

Supplemental Online Content

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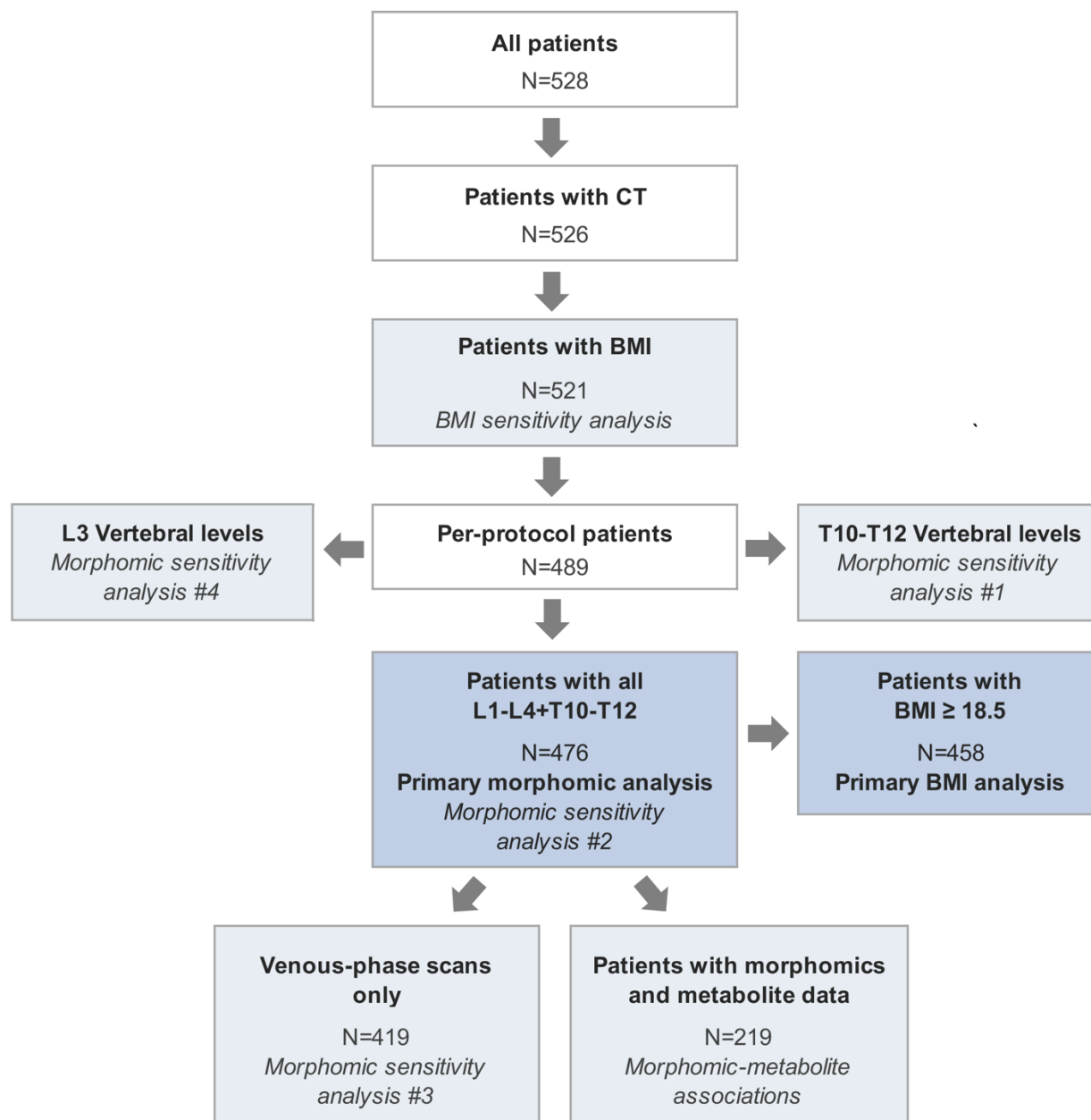
This supplemental material has been provided by the authors to give readers additional information about their work.

