



## SCIENTIFIC LETTER

### Organization of attention to infectious pathology in critical care units in Spain

### Organización de la atención a la patología infecciosa en las unidades de críticos de España

Dear Editor,

Both treatment and prevention of infections are an essential part of the daily routine of Intensive Care Units (ICU, assigned to Intensive Care Medicine Service) and Reanimation Units (RU, assigned to Anesthesia and Reanimation Service)

The incidence of sepsis on admission or during the stay in these units is high<sup>1</sup> so, this experience has made intensivists play an important role in the development of Sepsis Code (SC).<sup>2-4</sup>

In the field of prevention of healthcare-related infections (HCRI), the Program for Safety in the Critically Ill Patient has been developed by the Spanish Society of Intensive Care Medicine (SEMICYUC), which consists of preparing and implementing the *Zero Projects* (ZP): *Zero Bacteremia* (ZB), *Zero Pneumonia*, *Zero Resistance* and *Zero Urinary Tract Infection* (Z-UTI).<sup>5</sup>

Antimicrobial Stewardship Programs (ASP),<sup>6,7</sup> with the aim of improving the clinical outcome of infected patients and minimizing adverse effects of antibiotics (including appearance and spread of antimicrobial resistance), have a wide margin of action in critical care units, both as part of hospital ASP or as specific ICUs programs.<sup>8,9</sup>

In order to measure the degree of implementation of SC, ZP and ASP, and the role played by intensivists/anesthesiologists, the main national study groups of infection in critically ill patient (GEIPC-SEIMC, GTEIS-SEMICYUC and GTIPO-SEDAR) designed an online questionnaire that was mailed (in January 2019) to all members of the aforementioned groups requesting the response of the department heads.

We received answers from 118 units and 103 hospitals. **Table 1** summarizes our main findings. Qualitative variables were compared using Chi-square.

We observed that ZP is implemented in most units, ranging from 62.7% for Zero-UTI (the latest program) to 78.0%



for ZB. We must bear in mind that adherence is higher in ICUs (80.9% of ICUs have joined Zero-UTI and up to 89.7% take part in ZB; compared to RUs, in which only 25.7% have implanted Zero-UTI, increasing to 62% for ZB. 3 out of every 4 units uses the Spanish Study for Monitoring Nosocomial Infection (ENVIN, developed by SEMICYUC) as a monitoring tool for HCRI. Its use is widespread in ICUs (95.6%) and scarce in RUs (44%).

Less than half of hospitals have an active SC, 38.5% in the smallest. SC have several components: 94.1% of SC have a protocol; early detection systems are the next most commonly implemented component (80%), and only 29.4% SC have a team specifically focused on sepsis management. The role of intensivists in SC is remarkable: they are only absent in 15.7 and coordinate 72.5%. Also notable is the role of Emergency Medicine physicians, who are present in 82.4% of teams and especially important in the smallest hospitals.

Only 37.3% of units have an ASP, being more common in large hospitals. In general, the ICU-RU ASP works in a coordination with the hospital ASP although it is notable that 29% of ICU-ASPs are independent. At least one intensivist participates in all ICU-ASPs, supported essentially by the Microbiology Department. The composition of RU-ASP is heterogeneous with the participation of specialists from Infectious Diseases (ID), Pharmacy and Microbiology units, in addition to anesthesiologists themselves.

It is noteworthy that 80.5% of units have a reference expert in infectious diseases; more frequent in ICUs (86.8%) than in RUs (72.0%) ( $p=0.045$ ) and, often, a specialist from the unit itself (94.9% of ICUs and 86.1% of RUs). Despite the workload of these programs, only 25.2% of reference experts have a reserved daily work time dedicated to these programs.

A high percentage of units taking part in our study train residents in Intensive Care Medicine (ICM) or Anesthesiology (**Table 2**). Less than half of residents have a scheduled stay in an ID unit, being more common among ICM residents (62.5% vs 22.7%,  $p<0.001$ ). Stays in the Microbiology Department are anecdotal. We have observed a significant discrepancy between the importance attributed to sepsis and antibiotic courses (according to the perception of the person who answers the survey) and the number of residents who have these courses scheduled.

