Pubmed search:

("Enterocolitis, Necrotizing" [Mesh] OR "necrotizing enterocolitis" OR "necrotising

enterocolitis") AND ("Ultrasonography" [Mesh] OR ultrasonograph* OR sonograph* OR

ultrasound*) AND (English[lang])

CINAHL search:

((MH "Enterocolitis, Necrotizing") OR "necrotizing enterocolitis" OR "necrotising

enterocolitis") AND ((MH"Ultrasonography") OR ultrasonograph* OR sonograph* OR

ultrasound*) AND Limiters – English Language, Expanders – Apply related words; Also

search within the full text of the articles; Apply equivalent subjects

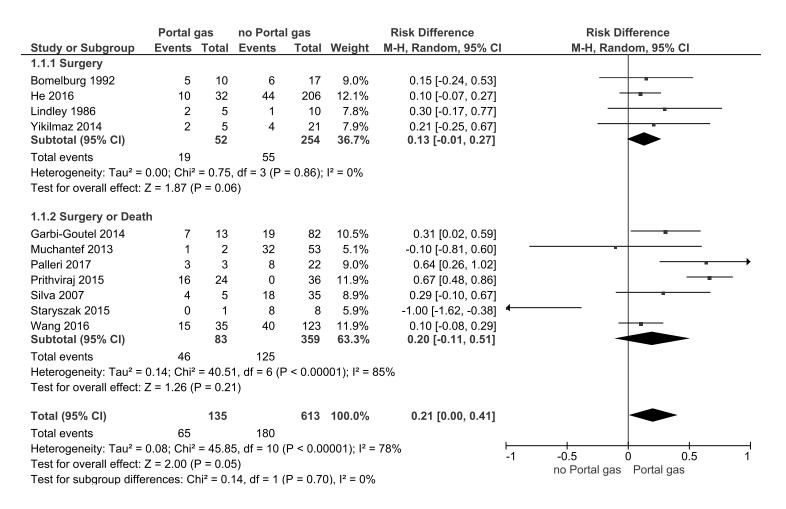
Embase search:

('necrotizing enterocolitis'/exp OR 'necrotizing enterocolitis' OR 'necrotising

enterocolitis'/exp or 'necrotising enterocolitis') AND (ultrasonograph* OR sonograph* OR

ultrasound*) AND [English]/lim AND [embase]/lim NOT [medline]/lim

Online Resource 1: Search strategy for Pubmed, CINAHL, and Embase.



Online Resource 2: Forest plots for association of portal venous gas with surgery and surgery or death. Event refers to either surgery or surgery or death. Odds ratios (95% confidence intervals) for each study are denoted by boxes (lines and arrows). Combined odds ratio estimate for all studies is represented by the diamond. Tau-squared (Tau2) >1, Cochran Q (Chi2) P<0.1, and inconsistency (I2) \geq 50% suggests substantial statistical heterogeneity. Z score with P<0.05 indicates test for overall effect was statistically significant. CI = confidence interval. M-H = Mantel-Haenszel test.

