

Special article

Teaching nephrology as part of a degree in medicine[☆]

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ABSTRACT

The teaching of nephrology as part of a degree in medicine is potentially one of the most decisive factors when choosing a speciality. Until now, however, we have not had an overview of the teaching of nephrology in Spain. We have integrated information available in public databases with a survey and personal interviews with those responsible for teaching in Spanish medical faculties. In 2019, there were 44 universities offering a medicine degree in Spain, in 16 Autonomous Communities (34 of which were public and 10 private). For learning purposes, students have a number of hospital beds ranging from 0.2 to 4.7, and there are Autonomous Communities that have a higher proportion of students per inhabitant or per physician, such as Madrid or the Community of Navarra. In 16 universities there are tenured teaching staff (professors and lecturers), in eight contracted medical lecturers, and in two assistant lecturers. In 21 medical faculties, theoretical and practical nephrology is taught by associate lecturers. The subject is taught between the third and fifth years of the degree, the median being the fourth year. It is usually integrated with another subject and only in the University of Navarra is it an independent subject, with three credits. The total number of hours devoted to theoretical teaching (both theoretical classes and seminars) is highly variable and ranges from 11 to 35, with a median of 17.5. Variability is observed in both the number of theoretical topics (range 11–31) and seminars (range 0–9). Among the faculties that teach seminars, the ratio of theoretical topics to seminars ranges from 1.6 to 18. Most faculties evaluate clinical practices with various modalities and percentage of assessment. Knowledge is mostly assessed by a multiple choice exam.

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In conclusion, there is a high level of variability in the curriculum for the teaching of nephrology as part of a degree in medicine in Spain. Teaching staff who are tenured or who have a stable affiliation with universities make up just 23% of the total and, in many faculties, teaching depends exclusively on associate professors.

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La docencia de la nefrología en el grado de medicina

R E S U M E N

Palabras clave:

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La docencia de la nefrología en el grado de medicina es uno de los factores potencialmente más determinantes a la hora de elegir especialidad. Sin embargo, hasta ahora no había un mapa de la docencia de la nefrología en España. Hemos integrado información disponible en bases de datos públicos con una encuesta y entrevistas personales con los responsables de la docencia en las Facultades de Medicina españolas. En 2019, había 44 universidades que ofrecían el grado de Medicina en España en 16 Comunidades Autónomas (34 de ellas públicas y 10 privadas). Los alumnos disponen para su aprendizaje de un número de camas hospitalarias que oscila entre 0,2 y 4,7 y hay comunidades autónomas que tienen una mayor proporción de estudiantes por habitante o por médicos colegiados como Madrid o la Comunidad Foral de Navarra. En 16 universidades existen profesores vinculados (catedráticos y profesores titulares), en 8 profesores contratados doctores y en 2 profesores agregados. En 21 facultades de medicina la docencia teórica y práctica de Nefrología la llevan a cabo profesores asociados. La asignatura se imparte entre los años tercero y quinto de la carrera, siendo la mediana el cuarto año. Habitualmente está integrada con otra asignatura y solo en una Universidad de Navarra supone una asignatura independiente, con 3 créditos. El número total de horas dedicadas a la enseñanza teórica (clases teóricas y seminarios) es muy variable y oscila entre 11 y 35 con una media de 17,5. Se observa variabilidad tanto en el número de temas teóricos (rango 11 a 31) como de seminarios (rango 0 a 9). Entre las Facultades que imparten seminarios, el ratio temas teóricos: seminarios oscila entre 1,6 y 18. La mayoría de las Facultades realizan evaluación de las prácticas clínicas con varias modalidades y porcentaje de valoración. La evaluación de conocimientos se hace mayoritariamente con examen multirespuesta tipo test.

En conclusión, se aprecia una gran variabilidad en el curriculum de la enseñanza de la nefrología en el grado de medicina, en España. El profesorado con plaza vinculada o con adscripción estable a las universidades constituye sólo el 23% del total y la enseñanza en muchas facultades depende exclusivamente de profesores asociados. SPcopyright

Introduction

Since its foundation, the Spanish Society of Nephrology (Sociedad Española de Nefrología, SEN) has maintained a strong interest in the training of its members and in incorporating new scientific advances in the specialty's toolkit.^{1–3} In recent years, there has also been a growing interest in the training of medical students on renal diseases. A general concern among nephrologists is the growing lack of interest of medical students in choosing the specialty of nephrology.⁴ In this context, a plethora of initiatives aiming to facilitate learning and make the specialty more attractive to future junior doctors has been generated.^{5,6}

One of these projects was the creation of the S.E.N. University group as a group open to members encouraged to participate and put forward proposals for improvement of the teaching of renal diseases. One of the objectives is to learn about different aspects of the nephrology teaching in medicine

degrees in the medical schools of our country; this would be a first step to analyse how the teaching of nephrology has been carried out since the implementation of the Bologna Planification. This information will enable us to form common teaching strategies for all the professors and students involved. In addition, it is also important to know teaching institutions that are associated to medical schools and specifically, the hospitals where students do their practical training.

Another key objective of the University group is to obtain information about the situation of the nephrology teaching staff. To date there have been no prior studies analyzing this situation. This is an information that will be necessary to implement corrective or stimulatory measures to help nephrologists improve their university credentials, that will certainly benefit our students.

For the present study, we used sources of information from public organisms and university websites. As there is no centralised registry of nephrology teaching staff, and each university has adapted its teaching to the instruments it has

available, the procedure we chose was to conduct a survey through the SEN followed by directly contacting professors in each medical school to confirm the data.

Our study is the first to analyze teaching in medicine degrees in Spanish medical schools, and we believe that information obtained that will be useful to establish common teaching strategies for students and professors in the subject of nephrology.

In the current context of the transformation of teaching in general, and particularly university teaching, this information will offer opportunities for collaboration among all SEN members, who will be able to share both teaching materials and teaching methodologies.

Methods

Universities, medical schools and physicians

Information on the medical schools and associated hospitals, as well as the number of students in each medical schools and the grades required to be admitted in the different medical schools, was obtained from the websites of the Ministry of Education and Professional Training, the Ministry of Universities, the Vice-Chancellors' Conference of Spanish Universities (Conferencia de Rectores de las Universidades Españolas, CRUE) and the National Conference of Deans of Spanish medical schools of Medicine (Conferencia Nacional de Decanos de Medicina).^{7–9} Statistical data on population and the number of registered physicians in our country was obtained from the National Statistics Institute (Instituto Nacional de Estadística, INE).¹⁰ Information on the number of beds and characteristics of each hospital is available in the National Catalogue of Hospitals (Catálogo Nacional de Hospitales), the latest available update of which is dated in 31 December 2018.¹¹ Information on a newly-created university hospital, or one not included in the catalogue was obtained from its website or through direct contact with those responsible at the university. Health centres and other care or teaching facilities such as skills laboratories or other types of laboratories were not included, due to their heterogeneity in each medical school.

The number of nephrologists working for the National Health System in each autonomous community was obtained from the Ministry of Health, Consumer Affairs and Social Services.¹²

Nephrology professors

This data was initially collected by a survey among the SEN members, which was later supplemented with confirmatory information through direct contact with professors at each university. The following categories of professors were considered.