eTable 1. Morphomic variable specifics

Variable		Lowest Tertile	Middle Tertile	Highest Tertile
Definition		N or Median [25%, 75%]		
BMI (kgm⁻²)		153	153	152
<i><18.5 excluded</i>		21.8 [20.6, 22.6]	25.1 [24.2, 26.3]	30.5 [28.9, 33.2]
Muscle				
Area (cm ²)	Area of skeletal muscle (psoas, erector spinae, quadratus lumborum, transverse abdominus, rectus abdominus, internal and external obliques)	159	159	158
		5659 [5307, 6112]	7574 [7107, 7994]	94756 [8870, 10195]
Index (cm ² m ⁻²)	Area divided by height (m ²)	159 213.2 [198.1, 226.1]	159 258.9 [249.9, 268.8]	158 305.2 [290.6, 327.5]
Density (HU)	Density: median pixel intensity of area; patient omitted if had <200 fat pixels	159 223 [193, 242]	159 285 [274, 297]	158 338 [319, 353]
Subcutaneous fat				
Area (cm ²)	Area between skin and fascia (abdominal compartment) meeting fat density thresholds (-205 to -51 HU)	159	159	158
		2702 [1748, 3763]	6812 [5977, 8001]	13248 [11518, 16996]
Index (cm ² m ⁻²)	Area divided by height (m ²)	159 93.4 [57.6, 122.9]	159 242.4 [206.0, 272.4]	158 463.2 [391.4, 625.6]
Density (HU)	Density: median pixel intensity of area; patient omitted if had <200 fat pixels	141 -762 [-782, -746]	141 -717 [-728, -703]	141 -663 [-681, -632]
Visceral fat				
Area (cm ²)	Area inside fascia (abdominal compartment) meeting fat density thresholds (-205 to -51 HU)	159	159	158
		3187 [2126, 4297]	7120 [5806, 8428]	13860 [11957, 16966]
Index (cm ² m ⁻²)	Area divided by height (m ²)	159 115.7 [74.2, 152.3]	159 248.7 [209.3, 288.3]	158 447.5 [393.7, 572.0]
Density (HU)	Density: median pixel intensity of area; patient omitted if had <200 fat pixels	157 -691 [-713, -678]	157 -641 [-652, -633]	156 -600 [-614, -582]
Fascia				
Area (cm ²)	Total area inside the abdominal compartment	159	159	158
		30389 [27582, 32387]	39117 [37409, 41440]	49328 [46284, 53388]
Index (cm ² m ⁻²)	Area divided by height (m ²)	159 1129 [1047, 1175]	159 1333 [1296, 1394]	158 1635 [1520, 1771]
Selected ratios				
Muscle:fascia	Muscle area divided by fascia (area inside the abdominal compartment)	159 0.1631 [0.1514, 0.1721]	159 0.191 [0.1853, 0.1971]	158 0.2226 [0.2113, 0.2336]
Subcutaneous fat:fascia	Subcutaneous fat area divided by fascia (area inside the abdominal compartment)	159 0.07327 [0.04538, 0.0970]	159 0.1811 [0.1416, 0.2047]	158 0.3398 [0.2847, 0.4256]

N of primary analysis. BMI: body mass index, HU: Hounsfield units.

eFigure 1. Consort diagram of analysis groups



eTable 2. Associations of body morphomic index and survival by region

Region, evaluation	Low tertile	Middle tertile	High tertile	P-trend
Europe				
<i>PFS HR (95% CI), p-trend:</i>	1.00 (Reference)	0.62 (0.25, 1.52)	1.10 (0.49, 2.44)	0.83
<i>OS HR (95% CI), p-trend:</i>	1.00 (Reference)	1.35 (0.64, 2.86)	1.59 (0.77, 2.62)	0.21
<i>N</i>	29	28	28	
<i>BMI Median [25%, 75%]</i>	21.2 [19.9, 21.6]	23.4 [23.0, 24.0]	27.6 [25.5, 31.1]	
Israel				
<i>PFS HR (95% CI), p-trend:</i>	1.00 (Reference)	1.60 (0.49, 5.18)	1.01 (0.29, 3.53)	0.90
<i>OS HR (95% CI), p-trend:</i>	1.00 (Reference)	0.71 (0.20, 2.61)	1.32 (0.42, 4.17)	0.63
<i>N</i>	9	8	8	
<i>BMI Median [25%, 75%]</i>	21.9 [19.8, 22.0]	24.5 [23.6, 24.7]	26.6 [25.6 [29.2]	
Korea				
<i>PFS HR (95% CI), p-trend:</i>	1.00 (Reference)	0.42 (0.14, 1.24)	0.29 (0.09, 0.96)	0.051
<i>OS HR (95% CI), p-trend:</i>	1.00 (Reference)	0.38 (0.15, 0.98)	0.32 (0.12, 0.82)	0.03
<i>N</i>	17	17	16	
<i>BMI Median [25%, 75%]</i>	20.9 [20.5, 22.1]	23.2 [22.9, 23.6]	25.9 [25.2, 27.2]	
USA				
<i>PFS HR (95% CI), p-trend:</i>	1.00 (Reference)	1.06 (0.69, 1.62)	0.98 (0.64, 1.51)	0.93
<i>OS HR (95% CI), p-trend:</i>	1.00 (Reference)	0.83 (0.60, 1.17)	0.84 (0.60, 1.18)	0.32
<i>N</i>	100	99	99	
<i>BMI Median [25%, 75%]</i>	22.2 [21.2, 23.3]	26.7 [25.5, 27.8]	32.0 [30.2, 34.5]	
PFS p-heterogeneity	0.31			
OS p-heterogeneity	0.07			