Our study has detected important differences between ICUs and RUs. First, adherence to ZP is significantly higher in ICUs than in RUs. Secondly, the number of ICUs in which

**Table 1** Main findings of our survey.

	Overall	ICU	RU	p	By number of hospital beds			p
					<200	200–500	>500	
<b>n (%)</b>	118	68 (57.6)	50 (42.4)		13 (12.6)	47 (45.6)	43 (41.7)	
<b>Antimicrobial stewardship programs</b>								
<i>ICU or RU ASP</i>	44 (37.3)	31 (45.6)	13 (26)	0.03	3 (21.4)	18 (34.6)	23 (44.2)	0.255
<b>Relation with hospital ASP</b>								
The same ASP	8 (18.2)	4 (12.9)	4 (30.8)		1 (33.3)	3 (16.7)	4 (17.4)	
Independent ASPs	10 (22.7)	9 (29)	1 (7.7)		2 (66.7)	5 (27.8)	3 (13)	
Coordinated ASPs	26 (59.1)	18 (58.1)	8 (61.5)		0	10 (55.6)	16 (69.6)	
<b>Members of ICU or RU ASP</b>								
Intensive Care Medicine	33 (75)	31 (100)	2 (15.4)	<0.001	3 (100)	14 (77.9)	16 (69.6)	0.488
Anaesthesiology	9 (20.5)	0	9 (69.2)	<0.001	0	3 (16.7)	6 (26.1)	0.502
Infectious Diseases	10 (22.7)	4 (12.9)	6 (40)	0.016	0	2 (11.1)	8 (34.8)	0.124
Pharmacy	7 (15.9)	4 (12.9)	3 (23.1)	0.400	0	2 (11.1)	5 (21.7)	0.482
Microbiology	9 (20.5)	6 (19.4)	3 (23.1)	0.780	0	4 (22.2)	5 (21.7)	0.661
<b>Sepsis Code</b>								
<i>Active Sepsis Code</i>	51 (49.5)				5 (38.5)	23 (53.5)	23 (48.9)	0.633
<b>Sepsis Code Components</b>								
Management protocol	48 (94.1)				5 (100)	22 (95.7)	21 (91.3)	0.691
Educational program	32 (62.7)				2 (40)	15 (65.2)	15 (65.2)	0.541
Early detection system	41 (80.4)				2 (40)	19 (82.6)	20 (87)	0.053
Rapid response team	24 (47.1)				1 (20)	10 (43.5)	13 (56.5)	0.299
Sepsis unit	15 (29.4)				1 (20)	7 (30.4)	7 (30.4)	0.888
<b>Sepsis Code Members</b>								
Intensive Care Medicine	43 (84.3)				3 (60)	22 (95.7)	18 (78.3)	0.078
Anaesthesiology	19 (37.3)				1 (20)	12 (52.2)	6 (26.1)	0.132
Infectious diseases	33 (64.7)				2 (40)	15 (65.2)	16 (69.6)	0.455
Emergency Medicine	42 (82.4)				4 (80)	18 (78.3)	20 (87)	0.734
Pharmacy	25 (49)				3 (60)	10 (43.5)	12 (52.2)	0.735
Microbiology	39 (76.5)				3 (60)	19 (82.6)	17 (73.9)	0.517
Surgery	18 (35.3)				2 (40)	10 (43.5)	6 (26.1)	0.455
Pneumology	7 (13.7)				1 (20)	3 (13)	3 (13)	0.912
<b>Sepsis Code Coordinator*</b>								
Intensive Care Medicine	37 (72.5)				1 (20)	21 (91.3)	15 (65.2)	0.003
Anaesthesiology	5 (9.8)				1 (20)	2 (8.7)	2 (8.7)	0.722
Infectious Diseases	14 (27.5)				1 (20)	5 (21.7)	8 (34.8)	0.586
Emergency Medicine	9 (17.6)				1 (20)	3 (13)	5 (21.7)	0.734
Pharmacy	2 (3.9)				0	1 (4.3)	1 (4.3)	0.893
Microbiology	6 (11.8)				0	4 (17.4)	2 (8.7)	0.455
<b>Zero Projects</b>								
<i>ENVIN</i>	87 (73.7)	65 (95.6)	22 (44)	<0.001				
<i>Zero Bacteremia</i>	92 (78)	61 (89.7)	31 (62)	<0.001				
<i>Zero Pneumonia</i>	88 (74.6)	60 (88.2)	28 (56)	<0.001				
<i>Zero Resistance</i>	77 (65.3)	58 (85.3)	19 (38)	<0.001				
<i>Zero-UTI</i>	74 (62.7)	55 (80.9)	19 (25.7)	<0.001				
<b>Reference expert in infectious diseases</b>								
<i>Overall</i>	95 (80.5)	59 (86.8)	36 (72)	0.045	8 (57.1)	43 (82.7)	44 (84.6)	0.061
Intensive Care Medicine	56 (58.9)	56 (94.9)	0					
Anaesthesiology	31 (32.6)	0	31 (86.1)					
Infectious Diseases	7 (7.4)	2 (3.4)	5 (13.9)					
Pharmacy	1 (1.1)	1 (1.7)	0					
<i>Stipulated dedication</i>	24 (25.2)	14 (23.7)	10 (27.8)	0.659	1 (12.5)	9 (20.9)	14 (31.8)	0.347
<i>Exclusive dedication</i>	2 (2.1)	1 (1.7)	1 (2.8)	0.721	0	0	2 (4.5)	0.306
<i>Dedicated time (hours)</i>	2 (1, 3)	2 (1, 3.25)	1 (1.5, 3)	0.931	1 (0, 2.25)	1 (0, 2)	2 (0, 2)	0.19