- Full professor, with tenure, who must be a titular professor, have completed at least two six-year periods of research, be accredited by the National Agency for Quality Assessment and Accreditation (Agencia Nacional de Evaluación de la Calidad y Acreditación, ANECA).
- Titular professor on tenure accredited by ANECA.

- Senior lecturer, PhD, accredited by ANECA or equivalent institutions in the autonomous communities.
- Lecturer, PhD, accredited by ANECA or equivalent institution in the autonomous communities.
- Senior lecturer (Catalonia and Basque Country), who must be accredited by the autonomous community.
- Adjunct lecturer (equivalent to assistant professor), usually selected based on merit, on periodic contracts.
- Emeritus professor, approved by the corresponding university, according to a number of criteria.

Although on many occasions data were received from collaborators professors, honorary professors, assistant teachers of patients care and other similar figures (such as having obtained habilitation [*venia docendi*]), these were not taken into account in the study due to their heterogeneity across different universities and the difficulty of being classified. We also omitted from our report some professors who, despite being members of the SEN, do not strictly teach nephrology and also teach other subjects.

Course guides: content and methods of assessment

A search was performed of each university's website to obtain teaching guides for each course in which nephrology was imparted. The following data were collected:

- Course name and materials taught therein.
- Year in which it is taught and number of course credits.
- Theory lectures.
- Practical seminars.
- Assessment methods: Examinations based on patients assessment (case studies and simulation-based assessment, objective structured clinical examination [OSCE] or continuous assessment by tutors) and test theory knowledge (multiple-choice, short questions, case studies, etc.).¹³

Results

Structure, physical resources and demographic data

Fig. 1 and Table 1 show the distribution of the medical schools where the degree in medicine is taught, along with the associated hospitals with them in the various autonomous communities. La Rioja is the only community without a medical school, as well as the autonomous cities of Ceuta and Melilla.

Table 2 shows the number of students per 100,000 inhabitants in each autonomous community. In general, there is a consistent ratio of number of students per inhabitants, with an average of 15 students per 100,000 inhabitants, with two exceptions: the Chartered Community of Navarre has a higher and the Balearic Islands a lower ratio (Fig. 2). Regarding the number of physicians the National Institute of Employment (INE) in 2016 reveals that Madrid is the region with greatest amount of physicians per 100,000 inhabitants (594), while Andalusia (386) and Castile-La Mancha (366) have the fewest (Appendix B Supplementary Table S1). However, the analysis of the ratio of medical students per 100 physicians reveals a different picture: the Chartered Community of Navarre, Cantabria and Murcia have the highest ratio and could be considered a priori as exporters of new physicians, while the Balearic Islands have the lowest (Fig. 3).

Table 3 shows the different medical schools in which the degree in medicine is taught, together with the number of students in the 2019–2020 academic year and the final grade requirement for each.

Table 4 details the beds theoretically available in hospitals per student studying in each faculty. The mean number of beds per student is

Table 1 – Spanish faculties where a degree in medicine is taught, alongside associated hospitals and their number of beds.

Community	University	Teaching hospitals	Beds
Andalusia	Cádiz [U. of Cádiz]	Hospital Universitario de Jerez [University H. of Jerez]	498
	Cádiz [U. of Cádiz]	Hospital Universitario de Puerto Real [University H. of Puerto Real]	319
	Cádiz [U. of Cádiz]	Hospital Universitario Puerta del Mar [University H. of Puerta del Mar]	738
	Córdoba [U. of Córdoba]	Hospital Universitario Reina Sofía [Reina Sofía University H.]	1,233
	Granada [U. of Granada]	Hospital Campus de la Salud [Campus de la Salud H.]	700
	Granada [U. of Granada]	Hospital Universitario Clínico San Cecilio [San Cecilio Clinical University H.]	543
	Granada [U. of Granada]	Hospital Virgen de las Nieves [Virgen de las Nieves H.]	711
	Málaga [U. of Málaga]	Hospital Regional Universitario de Málaga [Málaga Regional University Hospital]	1,049
	Málaga [U. of Málaga]	Hospital Universitario Virgen de la Victoria [Virgen de la Victoria University H.]	657
	Sevilla [U. of Seville]	Hospital Universitario Nuestra Señora de Valme [Nuestra Señora de Valme University H.]	617
Aragón	Sevilla [U. of Seville]	Hospital Universitario Virgen del Rocío [Virgen del Rocío University H.]	1,350
	Sevilla [U. of Seville]	Hospital Universitario Virgen Macarena [Virgen Macarena University H.]	960
	Zaragoza [U. of Zaragoza]	Hospital Clínico Universitario Lozano Blesa [Lozano Blesa Clinical University H.]	807
Asturias	Zaragoza [U. of Zaragoza]	Hospital Universitario Miguel Servet [Miguel Servet University H.]	1,213
	Oviedo [U. of Oviedo]	Hospital Universitario Cabueñes de Gijón [Cabueñes University H., Gijón]	457
Balearic Islands	Oviedo [U. of Oviedo]	Hospital Universitario Central de Asturias [Central University H. of Asturias]	991
	Oviedo [U. of Oviedo]	Hospital Universitario San Agustín de Avilés [San Agustín de Avilés University H.]	436
	Illes Balears [U. of the Balearic I.]	Hospital Son Llátzer [Son Llátzer H.]	419
Canary Islands	Illes Balears [U. of the Balearic I.]	Hospital Universitario Son Espases [Son Espases University H.]	839
	La Laguna [U. of La Laguna]	Hospital Universitario de Canarias [Canary Islands University H.]	826
	La Laguna [U. of La Laguna]	Hospital Universitario Nuestra Señora de la Candelaria [Nuestra Señora de la Candelaria University H.]	1,066
Cantabria	Las Palmas de Gran Canaria [U. of Las Palmas de Gran Canaria]	Complejo Hospitalario Universitario Insular Materno-Infantil [Women's and Children's Island University H. Complex]	916
	Las Palmas de Gran Canaria [U. of Las Palmas de Gran Canaria]	Hospital Universitario de Gran Canaria Dr. Negrín [Dr Negrín University H. of Gran Canaria]	828
	Cantabria [U. of Cantabria]	Hospital Sierrallana de Torrelavega [Sierrallana H., Torrelavega]	301
Castile-La Mancha	Cantabria [U. of Cantabria]	Hospital Universitario Marqués de Valdecilla [Marqués de Valdecilla University H.]	923
	Castilla-La Mancha Albacete [U. of Castile-La Mancha, Albacete Campus]	Complejo Hospitalario Universitario de Albacete [Albacete University H. Complex]	705
Castile and León	Castilla-La Mancha Ciudad Real [U. of Castile-La Mancha, Ciudad Real Campus]	Hospital General Universitario de Ciudad Real [Ciudad Real University General H.]	564
	Salamanca [U. of Salamanca]	Complejo Asistencial Universitario de Salamanca [Salamanca University Healthcare Complex]	914
Catalonia	Salamanca [U. of Salamanca]	Hospital de Ávila [Ávila H.]	430
	Salamanca [U. of Salamanca]	Hospital de León [León H.]	1,056
	Salamanca [U. of Salamanca]	Hospital de Zamora [Zamora H.]	540
	Valladolid [U. of Valladolid]	Hospital Clínico Universitario [University Clinical H.]	777
	Valladolid [U. of Valladolid]	Hospital Universitario de Palencia [Palencia University H.]	495
	Valladolid [U. of Valladolid]	Hospital Universitario del Río Hortega [Río Hortega University H.]	606
Catalonia	Autónoma de Barcelona [Autonomous U. of Barcelona]	Hospital Universitario de la Santa Creu i Sant Pau [Santa Creu i Sant Pau University H.]	644
	Autónoma de Barcelona [Autonomous U. of Barcelona]	Hospital Universitario [Germans Trias i Pujol University H.]	516
	Autónoma de Barcelona [Autonomous U. of Barcelona]	Hospital Universitario Parc Taulí [Parc Taulí University H.]	861

