoscopy is recommended for all IPMN patients with evidence of main pancreatic duct involvement. (Evidence strength: C; Recommendation strength: Weak recommendation)

Recommendation 21: During follow-up, if a solid pancreatic lesion, a pancreatic cystic tumor with worrisome features or high-risk stigmata, or asymptomatic main pancreatic duct stenosis (with or without a mass) is detected, EUS-FNA is recommended. (Evidence strength: B; Recommendation strength: Strong recommendation)

High-risk groups undergoing early pancreatic cancer screening for the first time should undergo fasting blood glucose and/or HbA1c testing and regularly monitor blood glucose and body weight. Studies have found that elevated HbA1c is positively correlated with an increased risk of pancreatic cancer and has predictive value for its occurrence.[111–114] Meta-analyses show a strong linear dose–response relationship between fasting blood glucose and pancreatic cancer incidence: for every 0.56 mmol/L increase in fasting blood glucose, the incidence increases by 14%.[115] Serum CA19-9 is currently the only biomarker used in pancreatic cancer screening. Although no studies have demonstrated its role in individuals with high familial or genetic risk, its role in early diagnosis has been widely studied.[116] While its specificity is limited and its

standalone value is modest, CA19-9 combined with other modalities can improve sensitivity and specificity.[117]

Imaging methods for early screening include CT, MRI, and EUS, each with advantages and limitations. CT is widely available, cost-effective, and provides valuable contrast-enhanced imaging that helps identify pancreatic masses by distinguishing lesions from surrounding parenchyma and delineating vascular structures. However, CT involves ionizing radiation and has lower sensitivity for detecting small lesions and distinguishing benign from malignant masses compared with MRI and EUS.[118–123] For the initial diagnosis of BD-IPMNs, CT, MRI/MRCP, and EUS were performed in 86%, 46%, and 37% of patients, respectively.[124–126] EUS provides high-resolution imaging of the pancreas and is particularly useful for evaluating malignancy-associated features, including focal hypoechogenicity, mural nodules, solid components, main pancreatic duct dilation, filling defects, and vascular invasion.[88,127] It effectively differentiates benign from malignant IPMNs, and contrast-enhanced EUS further improves diagnostic accuracy, particularly for detecting and characterizing mural nodules.[128] EUS also demonstrates significantly higher detection rates than other modalities for findings such as main pancreatic duct dilation and enlarged lymph nodes.[66] Compared with MRI/MRCP, EUS shows superior sensitivity for detecting solid lesions.[10,129] When high-grade dysplasia or invasive carcinoma is suspected in IPMN, EUS-FNA and contrast-enhanced EUS are recommended, provided appropriate expertise and infrastructure are available.[130] A key limitation of EUS is operator dependence, which may affect diagnostic consistency and accessibility.[131]

MRI/MRCP is recommended as the first-line surveillance modality due to its superior soft-tissue contrast, absence of ionizing radiation, and ability to characterize pancreatic parenchyma, ductal morphology, and cystic lesions without the risks associated with contrast agents. CT is recommended as an alternative or complementary modality in the following settings: (1) when MRI is contraindicated, such as in patients with non-MRI-compatible implants or severe claustrophobia; (2) for preoperative planning to assess vascular involvement and resectability; (3) for evaluation of extrapancreatic spread or distant metastases; and (4) when rapid imaging is required in patients unable to tolerate prolonged MRI examinations. EUS is recommended for: (1) initial evaluation and characterization of suspected solid lesions or cystic lesions with worrisome features; (2) assessment of lesions not clearly visualized on cross-sectional imaging; (3) evaluation of main pancreatic duct strictures or dilation; and (4) guidance for FNA when tissue diagnosis is indicated. For initial screening, all three imaging modalities can be used. However, if suspicious findings are detected during follow-up, MRI and EUS are preferred. EUS-FNA has higher sensitivity and specificity for identifying solid lesions and pancreatic cystic tumors with worrisome features or high-risk stigmata.[132–134] In addition, for pancreatic cystic tumors, EUS-FNA can be used to analyze cyst fluid components, such as carcinoembryonic antigen and amylase, which are useful for characterizing cystic lesions.[135,136] Molecular analysis of KRAS and GNAS mutations in cyst fluid can also help differentiate IPMN from MCN.[137]