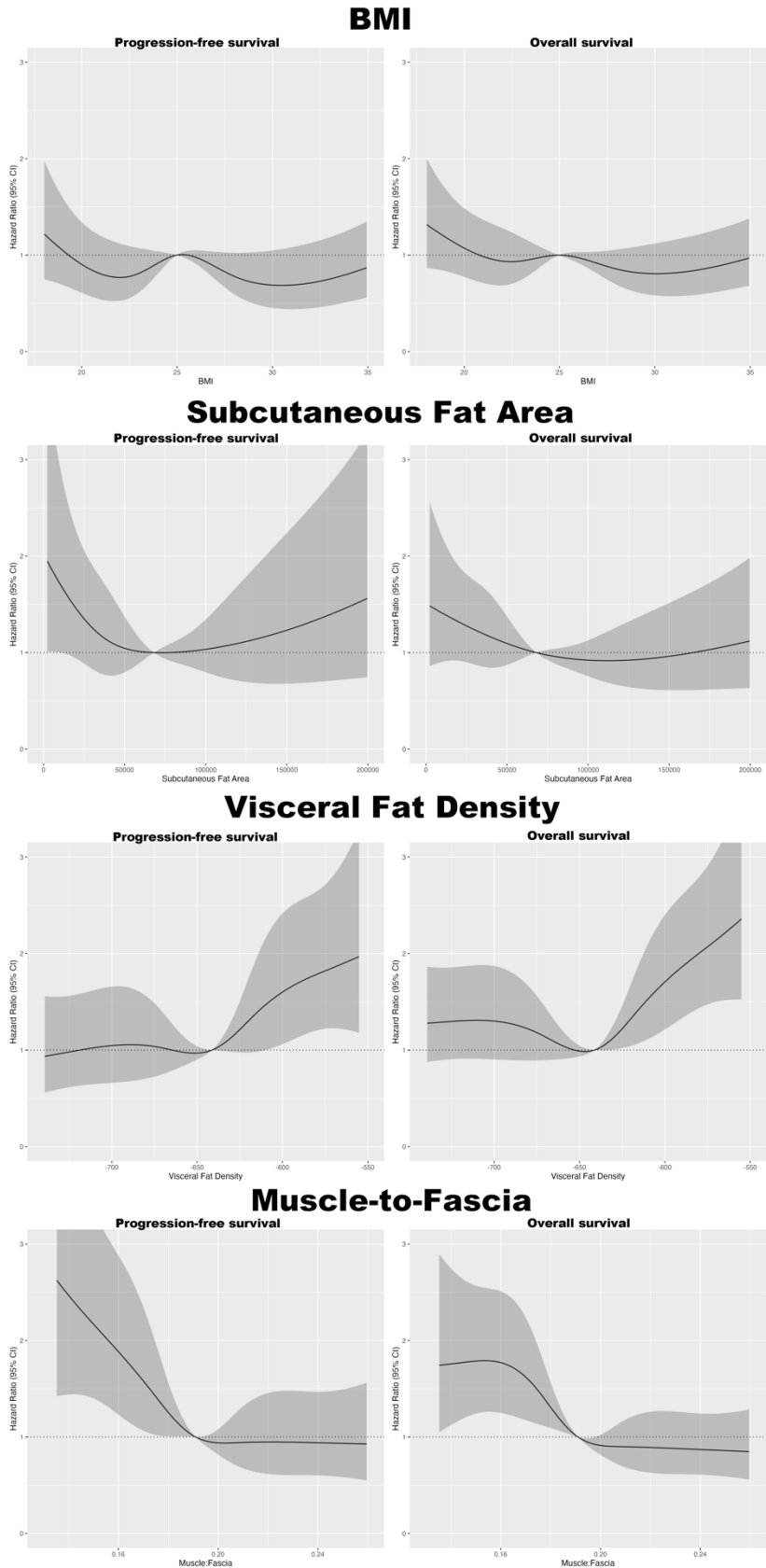
Hazard ratios (HRs) and 95% confidence intervals (CI) from multivariate Cox proportional models. Model adjustments include age, ECOG PS, sex, diabetes, and albumin. Europe includes Germany, Belgium, and France. *BMI*: Body mass index, *ECOG PS*: Eastern Cooperative Oncology Group performance status.

eTable 3. Associations between BMI and morphomic variables with progression-free and overall survival

