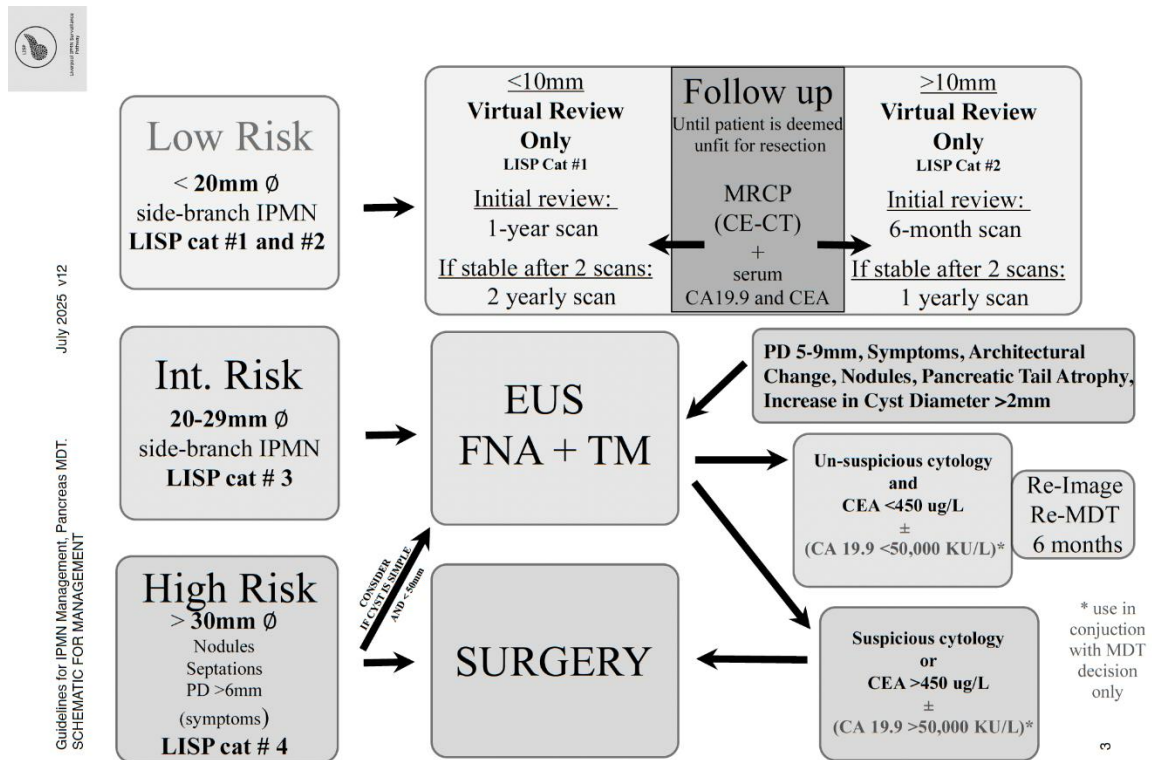
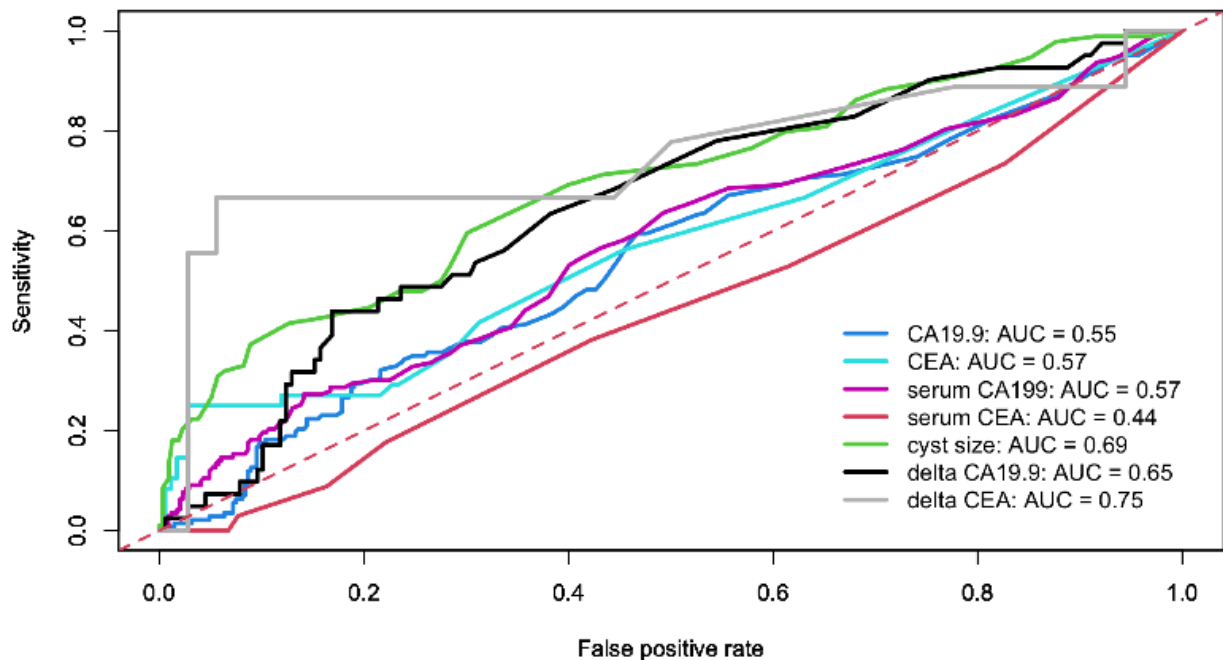


## Supplementary material



Supplementary Figure 1 Liverpool IPMN surveillance programme.