– Table 1 (Continued)

Community	University	Teaching hospitals	Beds
	Autónoma de Barcelona [Autonomous U. of Barcelona]	Hospital Universitario Vall D'Hebron [Vall D'Hebron University H.]	1,315
	Girona [U. of Girona]	Hospital Universitario Dr. Josep Trueta [Dr Josep Trueta University H.]	431
	Lleida [U. of Lleida]	Hospital Universitario Arnau De Vilanova [Arnau De Vilanova University H.]	463
	Lleida [U. of Lleida]	Hospital Universitario Santa María [Santa María University H.]	229
	Pompeu Fabra [U. Pompeu Fabra]	Hospital Universitario del Mar [University H. del Mar]	470
	Rovira i Virgili [U. of Rovira i Virgili]	Hospital Psiquiátrico Universitario Institut Pere Mata [Pere Mata Institute University Psychiatric H.]	727
	Rovira i Virgili [U. of Rovira i Virgili]	Hospital Universitario Joan XXIII de Tarragona [Joan XXIII University H., Tarragona]	372
	Rovira i Virgili [U. of Rovira i Virgili]	Hospital Universitario Sant Joan de Reus [Sant Joan University H., Reus]	313
	Barcelona [U. of Barcelona]	Hospital Clínic [Hospital Clínic]	844
	Barcelona [U. of Barcelona]	Hospital de Sant Joan de Déu [SJD Barcelona Children's H.]	401
	Barcelona [U. of Barcelona]	Hospital Universitario Mútua Terrassa [Mútua Terrassa University H.]	460
	Barcelona [U. of Barcelona]	Hospital Universitario de Bellvitge [Bellvitge University H.]	1,022
	Internacional de Catalunya [UIC Barcelona]	Fundación Hospital Asilo de Granollers [Asilo de Granollers H. Foundation]	306
	Internacional de Catalunya [UIC Barcelona]	Hospital Universitario General de Cataluña - Grupo Quirónsalud [General University Hospital of Catalonia - Quirónsalud Group]	297
	Internacional de Catalunya [UIC Barcelona]	Red Asistencial Universitaria de Manresa [Manresa University Healthcare Network]	309
	Internacional de Catalunya [UIC Barcelona]	Hospital Plató [Plato H.]	161
	Internacional de Catalunya [UIC Barcelona]	Hospital de Mollet [Mollet H.]	164
	Vic [U. of Vic]	Hospital Universitario de Vic [Vic University H.]	292
	Vic [U. of Vic]	Hospital Universitario de Sant Joan De Déu (Manresa) [SJD Manresa University Hospital]	280
Extremadura	Extremadura [U. of Extremadura]	Complejo Hospitalario Universitario de Badajoz [Badajoz University H. Complex]	915
	Extremadura [U. of Extremadura]	Hospital Universitario de Cáceres [Cáceres University H.]	520
Galicia	Santiago de Compostela [U. of Santiago de Compostela]	Hospital Clínico Universitario [University Clinical H.]	1,395
	Santiago de Compostela [U. of Santiago de Compostela]	Complejo Hospitalario Universitario de A Coruña [A Coruña University H. Complex]	1,341
	Santiago de Compostela [U. of Santiago de Compostela]	Complejo Hospitalario Universitario de Vigo [Vigo University H. Complex]	1,273
	Santiago de Compostela [U. of Santiago de Compostela]	Complejo Hospitalario Universitario de Ourense [Ourense University H. Complex]	869
Madrid	Alcalá [U. of Alcalá]	Hospital General Universitario de Guadalajara [Guadalajara University H. Complex]	432
	Alcalá [U. of Alcalá]	Hospital Universitario Central de la Defensa Gómez Ulla [Gómez Ulla Military University H.]	475
	Alcalá [U. of Alcalá]	Hospital Universitario Príncipe de Asturias [Príncipe de Asturias University H.]	507
	Alcalá [U. of Alcalá]	Hospital Universitario Ramón y Cajal [Ramón y Cajal University H.]	901
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Hospital de la Cruz Roja [Red Cross H.]	154
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Hospital Universitario del Tajo [University H. del Tajo]	98
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Hospital Universitario Severo Ochoa [Severo Ochoa University H.]	386
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Hospital Virgen de la Poveda [Virgen de la Poveda H.]	202
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Instituto Psiquiátrico José Germain [José Germain Psychiatric Institute]	178
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Hospital la Luz [La Luz H.]	180
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Hospital San Francisco de Asís [Francisco de Asís H.]	168
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Hospital los Madroños [Los Madroños H.]	53
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Hospital Quirón Sur-Alcorcón [Quirónsalud South Hospital, Alcorcón]	81
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Clínica Santa Elena [Santa Elena Clinic]	76
	Alfonso X el Sabio [Alfonso X el Sabio U.]	Hospital de Ciempozuelos [Ciempozuelos H.]	332
	Autónoma de Madrid [Autonomous U. of Madrid]	Hospital Niño Jesús [Niño Jesús H.]	170

- Table 1 (Continued)