	Pneumat	tosis	no Pneuma	atosis		Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% C	M-H, Random, 95% Cl
2.1.1 Surgery							
Bomelburg 1992	6	14	2	9	8.3%	2.63 [0.39, 17.46]	
He 2016	8	24	46	214	18.1%	1.83 [0.74, 4.53]	
Yikilmaz 2014	8	16	0	10	4.0%	21.00 [1.05, 418.48]	
Subtotal (95% CI)		54		233	30.3%	2.61 [0.93, 7.34]	
Total events	22		48				
Heterogeneity: Tau ² =	0.22; Chi ² :	= 2.52, c	lf = 2 (P = 0.	28); l² =	21%		
Test for overall effect:	Z = 1.81 (P	9 = 0.07)					
2.1.2 Surgery or Deat	:h						
Garbi-Goutel 2014	18	51	8	44	17.4%	2.45 [0.94, 6.39]	
Muchantef 2013	6	7	27	48	6.7%	4.67 [0.52, 41.80]	
Palleri 2017	7	19	4	6	8.0%	0.29 [0.04, 2.02]	
Prithviraj 2015	16	31	0	29	4.3%	62.81 [3.53, 1118.73]	
Silva 2007	14	21	8	19	13.3%	2.75 [0.76, 9.95]	+
Staryszak 2015	3	4	5	5	3.1%	0.21 [0.01, 6.82]	· · · · · · · · · · · · · · · · · · ·
Wang 2016	8	18	47	140	16.9%	1.58 [0.59, 4.28]	- +
Subtotal (95% CI)		151		291	69.7%	2.07 [0.85, 5.05]	
Total events	72		99				
Heterogeneity: Tau ² =	0.67; Chi ² :	= 12.66,	df = 6 (P = 0	0.05); l² =	= 53%		
Test for overall effect:	Z = 1.60 (P	9 = 0.11)					
Total (95% Cl)		205		524	100.0%	2.25 [1.18, 4.31]	◆
Total events	94		147				
Heterogeneity: Tau ² =	0.39; Chi ² :	= 15.21,	df = 9 (P = 0	0.09); l² =	= 41%		
Test for overall effect:	Z = 2.46 (P	e = 0.01)	`				0.01 0.1 1 10 100 No pneumatosis Pneumatosis
Test for subgroup diffe	•	,		0.74), l²	= 0%		No prieurratosis Frieurratosis

Online Resource 3: Forest plots for association of pneumatosis with surgery and surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.

	Free a	ir	No free	air		Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% Cl	CI M-H, Random, 95% CI
3.1.1 Surgery or Deat	h						
Garbi-Goutel 2014	5	7	21	88	22.2%	7.98 [1.44, 44.17]	
Muchantef 2013	7	8	26	47	19.7%	5.65 [0.64, 49.66]	
Prithviraj 2015	10	10	6	50	15.7%	143.77 [7.49, 2757.85]	
Silva 2007	6	6	16	34	15.7%	14.58 [0.76, 279.04]	
Staryszak 2015	0	1	8	8	10.6%	0.02 [0.00, 1.43]	
Wang 2016 Subtotal (95% Cl)	13	13 45	42	145 372	16.2% 100.0%	65.75 [3.82, 1131.24] 9.63 [1.65, 56.32]	
Total events	41		119				
Heterogeneity: Tau ² = 2	2.90; Chi²	= 13.3	2, df = 5 (P = 0.0	2); l² = 62	%	
Test for overall effect: 2	Z = 2.51 (F	> = 0.0	1)				
Total (95% CI)		45		372	100.0%	9.63 [1.65, 56.32]	
Total events	41		119				
Heterogeneity: Tau ² = 2	2.90; Chi²	= 13.3	2, df = 5 (P = 0.0	2); I² = 62	%	+ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$
Test for overall effect: 2	Z = 2.51 (F	> = 0.0	1)				Free air No free air
Test for subgroup differ	rences: No	ot appli	cable				

Online Resource 4: Forest plot for association of free air with surgery or death in NEC. See Online Resource 2 legend for an explanation of symbols and statistics.

	Wall thick	ness	No wall thic	kness		Odds Ratio		Odds Ratio			
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% C		M-H, Random, 95% Cl			
5.1.2 Surgery or Deat	h										
Garbi-Goutel 2014	13	31	13	64	24.4%	2.83 [1.11, 7.24]					
Muchantef 2013	23	30	10	25	15.8%	4.93 [1.54, 15.79]					
Palleri 2017	3	5	8	20	5.4%	2.25 [0.30, 16.63]					
Prithviraj 2015	16	43	0	17	2.6%	21.00 [1.18, 372.84]					
Silva 2007	15	19	7	21	10.5%	7.50 [1.80, 31.28]					
Staryszak 2015	8	8	0	1	1.2%	51.00 [0.70, 3710.31]					
Wang 2016	23	42	32	116	40.1%	3.18 [1.53, 6.60]					
Subtotal (95% CI)		178		264	100.0%	3.86 [2.43, 6.14]		•			
Total events	101		70								
Heterogeneity: Tau ² =	0.00; Chi ² =	4.78, di	⁻ = 6 (P = 0.57	'); l² = 0%	þ						
Test for overall effect:	Z = 5.71 (P	< 0.000	01)								
Total (95% CI)		178		264	100.0%	3.86 [2.43, 6.14]		•			
Total events	101		70								
Heterogeneity: Tau ² =	0.00; Chi ² =	4.78, df	= 6 (P = 0.57	'); l² = 0%	D		+ + +		-+		
Test for overall effect:	Z = 5.71 (P	< 0.0000	01)	,.			0.01 0.1		100		
Test for subgroup diffe	``		,				INO WAILI	thickness Wall thickness			

Online Resource 5: Forest plot for association of bowel wall thickening with surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.