Many high-risk individuals who meet screening criteria (particularly mutation carriers) are also at increased risk for other cancers. These patients should undergo surveillance for other malignancies based on germline mutation status and family history. Genetic testing is recommended for patients, especially younger individuals, with pancreatitis-related disease or unexplained chronic pancreatitis.[71] Detecting pancreatic cancer in patients with imaging abnormalities such as unexplained pancreatic duct stenosis but without definitive solid lesions remains extremely challenging. In such cases, endoscopic retrograde cholangiopancreatography (ERCP) combined with pancreatic juice cytology offers a feasible diagnostic approach.[138]

Studies show that repeated pancreatic juice cytology via endoscopic nasopancreatic drainage achieves a sensitivity of 80–100% for pancreatic cancer diagnosis.[139,140] In patients without obvious space-occupying lesions on repeated EUS but with pancreatic duct stenosis and proximal duct dilation suspicious for early disease, ERCP with serial pancreatic juice aspiration cytologic examination can facilitate early diagnosis and help differentiate cancer from pancreatitis, including carcinoma in situ.[141,142] Pancreatoscopy is also valuable for evaluating lesions involving the pancreatic duct, such as IPMN, enabling direct visualization and targeted biopsy of suspicious ductal lesions,[143] and facilitating detection of malignant ductal lesions.[144] Biopsy alone has a diagnostic accuracy of 64%, which increases to 100% when combined with direct endoscopic visualization.[145] Recent evidence indicates that pancreatoscopy achieves 93% accuracy, 90% sensitivity, and 100% specificity for detecting main pancreatic duct involvement in mixed-type IPMN, outperforming CT, MRCP, and EUS. Because main duct involvement is highly suggestive of malignancy,[146] pancreatoscopy is recommended for all IPMN patients with evidence of main pancreatic duct involvement. A case report described the smallest intraductal pancreatic tumor detected using EUS combined with pancreatoscopy, as well as the first reported pancreatic squamous neoplasm, suggesting the utility of this combined approach for early detection and histopathological characterization of intraductal pancreatic tumors.[147]

Surgical indications for high-risk population of pancreatic cancer

Recommendation 22: For patients with malignant or suspicious EUS-FNA pathology, scheduled surgical resection is strongly recommended after MDT discussion. (Evidence strength: A; Recommendation strength: Strong recommendation)

Recommendation 23: For patients with a solid lesion >10 mm or main pancreatic duct narrowing or dilation ≥10 mm, in whom lesion nature cannot be definitively determined by EUS-FNA, MDT discussion and surgical exploration are recommended to clarify the diagnosis, with resection performed if indicated. (Evidence strength: B; Recommendation strength: Strong recommendation)

Recommendation 24: For patients with BD-IPMN with high-risk stigmata, including a solid lesion, tumor-related obstructive jaundice, enhancing mural nodules ≥5 mm, or a main pancreatic duct ≥10 mm, surgical resection is recommended following MDT discussion. (Evidence strength: B; Recommendation strength: Strong recommendation)

When deciding whether individuals in the screened population should undergo surgical resection, multiple factors must be considered, including surgical risk, comorbidities, and life expectancy.[130] Absolute surgical indications are as follows: Regardless of whether the lesion is solid or cystic, patients with malignant or suspicious findings on FNA pathology should undergo surgery.[148] For solid lesions, if EUS-FNA or other tests cannot provide a definitive preoperative diagnosis, but the lesion is >10 mm or there is main pancreatic duct stenosis and/or dilation ≥10 mm, MDT discussion and surgical exploration are recommended, with resection performed if necessary. For pancreatic cystic tumors, surgical

resection is generally recommended for patients with SPN, cNET, MCN, MD-IPMN, and MT-IPMN.[94] However, some studies suggest that for MD-IPMN and MT-IPMN with a main pancreatic duct diameter <10 mm and no enhancing mural nodules, the risk of malignant progression is lower, and surveillance may be considered instead of immediate surgery.[149] For BD-IPMN, surgical resection is recommended when high-risk stigmata are present.[92,93,150]

In addition to absolute indications, relative surgical indications may also warrant intervention in selected cases. These include worrisome features such as main pancreatic duct dilation of 5–9 mm, cyst growth >5 mm over two years, enhancing mural nodules <5 mm, or thickened/enhancing cyst walls. In such cases, surgery should be considered, particularly when recurrent symptoms such as pancreatitis affect quality of life or in younger patients with multiple worrisome features. Decisions should be made following MDT discussion. The decision-making flowchart for the management of high-risk individuals for pancreatic cancer is shown in Figure 1.