Community	University	Teaching hospitals	Beds
	Autónoma de Madrid [Autonomous U. of Madrid]	Hospital Universitario Puerta de Hierro Majadahonda [Puerta de Hierro Majadahonda University H.]	613
	Autónoma de Madrid [Autonomous U. of Madrid]	Hospital Universitario de La Princesa [La Princesa University H.]	524
	Autónoma de Madrid [Autonomous U. of Madrid]	Hospital Universitario Fundación Jiménez Díaz [Jiménez Díaz Foundation University H.]	659
	Autónoma de Madrid [Autonomous U. of Madrid]	Hospital Universitario La Paz [La Paz University H.]	1,268
	CEU San Pablo [CEU San Pablo U.]	Hospital de Móstoles [Móstoles H.]	332
	CEU San Pablo [CEU San Pablo U.]	Hospital HM Madrid [HM Madrid H.]	99
	CEU San Pablo [CEU San Pablo U.]	Hospital Montepíncipe [Montepíncipe H.]	170
	CEU San Pablo [CEU San Pablo U.]	Hospital Nuevo Belén [Nuevo Belén H.]	60
	CEU San Pablo [CEU San Pablo U.]	Hospital Sanchinarro [Sanchinarro H.]	198
	CEU San Pablo [CEU San Pablo U.]	Hospital Torrelozones [Torrelozones H.]	86
	CEU San Pablo [CEU San Pablo U.]	HM Vallés [HM Vallés H.]	20
	Complutense de Madrid [U. Complutense de Madrid]	Hospital Clínico San Carlos [San Carlos Clinical H.]	861
	Complutense de Madrid [U. Complutense de Madrid]	Hospital Universitario 12 de Octubre [12 de Octubre University H.]	1,196
	Complutense de Madrid [U. Complutense de Madrid]	Hospital Universitario Gregorio Marañón [Gregorio Marañón University H.]	1,349
	Complutense de Madrid [U. Complutense de Madrid]	Hospital Universitario Infanta Cristina [Infanta Cristina University H.]	188
	Complutense de Madrid [U. Complutense de Madrid]	Hospital Universitario Infanta Leonor [Infanta Leonor University H.]	361
	Europea de Madrid [European U. of Madrid]	Hospital La Fuenfría [La Fuenfría H.]	192
	Europea de Madrid [European U. of Madrid]	Hospital José Germain [José Germain H.]	178
	Europea de Madrid [European U. of Madrid]	Hospital Universitario Asisa-Moncloa [Asisa-Moncloa University H.]	235
	Europea de Madrid [European U. of Madrid]	Hospital Universitario de Getafe [Getafe University H.]	510
	Europea de Madrid [European U. of Madrid]	Hospital Universitario Quirón-Madrid [Quirónsalud University H., Madrid]	81
	Europea de Madrid [European U. of Madrid]	Hospital Universitario Santa Cristina [Santa Cristina University H.]	156
	Europea de Madrid [European U. of Madrid]	Hospital Universitario Infanta Sofía [Infanta Sofía University H.]	271
	Europea de Madrid [European U. of Madrid]	Hospital Ruber Juan Bravo [Ruber Juan Bravo H.]	70
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital de Guadarrama [Guadarrama H.]	144
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Dr. Rodríguez Lafora [Dr Rodríguez Lafora H.]	334
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital El Escorial [El Escorial H.]	91
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Universitario de Móstoles [Móstoles University H.]	332
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Universitario Infanta Elena [Infanta Elena University H.]	158
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital del Henares de Coslada [Henares H., Coslada]	243
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital del Sureste de Arganda [South-eastern H., Arganda]	132
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital de Torrejón [Torrejón H.]	220
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Sanitas La Zarzuela [Sanitas La Zarzuela H.]	116
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Sanitas La Moraleja [Sanitas La Moraleja H.]	126
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital San Rafael [San Rafael H.]	188
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Beata María Ana [Beata María Ana H.]	160
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Asepeyo Coslada [Asepeyo H., Coslada]	133
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital MD Anderson [MD Anderson H.]	99
	Rey Juan Carlos [Rey Juan Carlos U.]	Hospital Universitario de Alcorcón [Alcorcón University H.]	400
	Rey Juan Carlos [Rey Juan Carlos U.]	Hospital Universitario de Fuenlabrada [Fuenlabrada University H.]	406
	Rey]	Hospital Clínico San Carlos [San Carlos Clinical H.]	861
	Complutense de Madrid [U. Complutense de Madrid]	Hospital Universitario 12 de Octubre [12 de Octubre University H.]	1,196
	Complutense de Madrid [U. Complutense de Madrid]	Hospital Universitario Gregorio Marañón [Gregorio Marañón University H.]	1,349

– Table 1 (Continued)

Community	University	Teaching hospitals	Beds
	Complutense de Madrid [U. Complutense de Madrid]	Hospital Universitario Infanta Cristina [Infanta Cristina University H.]	188
	Complutense de Madrid [U. Complutense de Madrid]	Hospital Universitario Infanta Leonor [Infanta Leonor University H.]	361
	Europea de Madrid [European U. of Madrid]	Hospital La Fuenfría [La Fuenfría H.]	192
	Europea de Madrid [European U. of Madrid]	Hospital José Germain [José Germain H.]	178
	Europea de Madrid [European U. of Madrid]	Hospital Universitario Asisa-Moncloa [Asisa-Moncloa University H.]	235
	Europea de Madrid [European U. of Madrid]	Hospital Universitario de Getafe [Getafe University H.]	510
	Europea de Madrid [European U. of Madrid]	Hospital Universitario Quirón-Madrid [Quirónsalud University H., Madrid]	81
	Europea de Madrid [European U. of Madrid]	Hospital Universitario Santa Cristina [Santa Cristina University H.]	156
	Europea de Madrid [European U. of Madrid]	Hospital Universitario Infanta Sofía [Infanta Sofía University H.]	271
	Europea de Madrid [European U. of Madrid]	Hospital Ruber Juan Bravo [Ruber Juan Bravo H.]	70
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital de Guadarrama [Guadarrama H.]	144
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Dr. Rodríguez Lafora [Dr Rodríguez Lafora H.]	334
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital El Escorial [El Escorial H.]	91
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Universitario de Móstoles [Móstoles University H.]	332
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Universitario Infanta Elena [Infanta Elena University H.]	158
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital del Henares de Coslada [Henares H., Coslada]	243
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital del Sureste de Arganda [South-eastern H., Arganda]	132
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital de Torrejón [Torrejón H.]	220
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Sanitas La Zarzuela [Sanitas La Zarzuela H.]	116
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Sanitas La Moraleja [Sanitas La Moraleja H.]	126
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital San Rafael [San Rafael H.]	188
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Beata María Ana [Beata María Ana H.]	160
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital Asepeyo Coslada [Asepeyo H., Coslada]	133
	Francisco de Vitoria [Francisco de Vitoria U.]	Hospital MD Anderson [MD Anderson H.]	99
	Rey Juan Carlos [Rey Juan Carlos U.]	Hospital Universitario de Alcorcón [Alcorcón University H.]	400
	Rey Juan Carlos [Rey Juan Carlos U.]	Hospital Universitario de Fuenlabrada [Fuenlabrada University H.]	406
	Rey Juan Carlos [Rey Juan Carlos U.]	Hospital Universitario de Móstoles [Móstoles University H.]	332
	Rey Juan Carlos [Rey Juan Carlos U.]	Hospital Universitario Rey Juan Carlos [Rey Juan Carlos University H.]	364
Murcia	Murcia [U. of Murcia]	Hospital General Universitario Morales Meseguer [Meseguer University General H., Morales]	394
	Murcia [U. of Murcia]	Hospital General Universitario Reina Sofía [Reina Sofía University General H.]	339
	Murcia [U. of Murcia]	Hospital Universitario Virgen de la Arrixaca [Virgen de la Arrixaca University H.]	920
	Católica de Murcia [San Antonio Catholic U. of Murcia]	Hospital Universitario Santa Lucía de Cartagena [Santa Lucía University H., Cartagena]	691
	Católica de Murcia [San Antonio Catholic U. of Murcia]	Hospital Universitario del Vinalopó de Elche [Vinalopó University H., Elche]	214
	Católica de Murcia [San Antonio Catholic U. of Murcia]	Hospital Universitario de Torrevieja [Torrevieja University H.]	269
	Católica de Murcia [San Antonio Catholic U. of Murcia]	Hospital La Vega [La Vega H.]	123
	Católica de Murcia [San Antonio Catholic U. of Murcia]	Hospital Mesa del Castillo [Mesa del Castillo H.]	76
	Católica de Murcia [San Antonio Catholic U. of Murcia]	Hospital Quirónsalud Murcia [Quirónsalud H., Murcia]	131
	Católica de Murcia [San Antonio Catholic U. of Murcia]	Hospital de Molina [Molina H.]	83
	Católica de Murcia [San Antonio Catholic U. of Murcia]	Hospital Comarcal del Noroeste de Caravaca [Northwest Regional H., Caravaca]	103
	Católica de Murcia [San Antonio Catholic U. of Murcia]	Hospital Virgen del Alcázar de Lorca [Virgen del Alcázar H., Lorca]	175
	Católica de Murcia [San Antonio Catholic U. of Murcia]	Hospital de la Vega Lorenzo Guirao de Cieza [La Vega Lorenzo Guirao H., Cieza]	125
Navarre	Navarra [U. of Navarre]	Clínica Universidad de Navarra [University of Navarre Clinic]	241
	Pública de Navarra [Public U. of Navarre]	Complejo Hospitalario de Navarra [Navarre H. Complex]	1,086
Basque Country	País Vasco [U. of the Basque Country]	Hospital Universitario Araba [Araba University H.]	811
	País Vasco [U. of the Basque Country]	Hospital Universitario de Basurto [Basurto University H.]	733
	País Vasco [U. of the Basque Country]	Hospital Universitario de Cruces [Cruces University H.]	912
	País Vasco [U. of the Basque Country]	Hospital Universitario Donostia [Donostia University H.]	1,054
Valencian Community	Jaume I [Jaume I U.]	Consortio Hospitalario Provincial de Castellón [Castellón Provincial H. Consortium]	257

