

ORIGINAL ARTICLE

Emergency medicine questions on the entrance examination for medical internships and residency training in Spain: analysis of changes between 2010 and 2019

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Objective. To investigate the presence of fundamental concepts in emergency medicine on the entrance examination taken by candidates for medical internships and residency training in Spain, and to identify changes over time.

Methods. Longitudinal retrospective study. Three independent researchers reviewed questions on the entrance examinations of the past 10 years (2010–2019) and classified them as directly, indirectly, or not related to emergency medicine. The topics of directly related questions were also classified according to the categories listed in *Tintinalli's Emergency Medicine* and subject areas in the Citation Index Expanded (SCIE) of the Web of Science. Changes in the number of questions and range of topics were analyzed with simple linear regression models.

Results. A total of 2300 questions were reviewed; 487 (22%) were directly related to emergency medicine, and 313 of them specifically referred to an emergency or urgent care setting. The proportion of directly related questions held steady over the 10-year period ($P=.172$). The most frequently mentioned categories listed by Tintinalli were cardiovascular (12.2%), infectious (11.1%), and gastrointestinal (10.9%) emergencies, and no significant differences were noted over time. However, proportions assigned to the SCIE categories did change over time, as follows. Questions about emergency care in general (11.9% during the period overall) increased significantly with time ($P=.005$) whereas cardiovascular questions (11.3%) decreased ($P=.037$). The proportion of infectious disease topics remained the same (10.7%).

Conclusion. Even though emergency medicine is not a recognized specialty for medical residency training in the public health system, questions on emergencies are considered important for evaluating candidates, judging by the high percentage of questions on the examinations.

Keywords: Emergency medicine. Medical internship. Medical residency. Education, evaluation.

Presencia de la Medicina de Urgencias y Emergencias en el examen de médico interno residente (MIR) en España: análisis evolutivo durante el periodo 2010-2019

Objetivo. Investigar la presencia del cuerpo doctrinal de la Medicina de Urgencias y Emergencias (MUE) en el examen de acceso a médico interno residente (MIR) en España y su evolución en el tiempo.

Método. Estudio longitudinal retrospectivo. Tres investigadores revisaron independientemente las preguntas de los exámenes MIR de los últimos 10 años (2010-2019) y las clasificaron por acuerdo mayoritario como directamente, indirectamente o no relacionadas con la MUE. La temática de las preguntas directamente relacionadas con la MUE se clasificó según el índice del libro de texto de MUE de Tintinalli y según la clasificación de las áreas de la base Science Citation Index Expanded (SCIE) de la Web of Science. La evolución temporal de la presencia y la temática de la MUE se analizó mediante regresión lineal simple.

Resultados. Se revisaron 2.300 preguntas: 487 (22%) estaban directamente relacionadas con la MUE (313 citaban específicamente el escenario de urgencias o emergencias). La presencia de preguntas directamente relacionadas con la MUE se mantuvo constante entre 2010-2019 ($p = 0,172$). Siguiendo la clasificación de Tintinalli, las temáticas más frecuentes de estas preguntas fueron urgencias cardiovasculares (12,2%), infecciosas (11,1%) y gastrointestinales (10,9%), sin cambios significativos entre 2010-2019, mientras que siguiendo la clasificación del SCIE, estas temáticas fueron urgencias (11,9%, que aumentó significativamente durante el periodo, $p = 0,005$), cardiovascular (11,3%, que descendió, $p = 0,037$) y enfermedades infecciosas (10,7%, sin cambios durante el periodo).

Conclusión. La MUE, a pesar de no estar reconocida como una especialidad formativa por la vía MIR, tiene una elevada relevancia para la administración sanitaria a la hora de seleccionar a los MIR, que inician su formación especializada en el sistema público de salud, a juzgar por su elevada presencia en el examen anual al que se somete a los candidatos.

Palabras clave: Medicina de Urgencias y Emergencias. Médico Interno Residente. Educación. Examen.