Recommendations for lifestyle habits in the high-risk population for pancreatic cancer

> ***Recommendation 25:*** Patients are advised to quit smoking and drinking, maintain a balanced and healthy diet, engage in moderate physical exercise, and avoid obesity. (Evidence strength: B; Recommendation strength: Strong recommendation)

Environmental factors also increase the risk of pancreatic cancer in the high-risk population. Multiple prospective studies have shown an additional increase in risk of developing pancreatic cancer due to smoking and alcohol consumption.[69,101,151,152] Studies have found that smoking can increase the risk of developing pancreatic cancer by 2–6 times.[153] Avoiding smoking and excessive alcohol consumption may help slow the progression of chronic pancreatitis and potentially directly or indirectly reduce the risk of developing pancreatic cancer.

Furthermore, obesity is another risk factor for the occurrence of pancreatic cancer. There is a significant positive correlation between increasing BMI and the occurrence of pancreatic cancer.[154] In some multicenter case–control studies, researchers have identified dietary factors such as adequate consumption of fruits and vegetables, which are considered protective in reducing the occurrence of pancreatic cancer.[98,155]

Institutions for early pancreatic cancer screening

> ***Recommendation 26:*** Surveillance for pancreatic cancer in the four high-risk populations that meet the screening criteria should be conducted at pancreatic specialty centers. (Evidence strength: C; Recommendation strength: Strong recommendation)

Pancreatic cancer screening should be performed at high-volume pancreatic specialty centers. Although no standardized national criteria currently exist in China, drawing on international guidelines and local practice,[156,157] these centers can be defined as tertiary hospitals with comprehensive multidisciplinary capacity for pancreatic disease management. Their core characteristics include: (1) a high surgical volume, with ≥20 pancreaticoduodenectomies performed annually; (2) a standing MDT involving specialists from gastroenterology, pancreatic surgery, radiology, pathology, medical oncology, and radiation oncology; (3) availability of advanced diagnostic tools, including EUS-FNA, ERCP, and high-resolution MRI/MRCP; and (4) the capability to conduct clinical research on early pancreatic cancer screening and long-term surveillance of high-risk populations.

In clinical practice, high-risk individuals identified at primary or secondary hospitals should be referred to these regional centers for baseline screening. Although supported by low-quality evidence, the recommendation is strong due to a clear benefit–risk balance, the organizational nature of the intervention, and unanimous guideline consensus. However, given challenges related to cost, accessibility, and geographic distribution within the Chinese healthcare system, a shared-care follow-up model may offer a feasible alternative. Subsequent surveillance can be alternated between local hospitals (e.g., for routine CA19-9 and blood glucose monitoring) and specialty centers (e.g., for annual MRI/EUS examinations), based on the patient's distance from the center and personal preference.

Potential harms and feasibility considerations

Although early screening for pancreatic cancer in high-risk populations offers potential survival benefits, it is essential to fully recognize the associated harms, including false positives, overdiagnosis, procedural risks, and psychological burden. During surveillance, misclassification of benign or low-risk lesions as suspicious is not uncommon and may lead to unnecessary surgical intervention. A meta-analysis focusing on high-risk individuals with familial pancreatic cancer revealed that over two-thirds of those who underwent surgery were ultimately confirmed by pathology to have non-malignant or low-grade lesions.[158] Pancreatic surgery remains a high-risk procedure, with complications such as postoperative pancreatic fistula occurring in 5–22% of cases, delayed gastric emptying affecting up to 57% of patients, and post-pancreatectomy hemorrhage occurring in 3–13% of cases.[159] The issue of overtreatment is especially prominent in patients with pancreatic cystic neoplasms. Some low-risk BD-IPMNs may never progress to invasive cancer throughout a patient's lifetime, yet these patients are still subjected to repeated imaging surveillance or even surgical resection, leading to unnecessary physical harm and inefficient use of healthcare resources.[160] In addition, long-term surveillance itself imposes persistent psychological anxiety and economic burden, particularly among young individuals carrying susceptibility genes, whose concerns about disease progression may negatively affect their quality of life.[161]

From a health system perspective, the feasibility of implementing large-scale screening programs is constrained by several factors. High-quality surveillance relies on specialized imaging modalities such as EUS and MRI, which require advanced infrastructure and operator expertise that are not uniformly available across different regions in China. This disparity in access may exacerbate existing inequalities in cancer outcomes. Additionally, the cumulative economic burden of repeated surveillance, combined with the potential for surveillance fatigue, may reduce long-term adherence. To optimize net benefit, screening strategies should incorporate robust risk stratification tools, establish clear criteria for discontinuing surveillance in stable low-risk lesions, and emphasize multidisciplinary decision-making to minimize unnecessary interventions while ensuring that high-risk individuals receive appropriate care.