	Wall thin	ness	No wall this	nness		Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% C	M-H, Random, 95% Cl
5.2.2 Surgery or Deat	h						
Muchantef 2013	10	11	23	44	22.0%	9.13 [1.08, 77.53]	
Palleri 2017	5	11	6	14	27.4%	1.11 [0.23, 5.45]	
Prithviraj 2015	9	10	7	50	21.4%	55.29 [6.03, 506.52]	
Silva 2007	15	19	7	21	29.2%	7.50 [1.80, 31.28]	
Staryszak 2015	0	0	8	9		Not estimable	
Subtotal (95% CI)		51		138	100.0%	7.11 [1.56, 32.29]	
Total events	39		51				
Heterogeneity: Tau ² =	1.52; Chi ² :	= 8.45, c	df = 3 (P = 0.0	04); l² = 6	64%		
Test for overall effect:	Z = 2.54 (P	9 = 0.01)	I				
Total (95% CI)		51		138	100.0%	7.11 [1.56, 32.29]	
Total events	39		51				
Heterogeneity: Tau ² =	1.52; Chi ² :	= 8.45, c	df = 3 (P = 0.0	04); I² = 6	64%		+ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$
Test for overall effect:	Z = 2.54 (P	= 0.01)	I				0.01 0.1 1 10 100 No wall thinness Wall thinness
Test for subgroup diffe	erences: No	t applica	able				No wai tiininess Wall tiininess

Online Resource 6: Forest plot for association of bowel wall thinning with surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.

	Echoger	ecity	No echoge	necity		Odds Ratio		Odds Ratio			
Study or Subgroup	p Events Total		Events Total		Weight	M-H, Random, 95% C		M-H, Random, 95% Cl			
4.1.2 Surgery or Dea	th										
Muchantef 2013	24	30	9	25	57.8%	7.11 [2.12, 23.88]					
Silva 2007	18	22	4	18	35.2%	15.75 [3.34, 74.35]			_		
Staryszak 2015 Subtotal (95% CI)	3	3 55	5	6 49	7.0% 100.0%	1.91 [0.06, 61.34] 8.58 [3.42, 21.53]					
Total events	45		18								
Heterogeneity: Tau ² =	0.00; Chi ² :	= 1.40, c	lf = 2 (P = 0.5	50); I² = 0	%						
Test for overall effect:	Z = 4.57 (P	< 0.000	001)	,							
Total (95% CI)		55		49	100.0%	8.58 [3.42, 21.53]					
Total events	45		18								
Heterogeneity: Tau ² =	0.00; Chi ² :	= 1.40, c	lf = 2 (P = 0.5	50); I ² = 0	%		+ 0.01	0.1			
est for overall effect: $Z = 4.57$ (P < 0.00001)								V. I No echogenecity	1 10 Echogenicity	100	
Test for subgroup diffe	erences: No	t applica	able					5 ,	- · ·		

Online Resource 7: Forest plot for association of increased bowel wall echogenicity with surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.