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Introduction

The training of medical specialists in Spain is currently carried out through the Resident Medical Intern (MIR) program, which was launched in 1978, and since 1984 has become the only form of access to specialized medical training^{1,2}. Every year since then, a test-type examination (MIR exam) prioritizes medical candidates who are graduates or undergraduates of this specialized training, which currently includes 44 specialties², not including Emergency Medicine (EM). This is an anomalous situation, since most European countries now have primary specialized training programs in EM, as do many other countries in the world³⁻⁵. In fact, the specialty of EM in Spain does exist in the military setting⁶. In addition, the European curriculum for the specialty of EM was defined and developed years ago⁷⁻⁹.

Contrary to this situation, EM is clearly present in undergraduate training, since internships in this field are mandatory for medical students. Meanwhile, a study published in 2010 showed that, at that time, 22 of the 28 Spanish medical schools existing at that time had at least one subject in their curriculum specifically designed for the teaching of EM¹⁰. Remarkably, more than half of medical students in Catalonia at that time placed the future specialty of EM among their preferential options. In this way, 2.4% would choose EM as their first option in the MIR and 52.1% had it among their preferences for residency. Moreover, these preferences were basically unrelated to the demographic characteristics of the students or the university of origin¹¹. These percentages were similar to those expressed by the candidates for EM in the same year 2010, in which 9% of them would have chosen EM first if it had existed and 40.5% would have been willing to take up residence in the specialty of EM¹².

The content of questions referring to EM, however, is still unknown, since they are not officially counted or classified as corresponding to the specialty of EM in the MIR exam, nor is it known what their evolution has been over time. Therefore, this study was designed to answer these two questions.

Method

The MIR exams for the years 2010 to 2019 were reviewed (10 years, 10 exams). All questions were reviewed without exception, including the back-up questions. The review was carried out by three independent reviewers belonging to each of the three research groups that have participated in this study (one from Madrid, one from Barcelona, one from Granada). The questions were classified according to the relationship of their statement with the specialty of EM. Based on the European curriculum and the experience of the three reviewers, who work in emergency departments, the questions could be classified into three different categories: 1) directly related to the practice of EM (here we also distinguished whether the statement ex-

plicitly mentioned the clinical setting of EM, essentially, the emergency department); 2) indirectly related to the practice of EM; and 3) not related to EM. For a question to be classified in one of the categories, at least two of the three independent reviewers had to agree and the third had to classify it in an adjacent group (for example, if two had classified it as directly related to EM without citing the clinical setting, the third had to classify it as directly related to EM with citation from the clinical setting, or as indirectly related to EM). The remaining situations were considered inconclusive and were discussed on a case-by-case basis until a majority agreement was reached, for which, if necessary, the cases were discussed among all the authors of this manuscript.

For those questions classified as directly related to EM (either with or without an express appointment from the emergency medicine clinical setting), we identified whether the question referred to the practice of out-of-hospital emergency medicine or not. On the other hand, the subject matter of these questions directly related to EM was classified following two different strategies used in previous studies to classify research conducted in the field of EM¹³⁻¹⁵: 1) assignment to one of the areas defined by the thematic index of the most widely used EM textbook in the world¹⁶, slightly modified by the authors in previous studies^{13,14,17} and 2) assignment to one of the thematic areas of research of the Science Citation Index Expanded (SCIE)¹⁸.

The qualitative variables were expressed as number of cases and percentages. To see if there was any significant change throughout the period analyzed in the global distribution of the general subject matter of the questions, the chi-square test of linear trend was used. A linear regression analysis was used to analyze the temporal evolution of questions directly related to EM and its subject matter. It was accepted that there were significant changes if the p value was less than 0.05. The analysis was carried out with the program SPSS v.24 and some graphs were prepared with Prism v.6.020.

Results

The revised exams for 2010-2018 contained 235 questions each, and the 2019 exam contained 185. The topic was considered directly related to EM in 487 questions (22%), and 313 of them explicitly cited a clinical scenario of EM (emergency or urgent care) (Figure 1). A total of 11 questions (0.5%) made direct reference to prehospital EM practice. The distribution of the classification over the 10-year period showed no significant change, either when the distribution was considered globally ($p = 0.374$) (Figure 1), or when each of the categories was analyzed individually (Figure 2). The variety of literal expressions found about emergencies is noteworthy: "Goes to the emergency department", "Is admitted to the emergency department", "is referred to the emergency department", "Assesses the patient in the emergency department", among others.