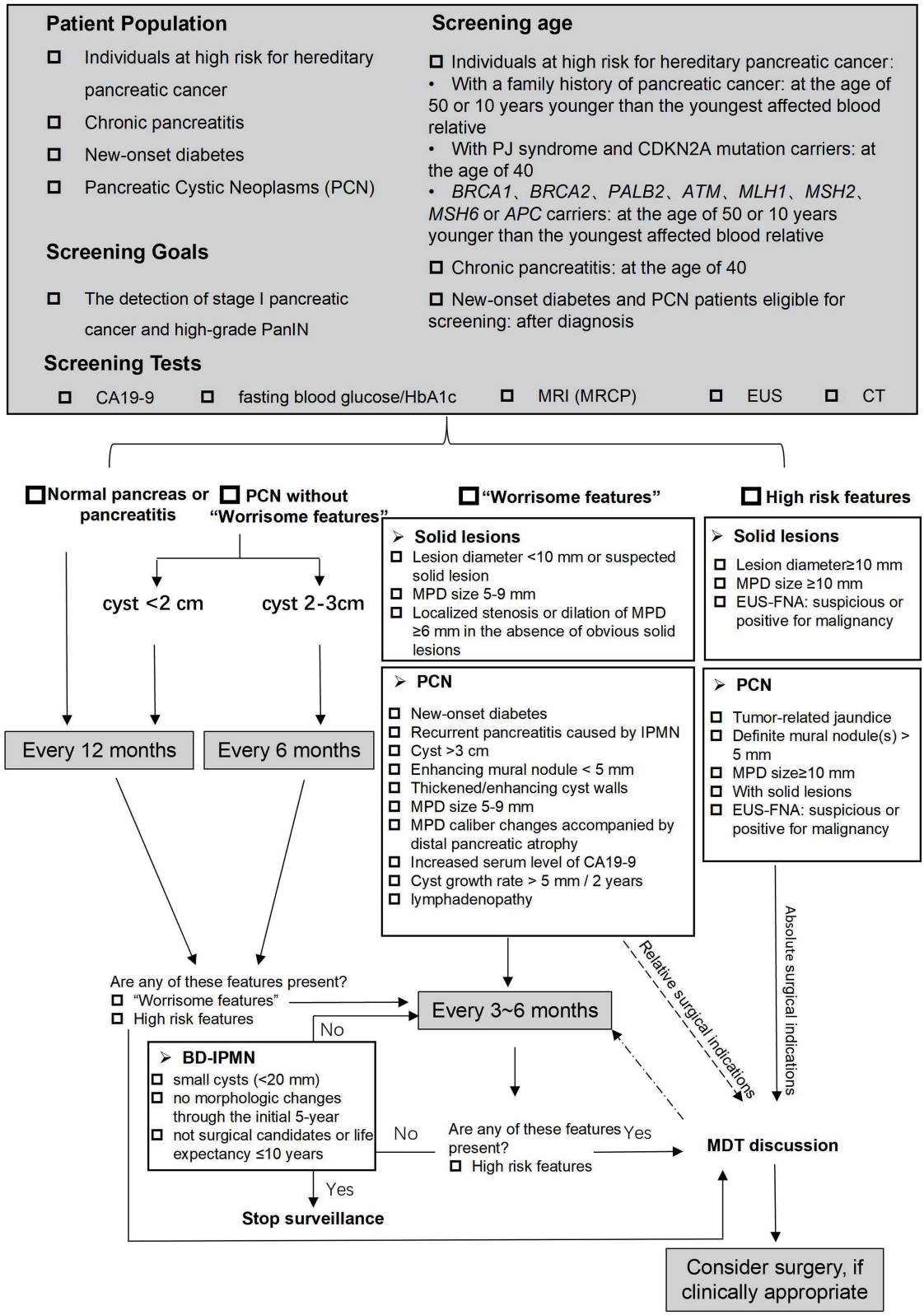

Fig. 1. Decision flow chart for the management of pancreatic cancer high-risk individuals. BD-IPMN, branch duct intraductal papillary mucinous neoplasm; CT, computed tomography; EUS, endoscopic ultrasound; FNA, fine-needle aspiration; MDT, multidisciplinary team; MPD, main pancreatic duct; MRCP, magnetic resonance cholangiopancreatography; MRI, magnetic resonance imaging; PCN, pancreatic cystic neoplasms; PJ, Peutz-Jeghers.