		Progression-free survival				Overall survival			
		HR (95% CI), p-trend				HR (95% CI), p-trend			
		18.5-24.9, 25.0-24.9, ≥30							
BMI	Unadjusted:	1.00 (Reference)	0.94 (0.69, 1.28)	0.90 (0.62, 1.30)	0.54	1.00 (Reference)	0.86 (0.67, 1.11)	0.85 (0.63, 1.15)	0.22
	Model 1:	1.00 (Reference)	0.96 (0.71, 1.31)	0.97 (0.67, 1.42)	0.84	1.00 (Reference)	0.88 (0.68, 1.13)	0.90 (0.67, 1.22)	0.38
	Model 2:	1.00 (Reference)	0.88 (0.64, 1.21)	0.97 (0.66, 1.44)	0.71	1.00 (Reference)	0.83 (0.63, 1.08)	0.90 (0.65, 1.24)	0.33
		Low, middle, high tertiles							
Muscle	Unadjusted:	1.00 (Reference)	1.10 (0.80, 1.52)	0.85 (0.61, 1.19)	0.36	1.00 (Reference)	0.97 (0.74, 1.28)	0.85 (0.65, 1.12)	0.24
	Model 1:	1.00 (Reference)	1.06 (0.77, 1.48)	0.86 (0.61, 1.21)	0.39	1.00 (Reference)	0.98 (0.74, 1.29)	0.87 (0.67, 1.15)	0.33
	Model 2:	1.00 (Reference)	0.99 (0.71, 1.40)	0.86 (0.61, 1.23)	0.42	1.00 (Reference)	0.91 (0.68, 1.22)	0.87 (0.66, 1.15)	0.33
Area	Unadjusted:	1.00 (Reference)	0.93 (0.67-1.28)	0.97 (0.70-1.35)	0.88	1.00 (Reference)	1.04 (0.80-1.36)	1.04 (0.80-1.35)	0.80
	Model 1:	1.00 (Reference)	0.69 (0.43-1.11)	0.63 (0.34-1.16)	0.19	1.00 (Reference)	0.92 (0.63-1.34)	0.88 (0.53-1.44)	0.62
	Model 2:	1.00 (Reference)	0.75 (0.45-1.24)	0.73 (0.37-1.42)	0.45	1.00 (Reference)	0.97 (0.65-1.45)	1.04 (0.61-1.76)	0.83
Index	Unadjusted:	1.00 (Reference)	0.81 (0.59-1.12)	0.86 (0.62-1.19)	0.35	1.00 (Reference)	0.79 (0.61-1.04)	0.88 (0.68-1.14)	0.35
	Model 1:	1.00 (Reference)	0.78 (0.54-1.12)	0.69 (0.44-1.07)	0.09	1.00 (Reference)	0.75 (0.56-1.02)	0.71 (0.49-1.03)	0.07
	Model 2:	1.00 (Reference)	0.87 (0.59-1.28)	0.79 (0.50-1.26)	0.33	1.00 (Reference)	0.83 (0.61-1.14)	0.82 (0.56-1.20)	0.30
Density	Unadjusted:	1.00 (Reference)	0.98 (0.71-1.34)	0.76 (0.55-1.05)	0.10	1.00 (Reference)	1.06 (0.82-1.38)	0.85 (0.66-1.11)	0.24
	Model 1:	1.00 (Reference)	0.79 (0.56-1.13)	0.63 (0.42-0.94)	0.02	1.00 (Reference)	0.93 (0.70-1.24)	0.76 (0.55-1.06)	0.10
	Model 2:	1.00 (Reference)	0.85 (0.59-1.21)	0.67 (0.44-1.03)	0.06	1.00 (Reference)	0.97 (0.73-1.31)	0.80 (0.56-1.13)	0.21
Subcutaneous fat									
Area	Unadjusted:	1.00 (Reference)	0.58 (0.42-0.81)	0.77 (0.56-1.04)	0.07	1.00 (Reference)	0.69 (0.53-0.90)	0.73 (0.56-0.94)	0.02
	Model 1:	1.00 (Reference)	0.58 (0.40-0.84)	0.70 (0.42-1.18)	0.10	1.00 (Reference)	0.65 (0.48-0.88)	0.62 (0.41-0.94)	0.02
	Model 2:	1.00 (Reference)	0.56 (0.38-0.82)	0.68 (0.40-1.16)	0.08	1.00 (Reference)	0.62 (0.45-0.86)	0.59 (0.38-0.91)	0.01
Index	Unadjusted:	1.00 (Reference)	0.62 (0.44-0.86)	0.83 (0.61-1.14)	0.22	1.00 (Reference)	0.75 (0.57-0.97)	0.77 (0.59-0.99)	0.04
	Model 1:	1.00 (Reference)	0.65 (0.44-0.94)	0.82 (0.48-1.39)	0.30	1.00 (Reference)	0.72 (0.53-0.97)	0.66 (0.43-1.01)	0.045
	Model 2:	1.00 (Reference)	0.61 (0.41-0.90)	0.84 (0.49-1.44)	0.35	1.00 (Reference)	0.68 (0.50-0.94)	0.66 (0.43-1.02)	0.049
Density	Unadjusted:	1.00 (Reference)	1.20 (0.84-1.71)	1.21 (0.85-1.73)	0.30	1.00 (Reference)	0.95 (0.72-1.26)	0.95 (0.72-1.26)	0.72