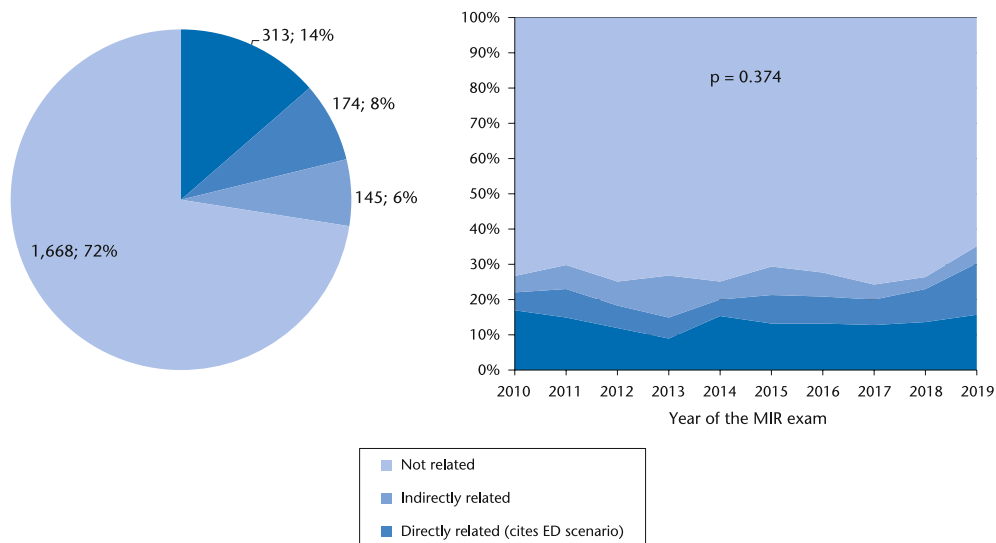


Figure 1. Classification of MIR examination questions according to their relationship with Emergency Medicine (left) and their evolution throughout the 2010-2019 period (right).

When the topic of the questions directly related to EM was analyzed, the five most frequent areas according to Tintinalli's classification¹⁶ were, in this order; cardiovascular, infectious, gastrointestinal, pulmonary, and neurological emergencies, and between them they totaled about half (50.6%) of these questions. A similar result was obtained with the classification of the Science Citation Index Expanded (SCIE), where the five main areas were emergencies, cardiovascular system, infectious diseases, respiratory system, and gastroenterology and hepatology, and among them they also accounted for slightly more than half of all the questions (53.0%). The distribution in the remaining topic areas of both classifications of the questions directly related to EM appearing in the MIR exams from 2010 to 2019 can be seen in Table 1.

When the presence of the five areas of EM most represented in MIR examinations over the 10 years under study according to Tintinalli's classification¹⁶ was analyzed (Figure 3), no significant changes were found in any of the five areas, and the representation of each of them remained relatively constant. In contrast, when analyzing the evolution of the presence of the five most frequent subject areas according to the SCI classification, it was possible to observe a significant increase in the presence of questions from the emergency department ($p = 0.005$) and a significant decrease in questions referring to the cardiovascular system ($p = 0.037$).

Discussion

The results of this study show a significant presence of EM-related questions in MIR exams in recent years. In fact, 22% of the questions were directly related and, in particular, almost two thirds of them explicitly cited the scenario of EM, i.e., the emergency department or the medical emergency services. Additionally, 6% of the