\* Sepsis Code Coordinator: 18 Sepsis Code have at least two coordinators, with the combination Intensive Care Medicine-Infectious Disease-Emergency Medicine being the most frequent.

**Table 2** Scheduled training in infectious diseases during the training period.

	Overall	Intensive Care Medicine	Anaesthesiology and Reanimation	p
<i>Specialized training</i>	92 (78)	48 (70.6)	44 (88)	0.024
<i>Stay in Infectious Diseases Unit</i>	40 (43.5)	30 (62.5)	10 (22.7)	<0.001
First training year	22 (23.9)	17 (35.4)	5 (11.4)	
Second training year	14 (15.2)	12 (25)	2 (4.5)	
Third training year	4 (4.3)	2 (4.2)	2 (4.5)	
Fourth training year	3 (3.3)	2 (4.2)	1 (2.3)	
Fifth training year	0	0	0	
Stay duration (months)	2 (1, 2)	2 (2, 3)	1 (10, 1.75)	0.009
<i>Stay in Microbiology Department</i>	3 (3.3)	3 (6.3)	0 (0)	0.09
<i>Sepsis Course Importance (1–10)</i>	10 (8, 10)	10 (8, 10)	10 (8.25, 10)	0.3
<i>Scheduled Antimicrobial Course</i>	55 (59.8)	28 (58.3)	27 (61.4)	0.767
<i>Antibiotics Course Importance (1–10)</i>	10 (8.25, 10)	9.5 (9, 10)	10 (9, 10)	0.22
<i>Scheduled Antibiotics Course</i>	49 (53.3)	23 (47.9)	26 (59.1)	0.283

an ASP has been implanted is significantly higher than RUs. Thirdly, the participation of intensivists in SC is greater; leading most of the active SCs in Spain. Finally, ICM resident training programs place greater importance to infectious diseases, with a greater number and longer stays in ID units.

The data provided by this study may be of interest to design strategies from scientific societies or autonomous communities, aimed at increasing the implantation of these programs. Given that HCRI prevention programs are broadly implanted, in our opinion, efforts should be directed at creating ASPs and SC, especially in hospitals with less than 200 beds (only 38.5% have a Sepsis Code and 21.4% an ASP for critically ill patients). Those units with more developed programs may serve as a model for others interested in developing them.

Another point for improvement detected is the lack of specific training in infectious diseases of residents in ICM and especially, Anesthesiology.

One of the limitations of this study is that participation was voluntary, and it is possible that just the units most interested in these programs have participated. Despite this, a good number of units took part and almost all Spanish Autonomous Communities were represented (16 of 17). The degree of real adherence to each project was not evaluated either.

From our results it could be inferred that, despite the existence of several programs related to infectious pathology in the critically ill patient (as SC, ZP and ASP), in ICUs and RUs of our environment, there are no structures or specialists with enough dedication to implant them optimally, follow them and coordinate them. We could hypothesize that initiatives such as SEMICYUC accreditation of experts in infectious pathology in the critically ill patient, together with allocation of specific resources to these programs (especially working time for specialists who lead them) would increase the number and quality of active programs.

## Acknowledgements

We want to record our appreciation to the 118 colleagues who have answered the questionnaire and participated in this survey.

The authors thank the Illustrious Medical College of Ourense for their collaboration in the English translation of this article.