	Model 1:	1.00 (Reference)	1.17 (0.81-1.69)	1.34 (0.91-1.96)	0.14	1.00 (Reference)	0.90 (0.68-1.20)	0.93 (0.69-1.26)	0.63
	Model 2:	1.00 (Reference)	1.26 (0.87-1.83)	1.44 (0.96-2.15)	0.07	1.00 (Reference)	0.90 (0.67-1.22)	0.91 (0.66-1.25)	0.53
Visceral fat									
Area	Unadjusted:	1.00 (Reference)	0.69 (0.50-0.96)	0.97 (0.71-1.33)	0.80	1.00 (Reference)	0.82 (0.63-1.07)	1.00 (0.77-1.29)	0.99
	Model 1:	1.00 (Reference)	0.67 (0.47-0.95)	0.99 (0.62-1.56)	0.71	1.00 (Reference)	0.84 (0.63-1.13)	1.06 (0.72-1.55)	0.88
	Model 2:	1.00 (Reference)	0.64 (0.44-0.92)	0.95 (0.59-1.54)	0.62	1.00 (Reference)	0.78 (0.57-1.06)	1.03 (0.69-1.53)	0.97
Index	Unadjusted:	1.00 (Reference)	0.77 (0.56-1.07)	1.02 (0.74-1.39)	0.96	1.00 (Reference)	0.90 (0.69-1.17)	0.95 (0.73-1.24)	0.72
	Model 1:	1.00 (Reference)	0.80 (0.56-1.14)	1.12 (0.71-1.77)	0.73	1.00 (Reference)	0.93 (0.69-1.24)	1.00 (0.69-1.46)	0.97
	Model 2:	1.00 (Reference)	0.75 (0.51-1.10)	1.12 (0.69-1.80)	0.72	1.00 (Reference)	0.84 (0.61-1.14)	0.95 (0.63-1.41)	0.75
Density	Unadjusted:	1.00 (Reference)	1.10 (0.79-1.55)	1.61 (1.16-2.24)	0.004	1.00 (Reference)	0.96 (0.73-1.26)	1.46 (1.13-1.90)	0.006
	Model 1:	1.00 (Reference)	1.15 (0.81-1.63)	1.74 (1.23-2.48)	0.002	1.00 (Reference)	0.94 (0.71-1.24)	1.50 (1.12-2.00)	0.008
	Model 2:	1.00 (Reference)	1.12 (0.78-1.62)	1.86 (1.29-2.70)	9.0x10 ⁻⁴	1.00 (Reference)	0.90 (0.67-1.20)	1.53 (1.14-2.07)	0.007
Fascia									
Area	Unadjusted:	1.00 (Reference)	0.94 (0.68-1.30)	1.20 (0.87-1.65)	0.28	1.00 (Reference)	0.95 (0.73-1.24)	1.13 (0.87-1.46)	0.37
	Model 1:	1.00 (Reference)	1.06 (0.70-1.62)	1.56 (0.89-2.73)	0.09	1.00 (Reference)	1.03 (0.73-1.45)	1.35 (0.86-2.11)	0.15
	Model 2:	1.00 (Reference)	1.09 (0.68-1.75)	1.60 (0.84-3.04)	0.11	1.00 (Reference)	1.01 (0.70-1.47)	1.37 (0.83-2.28)	0.17
Index	Unadjusted:	1.00 (Reference)	1.18 (0.85-1.64)	1.37 (0.99-1.90)	0.06	1.00 (Reference)	1.13 (0.86-1.48)	1.20 (0.92-1.57)	0.17
	Model 1:	1.00 (Reference)	1.45 (0.99-2.13)	2.23 (1.35-3.68)	0.002	1.00 (Reference)	1.31 (0.97-1.79)	1.64 (1.10-2.45)	0.01
	Model 2:	1.00 (Reference)	1.55 (1.05-2.31)	2.36 (1.38-4.02)	0.002	1.00 (Reference)	1.38 (1.00-1.90)	1.73 (1.13-2.66)	0.01
Select ratios									
Muscle:fascia	Unadjusted:	1.00 (Reference)	0.74 (0.54-1.02)	0.69 (0.50-0.95)	0.03	1.00 (Reference)	0.76 (0.59-0.99)	0.67 (0.52-0.87)	0.003
	Model 1:	1.00 (Reference)	0.66 (0.47-0.93)	0.58 (0.40-0.84)	0.005	1.00 (Reference)	0.68 (0.52-0.90)	0.56 (0.41-0.75)	1.7x10 ⁻⁴
	Model 2:	1.00 (Reference)	0.70 (0.49-0.99)	0.66 (0.44-0.98)	0.04	1.00 (Reference)	0.70 (0.53-0.93)	0.57 (0.41-0.80)	9.5x10 ⁻⁴
Subcutaneous fat:fascia	Unadjusted:	1.00 (Reference)	0.65 (0.47-0.90)	0.80 (0.59-1.09)	0.15	1.00 (Reference)	0.67 (0.52-0.88)	0.73 (0.57-0.95)	0.02
	Model 1:	1.00 (Reference)	0.68 (0.47-0.98)	0.84 (0.51-1.38)	0.35	1.00 (Reference)	0.67 (0.49-0.90)	0.72 (0.48-1.06)	0.07
	Model 2:	1.00 (Reference)	0.65 (0.44-0.95)	0.78 (0.46-1.31)	0.24	1.00 (Reference)	0.63 (0.46-0.86)	0.65 (0.43-0.97)	0.02