Limitations of the consensus

While this consensus provides a comprehensive framework for early pancreatic cancer screening in China, several limitations should be acknowledged. First, the majority of recommendations are supported by moderate- to low-certainty evidence (evidence strength B or C), reflecting the paucity of large-scale randomized controlled trials in pancreatic cancer screening. Many recommendations are therefore based on observational cohort studies, expert consensus, and extrapolated data from international populations, which may not fully capture the genetic and environmental heterogeneity of the Chinese population. Second, this consensus does not formally address health economic modeling specific to China's regional disparities in healthcare access and resource availability, which may affect the real-world feasibility and cost-effectiveness of implementing these recommendations, particularly in less developed areas. Third, the long-term outcomes of surveillance, including adherence, psychological impact, and survival benefit, remain to be validated in prospective Chinese cohorts. Finally, the potential harms of screening, including overtreatment and procedural risks, are discussed qualitatively but are not quantified in a risk–benefit model tailored to Chinese high-risk populations. These limitations underscore the need for ongoing research, including prospective national registries and cost-effectiveness analyses, to refine and validate these recommendations over time.

Future directions for early pancreatic cancer screening

The overall incidence of pancreatic cancer is relatively low, with high screening costs. Therefore, effectively enriching the high-risk population is key to early pancreatic cancer screening. Future research on pancreatic cancer screening could focus on establishing risk assessment models and large-scale databases,[162,163] as well as applying liquid biopsies and radiomics.[164] Based on the latest studies, artificial intelligence models demonstrate exceptionally high accuracy in CT imaging analysis. Not only can they detect PDAC on non-contrast CT scans, but they can also identify visually occult preinvasive cancer on pre-diagnostic CT scans.[165,166] This technology holds promise as a core tool for large-scale screening, significantly improving diagnostic accuracy. Meanwhile, breakthroughs have also been made in liquid biopsy technology. The PancreaSure serum biomarker panel (including TIMP1, ICAM1, CTSD, THBS1, and CA19-9) has been proven to efficiently distinguish early-stage PDAC from high-risk controls, with a sensitivity of 78.5% and a specificity of 93.5%, significantly outperforming CA19-9 alone. This provides a strong basis for non-invasive screening.[167] Moreover, portal venous circulating tumor cell-based microfluidic biopsy has been reported to be used with high sensitivity and specificity for the diagnosis of early-stage PDAC, particularly in CA19-9-negative patients.[168] In addition, for the management of pancreatic cysts, the PancreaSeq NGS panel not only demonstrates high sensitivity and specificity for various cyst types and malignant tumors arising from mucinous cysts, but also reveals the diversity and clinical significance of genomic alterations in pancreatic cysts. This provides a basis for precise risk stratification of patients with high-risk cysts.[169] At the same time, pancreatic cancer screening should balance cost and effectiveness, optimize the screening process, and reduce healthcare costs.[170]

Conclusions

This updated consensus presents 26 evidence-based recommendations for the early screening and surveillance of pancreatic cancer in high-risk populations in China. By clearly defining high-risk groups, including individuals with hereditary susceptibility, new-onset diabetes with specific metabolic features, chronic pancreatitis with *PRSS1* mutations, and pancreatic cystic neoplasms, this consensus aims to enable more targeted and effective screening. The recommendations specify starting ages, surveillance intervals, imaging modalities, and surgical indications, while emphasizing multidisciplinary decision-making and centralized care at high-volume pancreatic specialty centers. Implementation of this consensus offers a pathway to improving the early diagnosis of stage I pancreatic cancer and high-grade precursor lesions, with the ultimate goal of improving survival and quality of life for patients in China.

Acknowledgments

The authors gratefully acknowledge Prof. Helmut Friess from the Department of Surgery, Klinikum rechts der Isar, School of Medicine, Technical University of Munich, Munich, Germany, for his valuable support in the formulation of this consensus.

Funding

The work was supported by the Sino-German Mobility Programme (M-0251).

Conflict of interest

All authors declare no conflicts of interest.

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Contributions

Writing group: SS, HL, YY and XtZ conducted the literature search, extracted and appraised the evidence, prepared the initial draft of the recommendations and the supporting summary, and revised the manuscript based on panel feedback. *Expert panel:* Each panel member participated in the modified Delphi voting process (first and/or second round), reviewed the draft recommendations, provided critical intellectual input, and approved the final version of the consensus. *Corresponding authors:* LW and XpZ conceived the consensus update, supervised the entire process (including the literature review, Delphi process, and manuscript revision), and have final responsibility for the integrity of the work.

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