## References

- Vincent J-L, Marshall JC, Namendys-Silva SA, François B, Martin-Loeches I, Lipman J, et al. Assessment of the worldwide burden of critical illness: the intensive care over nations (ICON) audit. *Lancet Respir Med.* 2014;2:380–6.
- Código sepsis: Documento de consenso [Internet]. Available from: <https://www.seguridaddelpaciente.es/es/informacion/publicaciones/2016/codigo-sepsis-documento-de-consenso/> [cited 25.07.20].
- Plan de asistencia a la sepsis de Galicia: Código sepsis – Consellería de Sanidade – Servizo Galego de Saúde [Internet]. Available from: <https://www.sergas.es/Asistencia-sanitaria/sepse?idioma=es> [cited 05.11.19].
- Yébenes JC, Lorenzo C, Esteban E, Espinosa L, Badia JM, Capdevila JA, et al. Interhospital Sepsis Code in Catalonia (Spain): territorial model for initial care of patients with sepsis. *Med Intensiva.* 2019.
- Programa de Seguridad en los Pacientes Críticos (Proyectos Zero) [Internet]. Available from: <https://www.seguridaddelpaciente.es/es/practicas-seguras/seguridad-pacientes-criticos/> [cited 04.01.20].
- Barlam TF, Cosgrove SE, Abbo LM, MacDougall C, Schuetz AN, Septimus EJ, et al. Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. *Clin Infect Dis.* 2016;62:e51–77.
- Rodríguez-Baño J, Paño-Pardo JR, Álvarez-Rocha L, Asensio A, Calbo E, Cercenado E, et al. Programs for optimizing the use of antibiotics (PROA) in Spanish hospitals: GEIH-SEIMC, SEFH and SEMPSPH consensus document. *Enferm Infecc Microbiol Clin.* 2012;30, 22.e1–22.e23.
- Ruiz J, Ramírez P, Gordon M, Villarreal E, Frasquet J, Poveda-Andrés JL, et al. Antimicrobial stewardship programme in critical care medicine: a prospective interventional study. *Med Intensiva.* 2018;42:266–73.
- Álvarez-Lerma F, Grau S, Echeverría-Esnal D, Martínez-Alonso M, Gracia-Arnillas MP, Horcajada JP, et al. A before-and-after study of the effectiveness of an Antimicrobial Stewardship Program in critical care. *Antimicrob Agents Chemother.* 2018;62.

P. Vidal-Cortés<sup>a,b,c,\*</sup>, X. Nuvials-Casals<sup>c,d</sup>,  
E. Maseda-Garrido<sup>b,e,f</sup>, S. Sancho-Chinesta<sup>b,c,g</sup>,  
B. Suberviola-Cañas<sup>b,c,h</sup>, R. González-Castro<sup>f,i</sup>,  
M. Nieto-Cabrera<sup>b,c,j</sup>, E. Díaz-Santos<sup>c,k</sup>, G. Aguilar<sup>b,f,l</sup>

<sup>a</sup> Intensive Care Unit, Complejo Hospitalario Universitario de Ourense (CHUO), Ourense, Spain

<sup>b</sup> Infectious Diseases in the Critically Ill Patient Study Group of Spanish Society for Infectious Diseases and Clinical Microbiology (GEIPC-SEIMC), Spain

<sup>c</sup> Infectious Diseases and Sepsis Working Group of Spanish Society for Intensive Care Medicine, Critical Care Medicine and Coronary Units (GTEIS-SEMICyUC), Spain

<sup>d</sup> Intensive Care Unit, Hospital Universitari Vall d'Hebron, Barcelona, Spain

<sup>e</sup> Anaesthesiology and Surgical Critical Care Unit, Hospital Universitario La Paz, Madrid, Spain

<sup>f</sup> Perioperative Infections Working Group of Spanish Society for Anesthesiology, Resuscitation and Pain Therapy (GTIPO-SEDAR), Spain

<sup>g</sup> Intensive Care Unit, Hospital Universitari I Politècnic La Fe, Valencia, Spain

<sup>h</sup> Intensive Medicine, Hospital Universitario Marques de Valdecilla, Santander, Spain

<sup>i</sup> Department of Anaesthesiology, Hospital Universitario de León, León, Spain

<sup>j</sup> Intensive Care Unit, Hospital Clínico San Carlos, Madrid, Spain

<sup>k</sup> Intensive Care Unit, Hospital Universitari Parc Taulí, Sabadell, Spain

<sup>l</sup> Department of Anaesthesiology, Hospital Clínic Universitari de Valencia, Valencia, Spain

\* Corresponding author.

E-mail address: [pablo.vidal.cortes@sergas.es](mailto:pablo.vidal.cortes@sergas.es)  
(P. Vidal-Cortés).