Hazard ratios (HRs) and 95% confidence intervals (CI) from Cox proportional models. Model 1 adjustments include age, ECOG PS, sex, diabetes, albumin, and BMI in morphomic variable analyses. Model 2 additionally includes CA19-9 and race. BMI Model 1 N: 458 (N progression=212, N death=319); Morphomics Model 1 N: 476 (N progression=222, N death=332). *BMI*: Body mass index, *ECOG PS*: Eastern Cooperative Oncology Group performance status.

eFigure 2. Association shapes of BMI and morphomic variables with progression-free and overall survival



Restricted cubic splines describing relationships between body mass index and select morphomic variables with progression-free and overall survival after adjustment for adjusted for age, ECOG PS, sex, BMI, albumin, and diabetes. *BMI*: Body mass index, *ECOG PS*: Eastern Cooperative Oncology Group performance status.

eTable 4. Sensitivity analyses

	Progression-free survival HR (95% CI), p-trend				Overall survival HR (95% CI), p-trend			
BMI sensitivity analysis: all patients with BMI data (BMI≥ 18.5)								
	18.5-24.9	25.0-29.9	≥30	p-trend	18.5-24.9	25.0-29.9	≥30	p-trend
	1.00 (Reference)	0.93 (0.69, 1.26)	0.94 (0.65, 1.36)	0.66	1.00 (Reference)	0.88 (0.69, 1.12)	0.90 (0.67, 1.12)	0.37
Low, middle, high tertiles, p-trend HR (95% CI), p-trend								
	1.00 (Reference)	0.97 (0.71, 1.34)	0.80 (0.58, 1.12)	0.20	1.00 (Reference)	0.94 (0.73, 1.23)	0.85 (0.66, 1.10)	0.22
Morphomic sensitivity analysis 1: T10-T12 vertebral levels								
Muscle area	1.00 (Reference)	0.54 (0.35-0.85)	0.46 (0.26-0.82)	0.02	1.00 (Reference)	0.63 (0.44-0.92)	0.52 (0.32-0.85)	0.02
Subcutaneous fat area	1.00 (Reference)	0.58 (0.40-0.84)	0.68 (0.41-1.13)	0.07	1.00 (Reference)	0.68 (0.51-0.91)	0.54 (0.36-0.81)	0.003
Visceral fat density	1.00 (Reference)	0.99 (0.71-1.39)	1.53 (1.10-2.13)	0.01	1.00 (Reference)	0.86 (0.65-1.13)	1.33 (1.01-1.75)	0.05
Fascia index	1.00 (Reference)	1.44 (0.99-2.10)	1.85 (1.14-2.98)	0.01	1.00 (Reference)	1.16 (0.86-1.56)	1.23 (0.84-1.79)	0.28
Muscle-to-Fascia	1.00 (Reference)	0.75 (0.54-1.03)	0.68 (0.48-0.97)	0.03	1.00 (Reference)	0.82 (0.63-1.08)	0.69 (0.52-0.92)	0.01
Morphomic sensitivity analysis 2: exclude BMI from covariate adjustments								
Muscle area	1.00 (Reference)	0.85 (0.61-1.17)	0.68 (0.48-0.98)	0.04	1.00 (Reference)	0.98 (0.75-1.28)	0.83 (0.62-1.10)	0.20
Subcutaneous fat area	1.00 (Reference)	0.63 (0.45-0.88)	0.86 (0.61-1.21)	0.32	1.00 (Reference)	0.71 (0.54-0.94)	0.78 (0.59-1.03)	0.08
Visceral fat density	1.00 (Reference)	1.12 (0.79-1.58)	1.65 (1.18-2.30)	0.003	1.00 (Reference)	0.92 (0.70-1.21)	1.44 (1.10-1.88)	0.01
Fascia index	1.00 (Reference)	1.22 (0.86-1.71)	1.51 (1.07-2.15)	0.02	1.00 (Reference)	1.17 (0.88-1.54)	1.26 (0.95-1.67)	0.12
Muscle-to-Fascia	1.00 (Reference)	0.68 (0.49-0.94)	0.60 (0.42-0.86)	0.01	1.00 (Reference)	0.70 (0.54-0.92)	0.59 (0.44-0.79)	4.2x10 ⁻⁴
Morphomic sensitivity analysis 3: only venous-phase scans								
Muscle area	1.00 (Reference)	0.68 (0.46-1.00)	0.67 (0.44-1.02)	0.07	1.00 (Reference)	0.88 (0.64-1.20)	0.83 (0.59-1.17)	0.30
Subcutaneous fat area	1.00 (Reference)	0.59 (0.39-0.88)	0.63 (0.36-1.09)	0.06	1.00 (Reference)	0.70 (0.51-0.96)	0.54 (0.35-0.84)	0.01
Visceral fat density	1.00 (Reference)	0.98 (0.67-1.42)	1.51 (1.03-2.21)	0.03	1.00 (Reference)	0.89 (0.66-1.20)	1.46 (1.07-2.00)	0.02
Fascia index	1.00 (Reference)	1.34 (0.88-2.05)	2.29 (1.33-3.94)	0.003	1.00 (Reference)	1.27 (0.91-1.77)	1.62 (1.06-2.49)	0.03
Muscle-to-Fascia	1.00 (Reference)	0.56 (0.39-0.80)	0.57 (0.38-0.85)	0.01	1.00 (Reference)	0.63 (0.47-0.85)	0.55 (0.40-0.76)	3.0x10 ⁻⁴
Morphomic sensitivity analysis 4: L3 vertebral level								
Muscle area	1.00 (Reference)	0.91 (0.59-1.40)	0.80 (0.46-1.41)	0.43	1.00 (Reference)	0.98 (0.68-1.40)	0.88 (0.56-1.39)	0.52
Subcutaneous fat area	1.00 (Reference)	0.72 (0.50-1.02)	0.68 (0.42-1.11)	0.10	1.00 (Reference)	0.80 (0.60-1.07)	0.66 (0.45-0.99)	0.04
Subcutaneous fat index	1.00 (Reference)	1.28 (0.84-1.96)	1.34 (0.84-2.14)	0.27	1.00 (Reference)	0.88 (0.63-1.24)	1.04 (0.72-1.51)	0.63
Visceral fat density	1.00 (Reference)	1.02 (0.72-1.45)	1.53 (1.09-2.15)	0.01	1.00 (Reference)	0.92 (0.70-1.21)	1.46 (1.11-1.93)	0.01
Fascia index	1.00 (Reference)	1.47 (1.02-2.11)	1.92 (1.21-3.05)	0.005	1.00 (Reference)	1.31 (0.97-1.76)	1.59 (1.09-2.30)	0.01
Muscle-to-Fascia	1.00 (Reference)	0.75 (0.53-1.06)	0.66 (0.45-0.97)	0.04	1.00 (Reference)	0.69 (0.52-0.91)	0.56 (0.41-0.77)	3.7x10 ⁻⁴