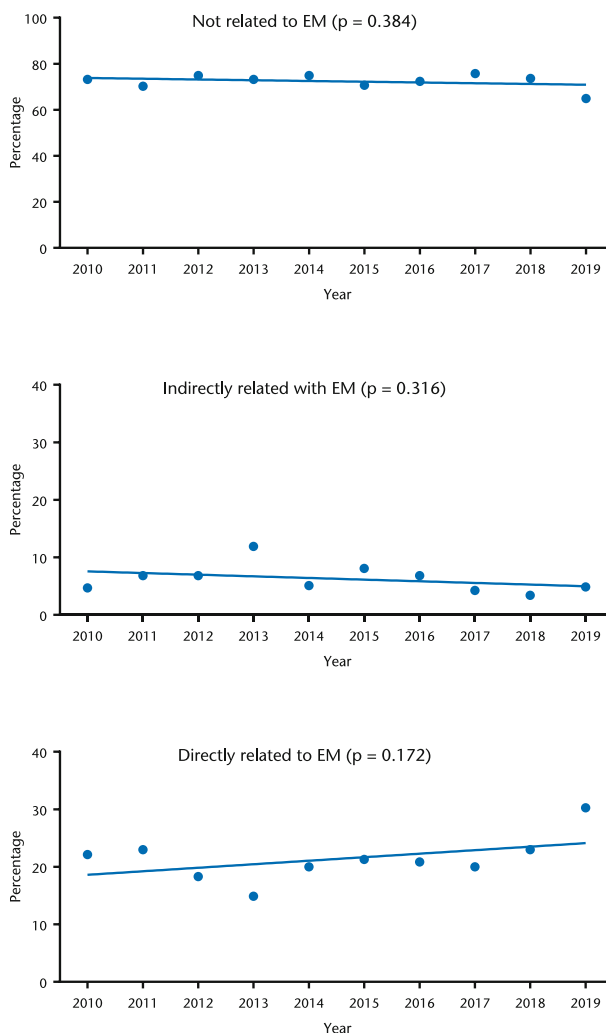


Figure 2. Evolution throughout the 2010-2019 period of the type of questions included in the MIR exam according to their relationship with Emergency Medicine (EM).

Table 1. Areas in which the questions directly related to Emergency Medicine appear in the MIR exams corresponding to the 2010-2019 period

	Total N = 487 n (%)
According to the index of Tintinalli's¹⁶	
Cardiovascular disease	59 (12.1)
Gastrointestinal emergencies	53 (10.9)
Infectious diseases	53 (10.9)
Lung emergencies	47 (9.7)
Neurology	32 (6.6)
Trauma and bone pathology.	27 (5.5)
Oncological and hematological emergencies	25 (5.1)
Pediatrics	25 (5.1)
Renal and genitourinary disorders	23 (4.7)
Eye, ear, nose, throat, mouth	16 (3.3)
Gynecology and obstetrics	15 (3.1)
Non-Traumatic Musculoskeletal Disorders	15 (3.1)
Cardiopulmonary resuscitation and techniques	14 (2.9)
Shock	12 (2.5)
Psycho-social disorders	11 (2.3)
Toxicology and Pharmacy	10 (2.1)
Image concepts	9 (1.8)
Pre-hospital care	7 (1.4)
Endocrinological emergencies	7 (1.4)
Wound care in the emergency department	6 (1.2)
Special Situations	4 (0.8)
Attention in catastrophes	2 (0.4)
Skin disorder	2 (0.4)
Organization of the emergency service	2 (0.4)
Others	11 (2.3)
According to Science Citation Index Expanded¹⁸	
Emergency	58 (11.9)
Cardiovascular system	55 (11.3)
Infectious diseases	52 (10.7)
Breathing apparatus	47 (9.7)
Gastroenterology and Hepatology	46 (9.4)
Neurology	29 (6.0)
Orthopedics	27 (5.5)
Pediatrics	26 (5.3)
Nephrology and Urology	20 (4.1)
Hematology	19 (3.9)
General and Internal Medicine	16 (3.3)
Gynecology and obstetrics	15 (3.1)
Ophthalmology	12 (2.5)
Psychiatry	11 (2.3)
Toxicology	9 (1.8)
Surgery	8 (1.6)
Radiology	8 (1.6)
Endocrinology	7 (1.4)
Oncology	5 (1.0)
Otolaryngology	4 (0.8)
Intensive Care Medicine	3 (0.6)
Others	10 (2.0)

questions were considered to be indirectly related to EM.

