

## Abstract

**Introduction:** The aim of this study was to develop a prediction model in patients with abdominal sepsis that could select out those that would benefit from an open abdomen.  
**Methods:** A retrospective review was performed of all adult (Age > 18) non-trauma patients who underwent damage control laparotomy (DCL) with an open abdomen (OA) for abdominal sepsis from January, 2004 to December, 2010. Patients with abdominal sepsis secondary to trauma or primary pancreatic disease were excluded. Patients were further divided into two groups: those that were not managed with an open abdomen (Non-OA) and those that were (OA). Data including indications and outcome were collected and analyzed. Variables were selected based on previous reports and common clinical sense and screened in an univariable regression analysis to identify those associated with the need for relaparotomy. Variables with the strongest association were considered for the prediction model which was constructed after backward elimination in a multivariable regression analysis.  
**Results:** A total of 401 patients were included of which 180 (44.9%) were managed Non-OA and 221 (55.1%) underwent an OA. Both groups were similar demographically. The median age was 55 years (IQR=38-68). The most common source of the abdominal sepsis was the colon in 140 (34.9%) patients, followed by the small bowel in 129 (32.2%). A total of 52 (13%) patients developed post-operative complications of which the most common was the entero-cutaneous fistula (10% in the OA group vs. 0.5% in the Non-OA group,  $p < 0.0001$ ). The overall mortality was 17.5%, which was noticeably less in the Non-OA group (13% vs. 21%,  $p = 0.0497$ ). The prediction model included abdominal sepsis from a small bowel source, abdominal sepsis from a colon source, diffuse peritonitis and an APACHE II score >15 as indicators for the need to leave the abdomen open. We also discovered that age >60 and acute perforated appendicitis were associated with higher complication rates when managed with an OA approach. Our predictive model had the capacity to determine 71.3% (*goodness-of-fit test*,  $p = 0.4035$ ) and to predict the need for an open abdomen in 77.3% of cases.  
**Conclusion:** We identified that an elevated APACHE II score >15, a colon or small bowel etiology of the abdominal sepsis, and the presence of diffuse peritonitis are the most common factors indicating the need for an open abdomen approach in severe intra-abdominal sepsis.

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The discriminatory capacity of the model was expressed with the area under the curve (AUC).

## Results

Table 1. General Characteristics

	Total (n=401)	Non-OA (n=180, 44.9%)	OA* (n=221, 55.1%)	P
Age (years)	55 (38-68)	53.5 (36.5-67.5)	56 (40-69)	0.3512
Sex (man)	198 (49.4)	87 (48.3)	111 (50.2)	0.7061
APACHE II score	15 (10-21)	14 (9-20)	16 (11-21)	0.0147
<b>Peritonitis</b>				
Localize	96 (23.9)	63 (35.0)	33 (14.9)	
Generalized	305 (76.1)	117 (65.0)	188 (85.1)	<0.0001
<b>Source</b>				
Liver	40 (10.0)	19 (10.6)	21 (9.5)	0.7263
Small bowel	129 (32.2)	36 (20.0)	93 (42.1)	<0.0001
Colon	140 (34.9)	42 (23.3)	98 (44.3)	<0.0001
Stomach and duodenum	40 (10.0)	17 (9.4)	23 (10.4)	0.749
Appendix	73 (18.2)	59 (32.8)	14 (6.3)	<0.0001

\* Open Abdomen

Table 3. Regression Model to predict the need to leave the abdomen open.