	Absent peris	stalsis	No absent peri	stalsis		Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% C	M-H, Random, 95% Cl
10.1.2 Surgery or Dea	ath						
Muchantef 2013	19	21	14	34	25.6%	13.57 [2.72, 67.84]	
Palleri 2017	7	11	4	14	25.1%	4.38 [0.81, 23.69]	
Prithviraj 2015	14	15	2	45	20.3%	301.00 [25.33, 3576.60]	
Wang 2016	9	19	46	139	29.1%	1.82 [0.69, 4.79]	+
Subtotal (95% CI)		66		232	100.0%	10.68 [1.65, 69.02]	
Total events	49		66				
Heterogeneity: Tau ² =	2.87; Chi ² = 16	6.65, df =	3 (P = 0.0008); I	² = 82%			
Test for overall effect:	Z = 2.49 (P = 0	0.01)					
Total (95% CI)		66		232	100.0%	10.68 [1.65, 69.02]	
Total events	49		66				
Heterogeneity: Tau ² =	2.87; Chi ² = 16	6.65, df =	3 (P = 0.0008); I	² = 82%			
Test for overall effect:	Z = 2.49 (P = 0)	0.01)					0.01 0.1 1 10 100 No absent peristalsis Absent peristalsis
Test for subgroup diffe	erences: Not ap	plicable					No absent pensiaisis Absent pensiaisis

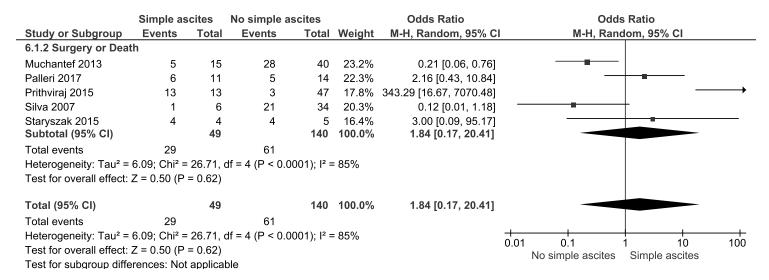
Online Resource 8: Forest plot for association of absent peristalsis with surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.

	Increased per	fusion	No increased per	fusion		Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% Cl	M-H, Random, 95% Cl
9.1.2 Surgery or Deat	h						
Muchantef 2013	17	26	16	29	31.1%	1.53 [0.52, 4.57]	
Palleri 2017	8	16	3	9	24.9%	2.00 [0.37, 10.92]	
Prithviraj 2015	16	27	0	33	15.1%	96.13 [5.33, 1733.40]	 **
Silva 2007	14	26	8	14	28.9%	0.88 [0.24, 3.24]	
Subtotal (95% CI)		95		85	100.0%	2.60 [0.61, 11.13]	
Total events	55		27				
Heterogeneity: Tau ² =	1.45; Chi² = 10.0)7, df = 3	(P = 0.02); I ² = 70%	•			
Test for overall effect: 2	Z = 1.29 (P = 0.2	20)					
Total (95% CI)		95		85	100.0%	2.60 [0.61, 11.13]	
Total events	55		27				
Heterogeneity: Tau ² =	1.45; Chi² = 10.0	07, df = 3	(P = 0.02); I ² = 70%				
Test for overall effect: 2	Z = 1.29 (P = 0.2	20)					0.01 0.1 1 10 100 No increased perfusion
Test for subgroup different	rences: Not appl	licable					No increased perfusion increased perfusion

Online Resource 9: Forest plot for association of increased bowel perfusion with surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.

	Absent perfusion No absent perfusio					Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% C	M-H, Random, 95% Cl
9.2.2 Surgery or Deat	h						
Muchantef 2013	11	12	22	43	32.9%	10.50 [1.24, 88.59]	
Palleri 2017	3	3	8	22	15.8%	11.94 [0.55, 260.28]	
Silva 2007	8	10	14	30	51.3%	4.57 [0.83, 25.21]	
Subtotal (95% CI)		25		95	100.0%	6.99 [2.06, 23.76]	
Total events	22		44				
Heterogeneity: Tau ² =	0.00; Chi ² = 0	.50, df = 2	2 (P = 0.78); l ² =	0%			
Test for overall effect:	Z = 3.12 (P =	0.002)					
Total (95% CI)		25		95	100.0%	6.99 [2.06, 23.76]	
Total events	22		44				
Heterogeneity: Tau ² =	0.00; Chi ² = 0	.50, df = 2	2 (P = 0.78); l ² =	0%			
Test for overall effect:	Z = 3.12 (P =	0.002)					0.01 0.1 1 10 100 No absent perfusion Absent perfusion
Test for subgroup diffe	rences: Not a	pplicable					No absent perusion Absent perusion

Online Resource 10: Forest plot for association of absent perfusion with surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.