– Table 1 (Continued)

Community	University	Teaching hospitals	Beds
	Jaume I [Jaume I U.]	Hospital General Universitario de Castellón [Castellón University General Hospital]	580
	Jaume I [Jaume I U.]	Hospital Universitario de La Plana [La Plana University H.]	258
	Católica de Valencia [Valencia Catholic U. Saint Vincent Martyr]	Hospital Universitario de La Ribera (Alzira) [La Ribera University H., Alzira]	301
	Católica de Valencia [Valencia Catholic U. Saint Vincent Martyr]	Grupo Vithas 9 de Octubre [Vithas Group - 9 de Octubre]	300
	Católica de Valencia [Valencia Catholic U. Saint Vincent Martyr]	Grupo Vithas Virgen del Consuelo [Vithas Group - Virgen del Consuelo]	156
	Católica de Valencia [Valencia Catholic U. Saint Vincent Martyr]	Grupo Vithas Valencia al Mar [Vithas Group - Valencia al Mar]	70
	Católica de Valencia [Valencia Catholic U. Saint Vincent Martyr]	Hospital Intermutual de Levante [Eastern Mutual H.]	230
	CEU Cardenal Herrera Castellón [CEU Cardenal Herrera U., Castellón Campus]	Hospital de Sagunto [Sagunto H.]	252
	CEU Cardenal Herrera Castellón [CEU Cardenal Herrera U., Castellón Campus]	Hospital de Vinaros [Vinaros H.]	150
	CEU Cardenal Herrera Castellón [CEU Cardenal Herrera U., Castellón Campus]	Hospital Provincial [Provincial H.]	257
	CEU Cardenal Herrera Castellón [CEU Cardenal Herrera U., Castellón Campus]	Hospital Rey Don Jaime [Rey Don Jaime H.]	96
	CEU Cardenal Herrera-Valencia [CEU Cardenal Herrera U., Valencia Campus]	Hospital Arnau De Vilanova [Arnau De Vilanova H.]	302
	CEU Cardenal Herrera-Valencia [CEU Cardenal Herrera U., Valencia Campus]	Hospital de Manises [Manises H.]	115
	CEU Cardenal Herrera-Valencia [CEU Cardenal Herrera U., Valencia Campus]	Grupo Vithas 9 de Octubre [Vithas Group - 9 de Octubre]	300
	CEU Cardenal Herrera-Valencia [CEU Cardenal Herrera U., Valencia Campus]	Grupo Vithas Virgen del Consuelo [Vithas Group - Virgen del Consuelo]	156
	CEU Cardenal Herrera-Valencia [CEU Cardenal Herrera U., Valencia Campus]	Grupo Vithas Valencia al Mar [Vithas Group - Valencia al Mar]	70
	CEU Cardenal Herrera-Valencia [CEU Cardenal Herrera U., Valencia Campus]	Hospital IMED Valencia de Burjassot [IMED Valencia H., Burjassot]	207
	CEU Cardenal Herrera-Valencia [CEU Cardenal Herrera U., Valencia Campus]	Hospital Quirón [Quirónsalud H.]	88
	CEU Cardenal Herrera-Valencia [CEU Cardenal Herrera U., Valencia Campus]	Instituto Valenciano de Oncología [Valencian Institute of Oncology]	160
	U. Miguel Hernández [Miguel Hernández U.]	Hospital General Universitario de Alicante [Alicante University General H.]	794
	U. Miguel Hernández [Miguel Hernández U.]	Hospital General Universitario de Elche [Elche University General H.]	492
	U. Miguel Hernández [Miguel Hernández U.]	Hospital General Universitario de Elda [Elda University General H.]	513
	U. Miguel Hernández [Miguel Hernández U.]	Hospital Universitario San Juan de Alicante [San Juan University H., Alicante]	396
	Valencia [U. of Valencia]	Hospital Clínico Universitario [University Clinical H.]	582
	Valencia [U. of Valencia]	Hospital General Universitario de Valencia [Valencia University General H.]	546
	Valencia [U. of Valencia]	Hospital Universitario Doctor Peset [Doctor Peset University H.]	539
	Valencia [U. of Valencia]	Hospital Universitario y Politécnico La Fe [University and Polytechnic La Fe Hospital]	1,000
Total			78,369



Fig. 1 – Map of Spain with the location of universities where the degree in medicine is taught.

Table 2 – Number of medical students per 100,000 inhabitants in each autonomous community.