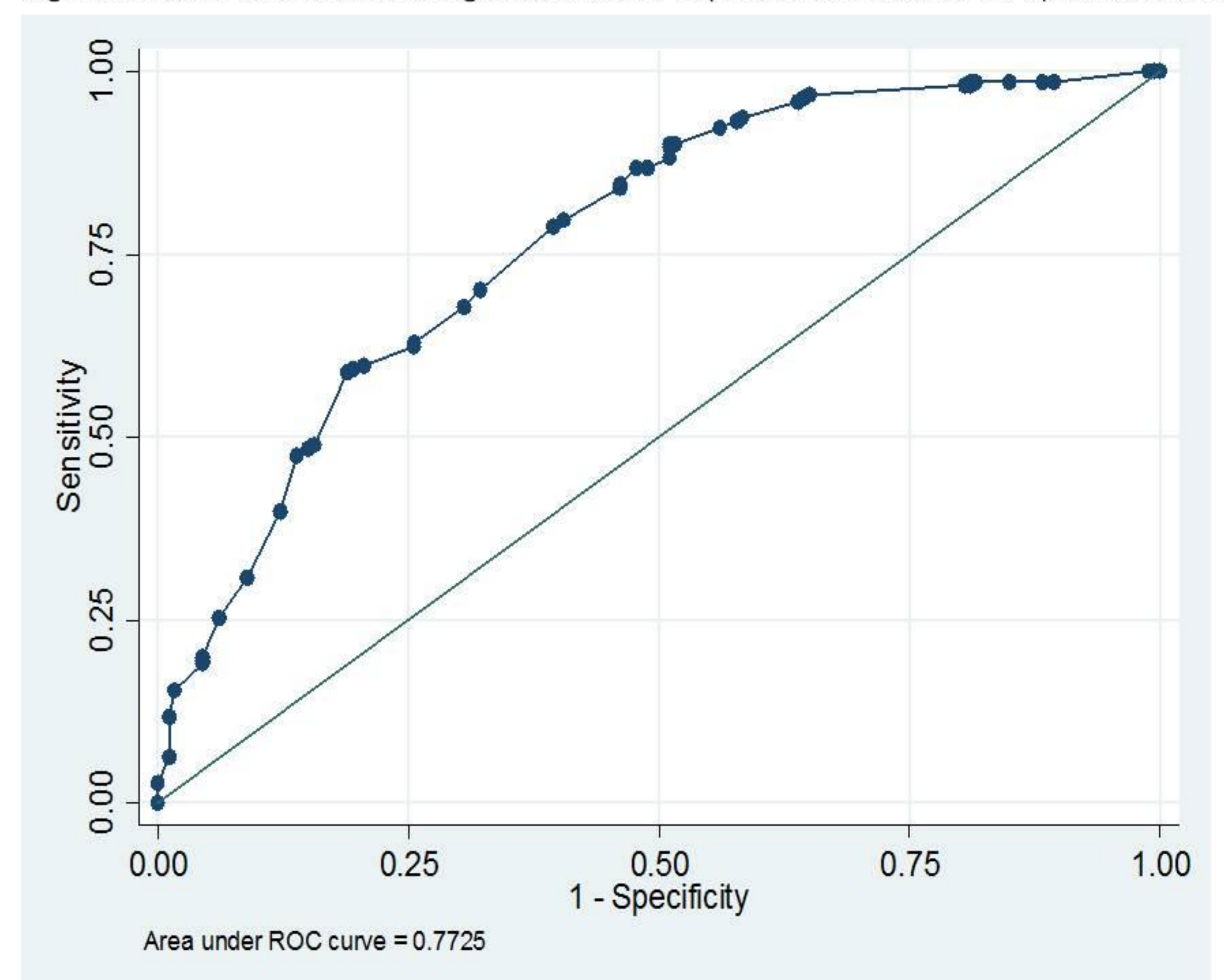
Variables	OR	P>z	[95% IC]
APACHE > 15	2.81	0.000	1.69 4.68
Generalized Peritonitis	2.88	0.000	1.67 4.96
Colon	2.46	0.001	1.47 4.12
Small Bowel	2.08	0.004	1.26 3.43
Appendix	0.24	0.000	0.12 0.48
Age > 60	0.43	0.001	0.26 0.71

Table 2. Complications, length and closure abdominal wall

	Total n (%)	Non-OA n (%)	OA* n (%)	P
<b>Complications</b>				
Leakage	24 (8.2)	0	23 (14.5)	<0.0001
Residual infection	13 (3.2)	5 (2.8)	8 (3.6)	0.6358
Abscess	13 (3.2)	7 (3.9)	6 (2.7)	0.5091
Bleeding	2 (0.5)	0	2 (0.9)	
Mortality	70 (17.5)	24 (13.3)	46 (20.8)	0.0497
<b>Length</b>				
UCI stay (days)*	9 (3-17)	3 (2-8)	11 (6-18)	<0.0001
Hospitalization	16 (8-30)	8.5 (5-16)	24.5 (14.5-38)	<0.0001
<b>Closure abdominal Wall</b>				
Closure of fascia	268 (66.8)	156 (86.7)	112 (50.7)	<0.0001
Closure of skin	94 (23.4)	18 (10.0)	76 (34.4)	<0.0001

\* Open Abdomen

Fig.1 ROC curve obtained from regression model to predict the need for an open abdomen



## Conclusion

We identified that an elevated APACHE II score >15, a colon or small bowel etiology of the abdominal sepsis, and the presence of generalized peritonitis are the most common factors indicating the need for an open abdomen approach in severe intra-abdominal sepsis. Our data also showed that age >60 and acute perforated appendicitis were associated with higher complication rates when managed with an OA approach.