## <sup>31st</sup> **ECCMID Development of a Clinical Score to Stratify the Risk for Carbapenem-resistant Enterobacteriaceae Bacteremia in Cancer Patients**

Herrera F<sup>1</sup>, Torres D<sup>1</sup>, Laborde A<sup>2</sup>, Berruezo L<sup>3</sup>, Jordán R<sup>4</sup>, Roccia Rossi I<sup>5</sup>, Valledor A<sup>6</sup>, Costantini P<sup>7</sup>, Dictar M<sup>8</sup>, Nenna A<sup>9</sup>, Pereyra M<sup>10</sup>, Lambert S<sup>11</sup>, Benso J<sup>12</sup>, Poletta F<sup>1</sup>, González Ibañez M<sup>2</sup>, Baldoni N<sup>3</sup>, Eusebio M<sup>4</sup>, Lovano F<sup>5</sup>, Barcán L<sup>6</sup>, Luck M<sup>7</sup>, Racioppi A<sup>8</sup>, Tula L<sup>11</sup>, Pasterán F<sup>13</sup>, Corso A<sup>13</sup>, Rapoport M<sup>13</sup>, Nicola F<sup>1</sup>, García Damiano M<sup>2</sup>, Carbone R<sup>3</sup>, Monge R<sup>4</sup>, Reynaldi M<sup>5</sup>, Greco G<sup>6, 12</sup>, Bronzi M<sup>7</sup>, Valle S<sup>8</sup>, Chaves M<sup>9</sup>, Vilches V<sup>10</sup>, Blanco M<sup>11</sup>, Carena A<sup>1</sup>. Argentinean Bacteremia in Cancer and Stem Cell Transplant Study Group (ROCAS Study)

1. Hospital Universitario CEMIC, 2. FUNDALEU, 3. HIGA Dr. Rodolfo Rossi, 4. Hospital Británico de Buenos Aires, 5. HIGA Gral. San Martín, 6. Hospital Italiano de Buenos Aires, 7. Instituto de Oncología Angel H. Roffo, 8. Instituto Alexander Fleming, 9. Hospital de Oncología Marie Curie, 10. Hospital Universitario Austral, 11. Hospital "El Cruce " Alta Complejidad en Red, 12. Hospital Italiano de Buenos Aires (San Justo), 13. Servicio de antimicrobianos, ANLIS Dr Carlos Malbrán. BUENOS AIRES - ARGENTINA.

## **Background:**

Carbapenem-resistant Enterobacteriaceae (CRE) bacteremia in cancer patients have a very high mortality. Being able to identify patients at risk would allow clinicians to initiate an appropriate empirical antibiotic treatment earlier.

We carried out this study to develop a clinical score to predict the risk of CRE bacteremia in cancer patients.

## Methods:

### Prospective multicenter study.

Adult patients with cancer or hematopoietic stem-cell transplant (HSCT) with Enterobacteriaceae bacteremia from 12 centers in Argentina (May 2014-June 2019). Risk factors for CRE bacteremia were identified (multiple logistic regression model). A score was developed according to the regression coefficient. Weighted scores for each variable were calculated by dividing each regression coefficient by one-half of the smallest coefficient and rounding to the nearest integer.

The predictive performance of the model was evaluated using sensitivity, specificity, positive and negative predictive values (PPV and NPV) and the area under the ROC curve (AUROC).

It was validated internally by the bootstrap resampling technique.

## **Results:** 443 patients were included 384 non-Carbapenem-Resitant Enterobacteriaceae (non-CRE) and 59 Carbapenem-Resistant Enterobacteriaceae (CRE)