Online Resource 11: Forest plot for association of simple ascites with surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.

	Complex ascites No complex ascites					Odds Ratio	Odds	Ratio
Study or Subgroup	roup Events Tota		Events	Total	Weight	M-H, Random, 95% C	I M-H, Rand	lom, 95% Cl
6.2.2 Surgery or Dea	th							
Muchantef 2013	25	28	8	27	45.4%	19.79 [4.62, 84.78]		
Silva 2007	17	22	5	18	46.7%	8.84 [2.11, 37.11]		_
Staryszak 2015 Subtotal (95% CI)	3	3 53	5	6 51	8.0% 100.0%	1.91 [0.06, 61.34] 11.28 [4.23, 30.04]		
Total events Heterogeneity: Tau ² = Test for overall effect:	-		. ,.	= 0%				
Total (95% CI)		53		51	100.0%	11.28 [4.23, 30.04]		
Total events	45		18					
Heterogeneity: Tau ² =	0.00; Chi ² = 1	.69, df =	2 (P = 0.43); I ² =	= 0%				
Test for overall effect:	Z = 4.85 (P <	0.00001)				0.01 0.1 Vo complex ascites	1 10 100 Complex ascites
Test for subgroup diffe	erences: Not a	pplicable	9				no complex asciles	Complex asciles

Online Resource 12: Forest plot for association of complex ascites with surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.

Focal fluid collection		No focal fluid coll	ection		Odds Ratio		Odds Ratio		
Events	Total	Events	Total	Weight	M-H, Random, 95% C	I	M-H, Randon	n, 95% Cl	
h									
5	9	21	86	27.6%	3.87 [0.95, 15.75]		-		
12	13	21	42	22.5%	12.00 [1.43, 100.75]		-		
7	8	4	17	20.8%	22.75 [2.11, 244.87]				
16	16	0	44	12.4%	2937.00 [55.96, 154132.85]				\rightarrow
3	3	19	37	16.8%	6.64 [0.32, 137.55]				
	49		226	100.0%	17.92 [3.11, 103.31]				
43		65							
2.38; Chi² = 10.8	5, df = 4 (P = 0.03); I ² = 63%							
Z = 3.23 (P = 0.0	01)								
	49		226	100.0%	17.92 [3.11, 103.31]				
43		65							
2.38; Chi² = 10.8	5, df = 4 (P = 0.03); l ² = 63%				+		10	100
Z = 3.23 (P = 0.0	01)					0.01			100
rences: Not appl	cable								
	Events h 5 12 7 16 3 43 2.38; Chi ² = 10.8 Z = 3.23 (P = 0.0 43 2.38; Chi ² = 10.8 Z = 3.23 (P = 0.0	Events Total 5 9 12 13 7 8 16 16 3 3 43 2.38; Chi ² = 10.85, df = 4 (2 = 3.23 (P = 0.001) 49 43 43	EventsTotalEvents59211213217841616033194943652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%223.23 (P = 0.001)4943652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%22.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%23.23 (P = 0.001)	EventsTotalEventsTotal 5 92186121321427841716160443319374922643652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%243652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%22.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%22.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%22.323 (P = 0.001)226	EventsTotalEventsTotalWeighth59218627.6%1213214222.5%7841720.8%161604412.4%33193716.8%49226100.0%43652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%226100.0%43652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%226100.0%43652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%226	EventsTotalEventsTotalWeightM-H, Random, 95% Ch 5 9218627.6% 3.87 [0.95, 15.75]1213214222.5%12.00 [1.43, 100.75]7841720.8%22.75 [2.11, 244.87]161604412.4%2937.00 [55.96, 154132.85]33193716.8%6.64 [0.32, 137.55]49226100.0%17.92 [3.11, 103.31]43652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%226100.0%17.92 [3.11, 103.31]43652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%226100.0%17.92 [3.11, 103.31]43652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%226100.0%17.92 [3.11, 103.31]43652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%226100.0%17.92 [3.11, 103.31]	EventsTotalEventsTotalWeightM-H, Random, 95% Cln59218627.6% 3.87 [0.95, 15.75]1213214222.5% 12.00 [1.43, 100.75]7841720.8%22.75 [2.11, 244.87]161604412.4%2937.00 [55.96, 154132.85]33193716.8%6.64 [0.32, 137.55]49226100.0%17.92 [3.11, 103.31]43652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%226100.0%17.92 [3.11, 103.31]43652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%226100.0%17.92 [3.11, 103.31]43652.38; Chi ² = 10.85, df = 4 (P = 0.03); l ² = 63%226100.0%17.92 [3.11, 103.31]43650.0010.010.01	Events Total Events Total Weight M-H, Random, 95% Cl M-H, Random n 5 9 21 86 27.6% 3.87 [0.95, 15.75] 12 13 21 42 22.5% 12.00 [1.43, 100.75] - 12 13 21 42 22.5% 12.00 [1.43, 100.75] - - 7 8 4 17 20.8% 22.75 [2.11, 244.87] - - 16 16 0 44 12.4% 2937.00 [55.96, 154132.85] - - 3 3 19 37 16.8% 6.64 [0.32, 137.55] - - 43 65 - <td>Events Total Events Total Weight M-H, Random, 95% Cl M-H, Random, 95% Cl n 5 9 21 86 27.6% 3.87 [0.95, 15.75] 12 13 21 42 22.5% 12.00 [1.43, 100.75] 12 13 21 42 22.5% 12.00 [1.43, 100.75] 16 16 0 44 17 20.8% 22.75 [2.11, 244.87] 16 16 0 44 12.4% 2937.00 [55.96, 154132.85] 17.92 [3.11, 103.31] 18 17.92 [3.11, 103.31] 19 37 16.8% 6.64 [0.32, 137.55] 16 16 10 10 10 10 10 10 10 10 No focal fluid F</td>	Events Total Events Total Weight M-H, Random, 95% Cl M-H, Random, 95% Cl n 5 9 21 86 27.6% 3.87 [0.95, 15.75] 12 13 21 42 22.5% 12.00 [1.43, 100.75] 12 13 21 42 22.5% 12.00 [1.43, 100.75] 16 16 0 44 17 20.8% 22.75 [2.11, 244.87] 16 16 0 44 12.4% 2937.00 [55.96, 154132.85] 17.92 [3.11, 103.31] 18 17.92 [3.11, 103.31] 19 37 16.8% 6.64 [0.32, 137.55] 16 16 10 10 10 10 10 10 10 10 No focal fluid F