Some uncertainty may exist when it comes to the relevance of a particular specialty, in this case EM, to a particular question. Certainly, the practice of specialized medicine is becoming increasingly transversal, and possibly EM itself is a good example of this. Therefore, it is plausible that certain questions classified as directly re-

lated to EM may also correspond to other fields of specialized medical knowledge. The fact that 14% of questions directly related to EM are cited as emergencies (Figure 1) means that, although not exclusively, these questions undoubtedly correspond to the specialty of EM. In the same way that there are few areas of knowledge exclusive to EM, it is also true that no other specialty fully covers the body of EM doctrine necessary for professional practice. Thus, a recent and comprehensive review of the training curricula of residencies in Internal Medicine, Intensive Care Medicine, Anesthesiology and Resuscitation and Family and Community Medicine²¹ showed that none of these training plans sufficiently covers the body of doctrine of EM established at the European level²².

The presence of pre-hospital EM, usually carried out by emergency medical systems, is poorly represented in MIR exams, since only 11 questions (0.5% of the total and 2.3% of those directly related to EM) were identified as being related to this healthcare setting. Perhaps the reason that only these 11 questions (0.5%) make direct reference to prehospital EM practice is because their setting is totally different from that of hospital emergency departments and that small number of questions is exclusive to that healthcare setting. This is an important area of action within the specialty of EM. A recent study²³ carried out in Catalonia estimated that the prehospital emergency service activity involves 447 full-time physicians (extrapolated to some 2,800 in all of Spain), a figure that represents 13.4% of the total number of jobs estimated to be generated by the specialty of EM in Catalonia²³⁻²⁵. Perhaps this would be an aspect to be studied in depth, both in the teaching of the degree and when asking the questions of the MIR exam. To this end, those professionals who prepare questions for this exam should be made aware of it, especially those who come from the professional field of EM. The main subject of the questions was in this order: cardiovascular, infectious, digestive, respiratory and neurological, in any of the two methods used to classify the questions, and these five areas assumed more than 50% of the questions directly related to EM. Despite this, there was extensive representation of other areas of knowledge, which, as we commented earlier, does not fit into any existing specialist training plan in Spain^{21,26}, and which in itself forms an independent and unique body of doctrine: that of EM²⁶⁻²⁸. Interestingly, when the SCIE classification of the WoS was used, the classification of questions directly related to EM as specific to emergencies, because it did not adapt to the other categories allowed by this indexing, was 11.9%. This is undoubtedly further evidence of the exclusivity of some areas of knowledge in the specialty of EM.

Although the high presence of EM in the MIR exam is not a circumstantial fact, it has been constant and without significant changes throughout the period studied. Similarly, the presence of many of the main topic groups during these ten years, such as questions related to the practice of EM referring to infectious, gastrointestinal and respiratory diseases, remained un-