Autonomous community (AC)	Students per AC	Inhabitants per AC	Students/100,000 inhabitants
Andalusia	988	8,460,261	12
Aragón	224	13,287,53	17
Asturias	153	1,018,706	15
Balearic Islands	60	1,018,706	6
Canary Islands	265	2,174,474	12
Cantabria	119	582,796	20
Castile-La Mancha	200	2,044,408	10
Castile and León	360	2,393,285	15
Catalonia	1,134	7,778,362	15
Extremadura	120	1,063,575	11
Galicia	360	2,700,269	13
Madrid	1,478	6,778,382	22
Murcia	290	1,510,951	19
Navarre, Chartered Community of	260	660,887	39
Basque Country	330	2,219,777	15
Valencian Community	770	5,054,796	15
Total	7,111	46,788,388	15

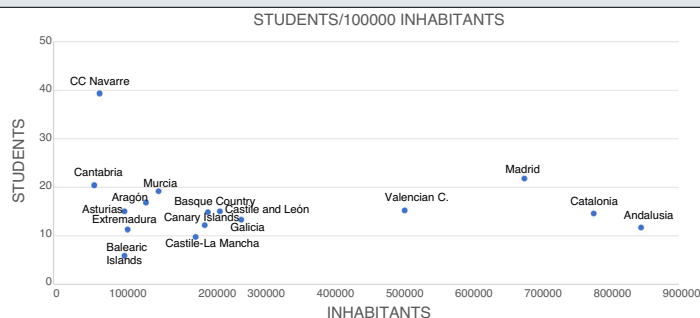


Fig. 2 – Number of medical students per 100,000 inhabitants in each autonomous community.

1.8, with a range from 0.2 beds at the Universidad de Navarra to 4.7 at CEU Cardenal Herrera – Castellón Campus.

Table 5 shows the characteristics of the nephrology teaching staff at the various universities, indicating the type of lecturer. In all the medical schools both nephrology theory and practical seminars are taught by nephrologists. On occasion, (data not shown) the course coordination may include other subjects for which other specialists are responsible.

Organisation and teaching content in nephrology

Table 6 shows the distribution of nephrology among the different medical schools, the year in which it is imparted and the overall number of credits for each subject. It also shows the distribution in hours for lectures and seminars, as well as assessment methods.

The subject is taught between the third and fifth years of the degree, the median being the fourth year. The total number of hours (lectures and seminars) is very variable and oscillates between 12 up to 35 h at CEU de Madrid, with a median of 18.5 h (Fig. 4). This variability is seen in both the number of topics (range 8–20, median 14) and the number of seminars (range 0–9, median 2) (Figs. 5 and 6). The highest number of seminars corresponds to the Universidad Complutense and the Internacional University of Catalunya. Thirteen (31%) of medical schools do not include seminars. Among those who include seminars, the ratio of number of lecture topics/seminars varies between 1.6 and 18, with a median of 4.25 (Fig. 7).

Table 3 – Universities where a degree in medicine is imparted with number of students and final grade requirements to be admitted in medicine.

University	Website	Name	Students	Grade req.
Andalusia-Cádiz [U. of Cádiz]	https://medicina.uca.es/	Faculty of Medicine	154	12.709
Andalusia-Córdoba [U. of Córdoba]	http://www.uco.es/medicinayenfermeria/es/	Faculty of Medicine and Nursing	130	12.791
Andalusia-Granada [U. of Granada]	https://medicina.ugr.es/	Faculty of Medicine	253	12.904
Andalusia-Málaga [U. of Málaga]	https://www.uma.es/facultad-de-medicina/	Faculty of Medicine	160	12.845
Andalusia-Sevilla [U. of Seville]	https://medicina.us.es/	Faculty of Medicine	291	12.89
Aragón-U. Zaragoza/Huesca [U. of Zaragoza, Huesca Campus]	https://medicina.unizar.es/	Faculty of Medicine	224	12.516
Asturias-U. de Oviedo [U. of Oviedo]	https://www.unioviado.es/medicina	Faculty of Medicine and Health Sciences (Medicine, Nursing and Physiotherapy).	153	12.487
Balearic Islands-U. de les Iles Balears [U. of the Balearic I.]	https://fmedicina.uib.es/	Faculty of Medicine	60	12.209
Canary Islands-La Laguna [U. of La Laguna]	https://www.ull.es/grados/medicina/	Faculty of Health Sciences	130	12.706
Canary Islands-Las Palmas [U. of Las Palmas de Gran Canaria]	http://www.fccs.ulpgc.es/node	Faculty of Health Sciences (Medicine, Nursing and Physiotherapy)	135	12.498
Cantabria-U. de Cantabria [U. of Cantabria]	https://web.unican.es/centros/medicina	Faculty of Medicine	119	12.355
Castile-La Mancha-Albacete [U. of Castile-La Mancha, Albacete Campus]	https://blog.uclm.es/medicinaab/	Faculty of Medicine	200	12.668
Castile-La Mancha-Ciudad Real [U. of Castile-La Mancha, Ciudad Real Campus]	http://medicina.cr.uclm.es/webmedicina/	Faculty of Medicine	60	12.668
Castile & León-Salamanca [U. of Salamanca]	https://facultadmedicina.org/	Faculty of Medicine	180	12.44
Castile & León-Valladolid [U. of Valladolid]	http://www.med.uva.es/grado-en-medicina/	Faculty of Medicine	180	12.476
Catalonia-Barcelona-Autónoma de Barcelona [Autonomous U. of Barcelona]	http://www.ub.edu/medicina/es/	Faculty of Medicine	320	12.3
Catalonia-Girona [U. of Girona]	https://www.udg.edu/es/estudia/Oferta-formativa/Graus/Fitxes?IDE=907&ID=3109G0111	Faculty of Medicine	80	12.197
Catalonia-Lleida [U. of Lleida]	http://www.udl.cat/ca/es/centros/facultad_medicina/	Faculty of Medicine	110	12.18
Catalonia-Barcelona-Pompeu Fabra [Pompeu Fabra U.]	https://www.upf.edu/es/web/graus/grau-medicina	Faculty of Medicine	60	12.494
Catalonia-Tarragona- Reus- Rovira i Virgili [U. of Rovira i Virgili]	http://www.urv.cat/es/estudios/grados/oferta/graudemedicina/	Faculty of Medicine and Health Sciences	125	12.182
Catalonia-Universidad de Barcelona [U. of Barcelona]	https://www.ub.edu/portal/web/medicina-ciencias-salut/graus/-/ensenyament/detallEnsenyament/4798347	Faculty of Medicine	259	12.458
Catalonia-Universitat Internacional de Catalunya [UIC Barcelona]	https://www.uic.es/en/studies-uic/health/bachelors-degree-medicine/curriculum	Faculty of Medicine	100	
Catalonia-Vic [U. of Vic]	https://www.uvic.cat/es/grado/medicina	Faculty of Medicine	80	
Extremadura-Badajoz-Universidad de Extremadura [U. of Extremadura]	https://www.unex.es/conoce-la-uex/centros/medicina	Faculty of Medicine	120	12.547
Galicia-La Coruña- Santiago [U. of Santiago de Compostela]	https://www.usc.gal/es/centros/medodo/	Faculty of Medicine and Dentistry	360	12.408
Madrid-Alcalá [U. of Alcalá]	http://medicinaycienciasdelasalud.uah.es/	Faculty of Medicine and Health Sciences	145	12.918

– Table 3 (Continued)