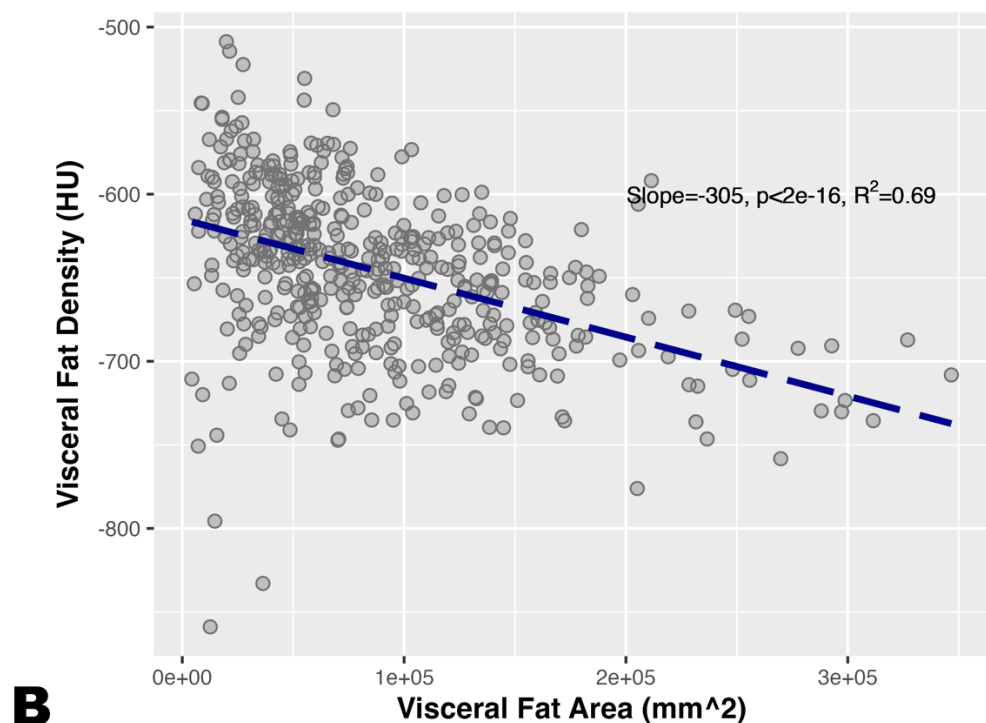
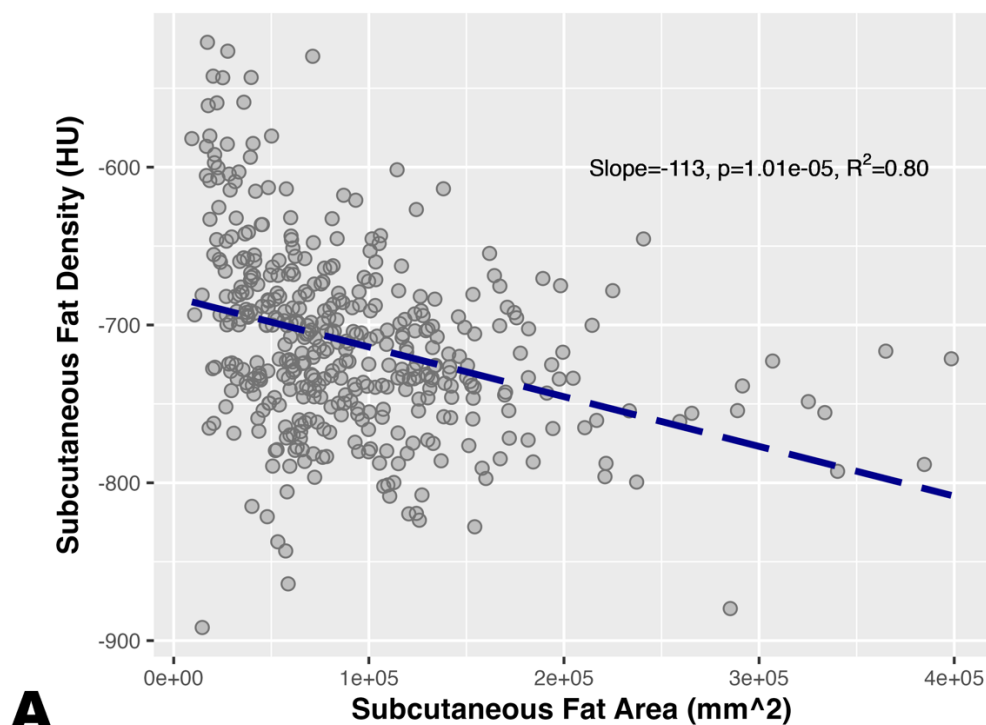
Hazard ratios (HRs) and 95% confidence intervals (CI) from multivariate Cox proportional models. BMI sensitivity analysis and morphomic sensitivity analysis 2 models were adjusted for age, ECOG PS, sex, diabetes, and blood albumin. Sensitivity analysis 1 and 3 additionally adjusted for BMI. *BMI*: Body mass index, *ECOG PS*: Eastern Cooperative Oncology Group performance status.