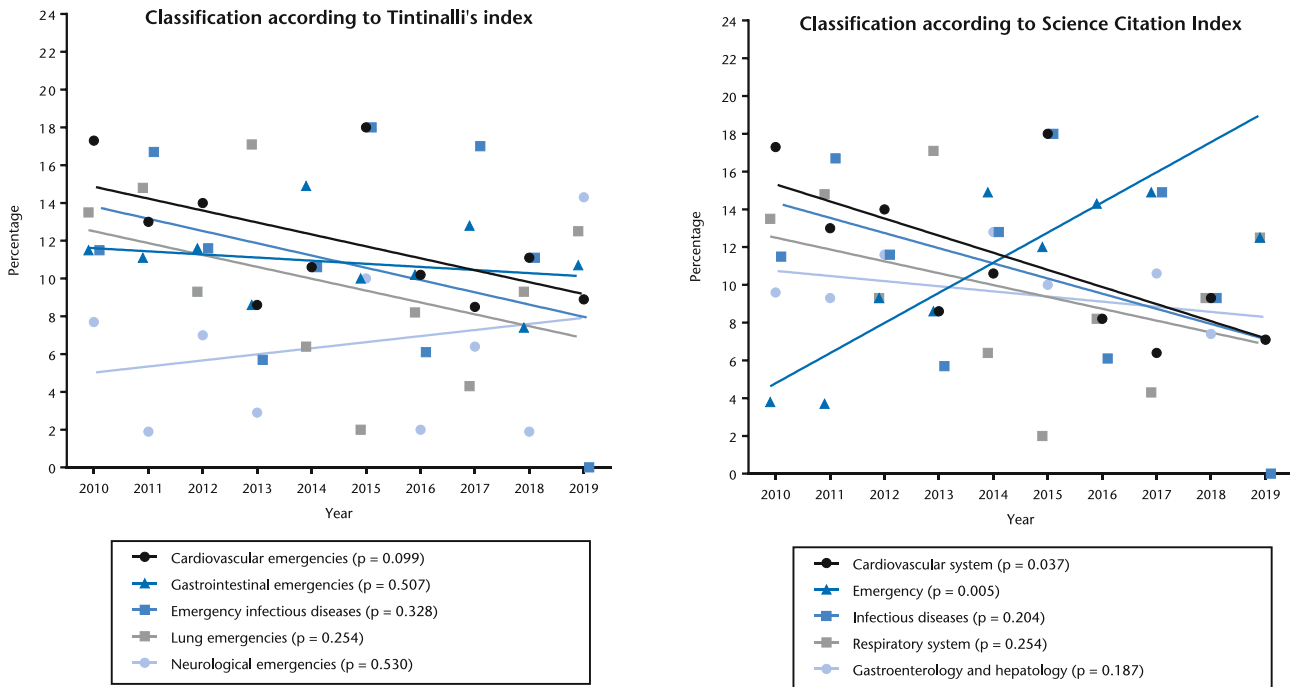


Figure 3. Evolution over the 2010-2019 period of the five most frequent topics of questions directly related to Emergency Medicine, according to the classification of Tintinalli's book¹⁶ (left) and Science Citation Index Expanded¹⁸ (right). Bold p values highlight the statistical significance ($p < 0.05$).

changed. However, one of the exceptions was precisely the questions classified as referring to emergencies following the SCIE classification, which increased significantly between 2010 and 2019. Similarly, the questions referring to cardiovascular disorders showed a tendency to decrease during the aforementioned period in both classifications, and this decrease was even significant in the case of using the SCIE classification¹⁸. The low presence of questions on EM as described in another report does not seem to be supported at this time²⁹. The discordance between our study and the previous report²⁹ could be due to the fact that the different subjects that make up the MIR exam can be divided into blocks. Thus, in the previous report, the nine medical specialties and their corresponding surgical disciplines correspond to the equipment block and make up 51.1% of the total examination. The basic subjects block comprises 10.4% of the questions. The questions on microbiology have been excluded from this block, given that they were classified within infectious diseases, those on biostatistics, which were classified within preventive medicine. The remaining 38.5% of questions were classified as corresponding to other subjects. Table 1 of the report²⁹ classifies each subject within the block to which it belongs. The difference between our study and the report is that the strategies for classifying the items are totally different and, as with the questions on microbiology and biostatistics, the questions without a clear direct link to the ED could be included in other subjects. The deepest reason for this divergence would be that since the specialty of EM does not exist in Spain, its disciplinary body,

which obviously exists, may be masked in other subjects, as has been the case in this study²⁹.

The main limitation of the study is the subjectivity when classifying the questions. However, this was attempted to be minimized through the independent analysis of three research teams, and consensus meetings in those cases where there was manifest divergence until agreement was reached. Another limitation is that this analysis refers specifically to the MIR exam that is carried out in Spain, and therefore its results cannot be extrapolated to other countries that have similar exams. Over the last few decades many European countries have approved the specialty of EM³⁰⁻³³, and we do not know if in this situation the presence of the EM topic can be even higher in their screening exams.

However, one may assume that although the specialty of EM is not part of the specialized medical training offered in Spain, the presence of its body of doctrine in the MIR exam is high. This is further evidence of the relevance of the practice of EM and is another example of the need to incorporate this primary specialty within the training offer of MIR³⁴⁻³⁶.

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