University	Website	Name	Students	Grade req.
Madrid-Alfonso X [Alfonso X el Sabio U.]	https://www.uax.es/grado-medicina.html	Health Sciences and Sport	132	
Madrid-Autónoma De Madrid [Autonomous U. of Madrid]	http://www.uam.es/Medicina/Home/1234890379763.htm	Faculty of Medicine	240	13.056
Madrid-CEU San Pablo [CEU San Pablo U.]	https://www.uspceu.com/es/alumnos/facultad-medicina/presentacion/index.aspx	Faculty of Medicine	176	
Madrid-Complutense [Complutense U. of Madrid]	https://medicina.ucm.es/	Faculty of Medicine	295	13.044
Madrid-Europea [European U. of Madrid]	https://universidadeuropea.es/madrid/titulacion/grado-medicina	Faculty of Medicine	220	
Madrid-Francisco de Vitoria [Francisco de Vitoria U.]	https://www.ufv.es/estudiar-en-ufv/titulaciones-de-grado/	Faculty of Medicine	120	
Madrid-Rey Juan Carlos [Rey Juan Carlos U.]	https://www.urjc.es/estudios/grado/596-medicina	Faculty of Medicine	150	12.794
Murcia-Murcia [U. of Murcia]	https://www.um.es/web/medicina/contenido/estudios/grados/medicina/2019-20/guias	Faculty of Medicine	200	12.644
Murcia-Católica San Antonio [San Antonio Catholic U. of Murcia]	https://www.ucam.edu/estudios/grados/medicina-presencial/plan-de-estudios	Faculty of Medicine	90	
Navarre-Navarra [U. of Navarre]	https://www.unav.edu/web/grado-en-medicina/plan-de-estudios	Faculty of Medicine	200	
Navarre-Universidad Publica de Navarra [Public U. of Navarre]	http://www.unavarra.es/fac-cienciasdelasalud	Faculty of Health Sciences	60	12.5
Basque Country-País Vasco [U. of the Basque Country]	https://www.ehu.eus/es/grado-medicina	Faculty of Medicine	330	12.361
Valencia-Castellón- Jaume I [Jaume I U.]	https://www.uji.es/estudis/oferta/base/graus/actual/medicina-p17/coneixer/organitzacioestudi/	Faculty of Medicine	80	12.37
Valencia-Universidad Católica San Vicente Mártir [Valencia Catholic U. Saint Vincent Martyr]	https://www.ucv.es/oferta-academica/grados/grado-en-medicina/seccion/guias-docentes	Faculty of Medicine	120	
Valencia-CEU Cardenal Herrera [CEU Cardenal Herrera U.]	https://www.uchceu.es/estudios/grado/medicines/plan-estudios	Faculty of Medicine	50	
Valencia-Castellón-CEU Cardenal Herrera [CEU Cardenal Herrera U.]	https://www.uchceu.es/estudios/grado/medicines/plan-estudios	Faculty of Medicine	70	
Valencia-Alicante-Miguel Hernández [Miguel Hernández U.]	https://umh.es/contenido/Estudios/:asi_g.1956.M1/datos_es.html	Faculty of Medicine	130	12.59
Valencia-Valencia [U. of Valencia]	https://www.uv.es/uvweb/universidad/es/estudios-grado/grau-1285846094474/Titulacio.html?id=1285847387054	Faculty of Medicine and Dentistry	320	12.509
Total			7,171	

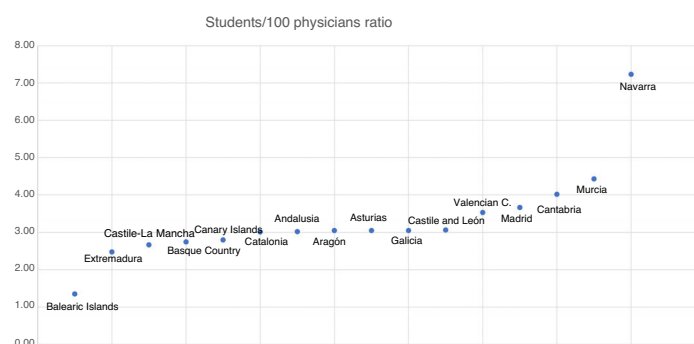


Fig. 3 – Ratio of students per 100 physicians in the different autonomous communities.

Table 4 – Beds in hospitals associated with universities per undergraduate medical student.

University	Students	Associated hospitals and beds	Beds per student
Andalusia-Cádiz [U. of Cádiz]	154	1,555	1.7
Andalusia-Córdoba [U. of Córdoba]	130	1,233	1.6
Andalusia-Granada [U. of Granada]	253	1,954	1.3
Andalusia-Málaga [U. of Málaga]	160	1,706	1.8
Andalusia-Sevilla [U. of Seville]	291	2,927	1.7
Aragón-U. Zaragoza/Huesca [U. of Zaragoza, Huesca Campus]	224	2,020	1.5
Asturias-U. de Oviedo [U. of Oviedo]	153	1,884	2.1
Balearic Islands-U. de les Iles Balears [U. of the Balearic I.]	60	1,258	3.5
Canary Islands-La Laguna [U. of La Laguna]	130	1,892	2.4
Canary Islands-Las Palmas [U. of Las Palmas de Gran Canaria]	135	1,744	2.2
Cantabria-U. de Cantabria [U. of Cantabria]	119	1,224	1.7
Castile-La Mancha-Albacete [U. of Castile-La Mancha, Albacete Campus]	140	705	0.8
Castile-La Mancha-Ciudad Real [U. of Castile-La Mancha, Ciudad Real Campus]	60	564	1.6
Castile and León-Salamanca [U. of Salamanca]	180	2,940	2.7
Castile and León-Valladolid [U. of Valladolid]	180	1,878	1.7
Catalonia-Barcelona-Autónoma de Barcelona [Autonomous U. of Barcelona]	320	3,336	1.7
Catalonia-Girona [U. of Girona]	80	431	0.9
Catalonia-Lleida [U. of Lleida]	110	692	1.0
Catalonia-Barcelona-Pompeu Fabra [Pompeu Fabra U.]	60	470	1.3
Catalonia-Tarragona- Reus- Rovira i Virgili [U. of Rovira i Virgili]	125	1,412	1.9
Catalonia-Universidad de Barcelona [U. of Barcelona]	259	2,727	1.8
Catalonia-Universitat Internacional de Catalunya [UIC Barcelona]	100	1,237	2.1
Catalonia-Vic [U. of Vic]	80	572	1.2
Extremadura-Badajoz-Universidad de Extremadura [U. of Extremadura]	120	1,435	2.0
Galicia-La Coruña- Santiago [U. of Santiago de Compostela]	360	4,878	2.3
Madrid-Alcalá [U. of Alcalá]	145	2,315	2.7
Madrid-Alfonso X [Alfonso X el Sabio U.]	132	1,908	2.4
Madrid-Autónoma De Madrid [Autonomous U. of Madrid]	240	3,234	2.2
Madrid-CEU San Pablo [CEU San Pablo U.]	176	965	0.9
Madrid-Complutense [Complutense U. of Madrid]	295	3,955	2.2
Madrid-Europea [European U. of Madrid]	220	1,693	1.3
Madrid-Francisco de Vitoria [Francisco de Vitoria U.]	120	2,476	3.4
Madrid-Rey Juan Carlos [Rey Juan Carlos U.]	150	1,502	1.7
Murcia-Murcia [U. of Murcia]	200	1,653	1.4
Murcia-Católica San Antonio [San Antonio Catholic U. of Murcia]	90	1,990	3.7
Navarre-Navarra [U. of Navarre]	200	241	0.2
Navarre-Universidad Pública de Navarra	60	1,086	3.0
Basque Country-País Vasco [U. of the Basque Country]	330	3,510	1.8
Valencia-Castellón- Jaume I [Jaume I U.]	80	1,095	2.3
Valencia-Universidad Católica San Vicente Mártir [Valencia Catholic U. Saint Vincent Martyr]	120	1,057	1.5
Valencia-CEU Cardenal Herrera [CEU Cardenal Herrera U.]	70	755	1.8
Valencia-Castellón-CEU Cardenal Herrera [CEU Cardenal Herrera U.]	50	1,398	4.7
Valencia-Alicante-Miguel Hernández [Miguel Hernández U.]	130	2,195	2.8
Valencia-Valencia [U. of Valencia]	320	2,667	1.4
Total	7,111	78,369	1.8