eTable 5. Comparing patient characteristics between the highest and lowest morphomic variable tertiles

Variable	Lowest tertile, highest tertile								
	Median [25%, 75%] or N%, p-value								
	Subcutaneous Fat Area			Visceral Fat Density			Muscle-to-Fascia		
Demographics									
Age	63 [57, 67]	61 [55, 67]	0.19	61 [54, 66]	63 [58, 68]	0.004	66 [60, 70]	59 [51, 64]	<0.001
Sex (Male)	119 (74.8)	71 (44.9)	<0.001	98 (62.4)	86 (5.5)	0.23	75 (47.2)	107 (67.7)	<0.001
Baseline CA19-9	1478 [172, 10000]	1902 [176, 11540]	0.92	1140 [87, 9948]	2357 [227, 15539]	0.08	2258 [218, 11793]	733 [120, 6383]	0.05
ECOG PS (1)	94 (59.1)	83 (52.5)	0.29	81 (51.6)	78 (4.9)	0.87	87 (54.7)	78 (49.4)	0.40
Baseline comorbidities									
Diabetes	37 (23.3)	54 (34.2)	0.04	44 (28)	42 (2.7)	0.93	57 (35.8)	33 (20.9)	0.005
PDA Resection	2 (1.3)	2 (1.3)	1.00	1 (0.6)	6 (0.4)	0.12	3 (1.9)	1 (0.6)	0.62
Hypertension	61 (38.4)	94 (59.5)	<0.001	77 (49)	72 (4.6)	0.69	98 (61.6)	57 (36.1)	<0.001
Abdominal pain	95 (59.7)	100 (63.3)	0.59	99 (63.1)	92 (5.8)	0.53	96 (60.4)	95 (60.1)	1.00
Hyperlipidemia	20 (12.6)	33 (20.9)	0.07	33 (21)	27 (1.7)	0.49	38 (23.9)	25 (15.8)	0.10
Osteoarthritis	3 (1.9)	15 (9.5)	0.007	12 (7.6)	5 (0.3)	0.14	11 (6.9)	1 (0.6)	0.008
Gastro reflux	29 (18.2)	63 (39.9)	<0.001	47 (29.9)	44 (2.8)	0.83	57 (35.8)	26 (16.5)	<0.001
Albumin (N-H)	136 (85.5)	132 (83.5)	0.74	139 (88.5)	125 (7.9)	0.06	129 (81.1)	138 (87.3)	0.17
Anthropometrics									
BMI	21.9 [19.9, 23.4]	29.7 [27.3, 33.2]	<0.001	27.1 [23.8, 32.0]	23.0 [21.1, 25.9]	<0.001	27.0 [22.8, 30.3]	23.8 [21.8, 26.5]	<0.001
Height (cm)	171 [165, 178]	170 [160, 178]	0.10	172 [164, 179]	168 [160, 176]	0.006	168 [160, 176]	171 [164, 178]	0.049
Weight (kg)	64.0 [55.7, 71.8]	85.1 [74.9, 101.9]	<0.001	82 [67, 95]	65 [57, 75]	<0.001	77 [64, 90]	69 [61, 80]	0.001
BSA	1.74 [1.60, 1.89]	1.99 [1.83, 2.20]	<0.001	1.98 [1.79, 2.18]	1.76 [1.60, 1.90]	<0.001	1.89 [1.70, 2.09]	1.81 [1.66, 1.97]	0.008

Chi-square or Fisher's exact test was used to compare categorical variables and ANOVA or the Kruskal-Wallis test for continuous variables, as appropriate. BMI: body mass index, BSA: body surface area, CA19-9: cancer antigen 19-9, ECOG PS: Eastern Cooperative Oncology Group performance status, Gastro: gastroesophageal, HU: Hounsfield units, PDA: pancreatic ductal adenocarcinoma.

eFigure 3. Association of key morphomic variables' area and density variables



A scatter plot displaying key morphomic variables' area versus density variables with results (slope, p-value, and R^2) from linear regression of area regressed on density adjusted for age, ECOG PS, sex, BMI, albumin, and diabetes. *BMI*: Body mass index, *ECOG PS*: Eastern Cooperative Oncology Group performance status.

eFigure 4. Associations of metabolites and morphomic variables



Multivariate linear regression of metabolites (log-transformed (ln[x+1]) and z-scored) and morphomic variables (z-scored). Models were adjusted for age, ECOG PS, sex, BMI, albumin, and diabetes. All associations with p<0.05 are shown. *BMI*: Body mass index, *CI*: confidence interval, *ECOG PS*: Eastern Cooperative Oncology Group performance status. *Indicates significance per our p<0.00063 cutoff.