Patient disease and outcome					Risk factors for CRE bacteremia: multivariate analysis							
	non-CRE	CRE	<i>p</i> -value	Risk factor			Adju	Adjusted OR (95%CI)		Points		
Hematologic neoplasms	59%	68%	0.192							(9		
HSCT	18%	27%	0.09	≥10-days hospitalization prior to bacteremia				<b>a</b> 4.03 (	4.03 (1.88-8.66)		2	
Solid tumors	23.2% 5.1% <b>0.001</b>			>7-days of antibiotic prior to bacteremia				4.65 (2	4.65 (2.29-9.46)		2	
30 day-Mortality	17.7%	54.2%	<0.001	Recent colonization by KPC-CRE			33.08 (	33.08 (11.7-93.25)		5		
Risk factors for CRE bacteremia: univariate analy			nalysis		0	1			te et much	- 1- 1124		
	Non-adjusted OR	sted OR		Sensitivity, specificity and post-test probability								
	(95%	SCI)	<i>p</i> -value	Cut-off	Sensiti	vity	Specificity	LR+	LR-	PTP+	PTP-	
Prior use of carbapenems	4.1 (2.3	4.1 (2.3-7.7)		≥0 ≥2	94.92	)% %	40.21%	1.58	0.12	13.30%	1.90%	
Central venous catheter in place	3.4 (1.7-6.7)		0.002	≥4	76.27	%	83.81%	4.71	0.28	41.95%	4.16%	
>7-days of antibiotic prior to	46(26	46(26-41)		≥5	42.37	%	97.13%	14.75	0.59	69.36%	8.34%	
bacteremia	1.0 (2.0 1.1)			≥7	35.59	%	98.43%	22.72	0.65	77.71%	9.12%	
Neutropenia	3.6 (1.6	36(16-82)		≥9	20.34	%	99.22%	25.96	0.80	79.93%	10.97%	
>10-days bosnitalization prior to	4 4 (2 )	2 2 6)	0.001	≥9	0.00	%	100.00%		1	0.00%	13.30%	
bacteremia	4.4 (2.0	5-0.0)	0.001	Predictive Performance of the Score: 7 point cut-off value								
Prior ICU admission	3 (1.4	-6.8)	0.006	Sensitivity:	35.59 % Specificity: 98.43 %		PPV:	PPV: 77.7 %		NPV: 90.9 %		
Prior colonization by KPC-CRE	10.6 (4.4	4-25.5)	0.0001	- Derivation set: AUROC 0.85: 95% CL 0.79-0.90								
Recent colonization by KPC-CRE	24.9 (1	.3-55)	0.0001	- Validation set: AUROC 0.85; 95% CI 0.80-0.91								

non-CRE CRE <i>p</i> -value Disk factor Adjusted OR	Points								
Hematologic neoplasms 59% 68% 0.192 (95%CI)									
<b>HSCT</b> 18% 27% 0.09 ≥10-days hospitalization prior to bacteremia 4.03 (1.88-8.66) <0.001	2								
Solid tumors 23.2% 5.1% 0.001 >7-days of antibiotic prior to bacteremia 4.65 (2.29-9.46) < 0.001	2								
30 day-Mortality 17.7% 54.2% <0.001	5								
Risk factors for CRE bacteremia: univariate analysis									
Non-adjusted OR Sensitivity, specificity and post-test probability	Sensitivity, specificity and post-test probability								
(95%CI) <i>p</i> -value Cut-off Sensitivity Specificity LR+ LR- PTP+	PTP-								
Prior use of carbapenems $4.1(2.3-7.7)$ 0.0001 $\geq 2$ $94.92\%$ $40.21\%$ $1.58$ $0.12$ $19.58\%$	1.90%								
Central venous catheter in place 3.4 (1.7-6.7) 0.002 ≥4 76.27% 83.81% 4.71 0.28 41.95%	4.16%								
>7-days of antibiotic prior to $46(2641)$ 0.0001 $\geq 5$ 42.37% 97.13% 14.75 0.59 69.36%	8.34%								
bacteremia ≥7 35.59% 98.43% 22.72 0.65 77.71%	9.12%								
Neutropenia 3.6 (1.6-8.2) 0.002 ≥9 20.34% 99.22% 25.96 0.80 79.93%	10.97%								
$ \begin{array}{c} 10.0 \ (1.0 \ 0.2) \\ \hline \\ 10.00\% \\ \hline \\ 100.00\% \\ \hline \\ 100.00\% \\ \hline \\ 1 \\ 0.00\% \\ \hline \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	13.30%								
bacteremia 4.4 (2.3-8.6) 0.001 Predictive Performance of the Score: 7 point cut-off value	Predictive Performance of the Score: 7 point cut-off value								
Prior ICU admission 3 (1.4-6.8) 0.006 Specificity: 35.59 % Specificity: 98.43 % PPV: 77.7 % NPV: 90	NPV: 90.9 %								
Prior colonization by KPC-CRE 10.6 (4.4-25.5) 0.0001	- Derivation set: AUROC 0.85: 95% CL 0.79-0.90								
Recent colonization by KPC-CRE 24.9 (1.3-55) 0.0001 - Validation set: AUROC 0.85; 95% CI 0.80-0.91	- Validation set: AUROC 0.85; 95% CI 0.80-0.91								

# **Conclusion:**

With the cut-off chosen, the score had high specificity and adequate PPV and NPV, with a satisfactory predictive performance. Likewise, in those patients without any point, it would practically rule out the presence of CRE bacteremia. This score can be a useful tool for decision making in clinical practice.