Online Resource 13: Forest plot for association of focal fluid collection with surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.

	Dilated b	owel	No dilated	bowel		Odds Ratio	Odds Ratio				
Study or Subgroup	Events	Total	Events Total		Weight	M-H, Random, 95% C	n, 95% CI M-		, Random, 95% Cl		
8.1.1 Surgery or Dea	th										
Muchantef 2013	3	3	30	52	4.8%	5.16 [0.25, 105.06]					
Staryszak 2015	4	5	4	4	3.6%	0.33 [0.01, 10.57]					
Wang 2016 Subtotal (95% CI)	34	65 73	21	93 149	91.6% 100.0%	3.76 [1.89, 7.48] 3.50 [1.81, 6.75]					
Total events	41		55								
Heterogeneity: Tau ² =	0.00; Chi ²	= 1.89, c	lf = 2 (P = 0.3	39); l² = (0%						
Test for overall effect:	Z = 3.73 (F	9 = 0.000)2)								
Total (95% Cl)		73		149	100.0%	3.50 [1.81, 6.75]			•		
Total events	41		55								
Heterogeneity: Tau ² =	0.00; Chi ²	= 1.89, c	lf = 2 (P = 0.3	39); l² = (0%		+	4		+	
Test for overall effect:							0.01 0. No dila	ted bowel	1 10 Dilated bowel	100	
Test for subgroup diffe	erences: No	t applica	able				NO UIIA		Dilated Dowel		

Online Resource 14: Forest plots for association of dilated bowel with surgery or death. See Online Resource 2 legend for an explanation of symbols and statistics.