Supplementary Figure 2 Relationship between the change in markers and surgery, all markers modelled for delta.

**Supplementary Table 1 Modelling the relationship between the change in CA19-9/CEA and dysplasia (delta)**

		LGD	IGD	HGD	Malignancy	Not stated	Imaged only	Total
<b>Change in CA19-9</b>	>10	11 (46%)	2 (29%)	1 (100%)	1 (33%)	6 (100%)	132 (74%)	153 (70%)
	≤10	13 (54%)	5 (71%)	0 (0%)	2 (67%)	0 (0%)	46 (26%)	66 (30%)
	Total	24	7	1	3	6	178	219
<b>Change in CEA</b>	>10	3 (33%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	21 (58%)	24 (53%)
	≤10	6 (67%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	15 (42%)	21 (47%)
	Total	9	0	0	0	0	36	45

LGD: low grade dysplasia; IGD: intermediate grade dysplasia; HGD: high grade dysplasia; CEA: carcinoembryonic antigen; CA19-9: cancer antigen 19-9

**Supplementary Table 2 Modelling for the relationship between all markers and the need for surgery (delta)**

		<b>No Surgery</b>	<b>Surgery</b>	<b>Total</b>
Cyst Size (mm)	<29	825 (93%)	59 (59%)	884 (90%)
	≥29	60 (7%)	41 (41%)	101 (10%)
	Total	885	100	985
CEA (µg/L)	<450	345 (99%)	131 (92%)	476 (97%)
	≥450	5 (1%)	12 (8%)	17 (3%)
	Total	350	143	493
CA19-9 (KU/L)	<90	301 (86%)	114 (80%)	415 (84%)
	≥90	49 (14%)	29 (20%)	78 (16%)
	Total	350	143	493
Serum CEA (µg/L)	<5	635 (97%)	68 (96%)	703 (97%)
	≥5	18 (3%)	3 (4%)	21 (3%)
	Total	653	71	724
Serum CA19-9 (KU/L)	<40	678 (92%)	108 (73%)	786 (89%)
	≥40	55 (8%)	39 (27%)	94 (11%)
	Total	733	147	880
Change in CA19-9 (KU/L)	<10	132 (74%)	21 (51%)	153 (70%)
	≥10	46 (26%)	20 (49%)	66 (30%)
	Total	178	41	219
Change in CEA (µg/L)	<10	21 (58%)	3 (33%)	24 (53%)
	≥10	15 (42%)	6 (67%)	21 (47%)
	Total	36	9	45

CEA: Carcinoembryonic antigen; CA19-9: cancer antigen 19-9.

**Supplementary Table 3 Coefficients for multivariate analysis of CA19-9 and Cyst size**

<b>Coefficients:</b>	<b>Estimate</b>	<b>Std. Error</b>	<b>t value</b>	<b>Pr(&gt;  t )</b>
(Intercept)	-4.497e-02	1.493e-02	-3.012	0.00276 **
Ca199	4.215e-05	5.450e-05	0.773	0.43973
cystSz	3.651e-03	6.167e-04	5.920	6.88e-09 ***

**Supplementary Table 4 Dysplasia grades for resected intraductal papillary mucinous neoplasms grouped by number of EUS prior to surgery and IPMN type**

All surgery	IPMN type	Dysplasia Grade			t-IPMN	Total
		LGD	IGD	HGD		
No EUS	BD	14	5	1	10	30
	MT	0	5	1	3	9
	MD	0	2	1	11	14
1 EUS	BD	30	5	1	0	36
	MT	4	4	0	0	8
	MD	5	0	1	2	8
2+ EUS	BD	7	2	0	1	10
	MT	5	2	1	0	8
	MD	0	0	0	2	2
Total		62	25	6	29	125

IPMN: intraductal papillary mucinous neoplasm; LGD: low grade dysplasia; IGD: intermediate grade dysplasia; HGD: high grade dysplasia; t-IPMN: transformed IPMN; EUS: endoscopic ultrasound; BD: branch-duct IPMN; MT: mixed type IPMN; MD: main duct IPMN

**Supplementary Table 5 Surgical procedures**

Procedure	Malignant (n=34)	Benign (n=119)
Total pancreatectomy	12	20
Whipple (PP or Classic)	17	61
Left pancreatectomy	4	36
Trial dissection	1	-
Cyst enucleation	0	2

PP: pylorus-preserving

**Supplementary Table 6 Surgical complications**

<b>Complication</b>	<b>Malignant (n=21)</b>	<b>Benign (n=76)</b>
Post-operative pancreatic fistula		
Overall	0	7
Grade A	-	1
Grade B	-	5
Grade C	-	1
Post-pancreatectomy haemorrhage		
Overall	1	5
Grade A	-	-
Grade B	-	3
Grade C	1	2
Delayed gastric emptying		
Overall	1	4
Grade A	-	-
Grade B	1	1
Grade C	-	3
Collection	7	38
HAP	4	13
Bile leak	2	2
Chyle leak	1	1
Gastric ischaemia	1	1
Cholangitis	3	-
Delirium	1	-
PJ anastomotic stricture	-	1
PJ stent migration into CBD	-	2
Stroke	-	1

PE	-	1
Pleural effusion	-	4
Acute heart failure	-	1
Liver abscess	-	1
Ileus	-	2
Splenic infarction	-	1

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HAP: hospital acquired pneumonia; PJ: pancreaticojejunal; CBD: common bile duct;

PE: pulmonary embolism

**Supplementary Table 7 Surgical complications (2)**

<b>Clavien-Dindo Grade</b>	<b>Malignant (n= 21)</b>	<b>Benign (n=76)</b>
I	1	3
II	14	44
IIIa	3	20
IIIb	0	3
IVa	0	2
IVb	0	1
V	3	3