Table 5 – Lecturers teaching nephrology in universities with their category and current situation.

University	Full professor	Titular professor	Senior lecturer/Dr	Senior lecturer	Temp. senior lecturer	Adjunct lecturer	Emeritus
Andalusia-Cádiz [U. of Cádiz]						1	
Andalusia-Córdoba [U. of Córdoba]	2		1			5	1
Andalusia-Granada [U. of Granada]		1				2	
Andalusia-Málaga [U. of Málaga]	1					2	
Andalusia-Sevilla [U. of Seville]						3	
Aragón		1				10	
Asturias	2					3	
Baleares [U. of the Balearic I.]						3	
Canary Islands-La Laguna [U. of La Laguna]	1					3	
Canary Islands-Las Palmas [U. of Las Palmas de Gran Canaria]	1					2	
Cantabria-Santander [U. of Cantabria, Santander Campus]						2	2
Castile-La Mancha-Albacete [U. of Castile-La Mancha, Albacete Campus]						3	
Castile-La Mancha-Ciudad Real [U. of Castile-La Mancha, Ciudad Real Campus]						3	
Castile and León-Salamanca [U. of Salamanca]			1			4	
Castile and León-Valladolid [U. of Valladolid]						4	
Catalonia-Autónoma de Barcelona [Autonomous U. of Barcelona]				2	2	11	1
Catalonia-Girona [U. of Girona]						4	
Catalonia-Lleida [U. of Lleida]						2	
Catalonia-Pompeu Fabra [Pompeu Fabra U.]						5	
Catalonia-Reus Tarragona-Rovira i Virgili [U. of Rovira i Virgili]	1					7	
Catalonia-Universidad de Barcelona [U. of Barcelona]	1	1		1		12	1
Catalonia-Universitat Internacional de Catalunya [UIC Barcelona]						3	
Catalonia-Vic [U. of Vic]		1	1			1	
Extremadura [U. of Extremadura]		1				3	
Galicia-Santiago [U. of Santiago de Compostela]						2	
Madrid-Alcalá [U. of Alcalá]	1	1				11	
Madrid-Alfonso X [Alfonso X el Sabio U.]						6	
Madrid-Autónoma De Madrid [Autonomous U. of Madrid]	1	1				7	1
Madrid-CEU San Pablo [CEU San Pablo U.]			2			2	
Madrid-Complutense [Complutense U. of Madrid]	1	1				10	
Madrid-Europea [European U. of Madrid]			1			11	
Madrid-Francisco de Vitoria [Francisco de Vitoria U.]			1			2	
Madrid-Rey Juan Carlos [Rey Juan Carlos U.]						4	
Murcia [U. of Murcia]			1			3	
Murcia-Católica [San Antonio Catholic U. of Murcia]						1	
Navarra [U. of Navarre]	1		3			3	
Universidad Pública de Navarra [Public U. of Navarre]							
Basque Country-País Vasco [U. of the Basque Country]						12	
Valencia-Castellón						4	
Valencia-Universidad Católica San Vicente Mártir [Valencia Catholic U. Saint Vincent Martyr]						1	
Valencia-CEU Cardenal Herrera [CEU Cardenal Herrera U.]						3	
Valencia-CEU Cardenal Herrera-Castellón						2	
Valencia-Elche [U. Miguel Hernández, Elche]						5	
Valencia-Valencia [U. of Valencia]		1				5	
Totals	13	8	11	3	2	187	6

Supplementary Table S2 details the hours dedicated to theory teaching (both lectures and seminars) in the different universities, as well as the specific topics imparted.

The theory topics presented are very variable (Fig. 8), and although it is to be hoped that the main topics are included in all universities, the distribution of lectures topics and seminars is variable, as are the titles and descriptions under which they are included. The most common topics are chronic kidney disease, acute kidney injury, chronic tubulointerstitial nephropathies, glomerulonephritis, systemic autoimmune diseases, renal vascular diseases and hydroelectrolytic

disorders and acid–base status. With regard to seminars, the most commonly taught were on acute kidney injury, nephrotic syndrome and hydroelectrolytic disorders and acid–base status (Fig. 9).

Nephrology is usually integrated with another broader subject and only in the Universidad de Navarra is it an independent course, with three credits. The field most commonly combined with nephrology is urology, although it was also combined with endocrinology, infectious diseases, rheumatology, neurology, the digestive system, cardiology, haematology, geriatrics, and even traumatology and neurosurgery (Fig. 10). Assessment often includes a practical part and another part

Table 6 – Analysis of course guides for courses including or relating to nephrology.

University	Year	Topics	Theory hours	Theory topics	Seminar hours	Seminar topics	Theory topic/seminar ratio	Total hours	Comments	Assessment
Andalusia-Cádiz [U. of Cádiz]	4	Medical pathology of the nephro-urinary system, neurology and geriatrics	14	14	2	2	7.0	16	With urology, neurology and geriatrics	Practical tutor-assessment and multiple choice and/or short questions exam
Andalusia-Córdoba [U. of Córdoba]	5	Module 1: Renal diseases, hypertension and hydroelectrolytic and acid-base balance disorders Module 2: Urological and male reproductive system diseases	12	12	2	2	6.0	14	Course with urology	Multiple choice exam and coursework assessment
Andalusia-Granada [U. of Granada]		Pathology of the urinary system and infectious diseases, 8 credits	15	12	5	5	2.4	20	With urology and infectious diseases	Practical assessments. Multiple choice exam
Andalusia-Málaga [U. of Málaga]	4	Diseases of the gastrointestinal and genito-urinary system	12	10	0	0	0.0	12	With urology and gastroenterology	Multiple choice exam
Andalusia-Sevilla [U. of Seville]	5	Endocrinology, rheumatics, nephrology, infectious diseases	13	13	4	4	3.3	17	With various	Multiple choice exam
Aragón-U. Zaragoza/Huesca [U. of Zaragoza, Huesca Campus]	5	Locomotor system and nephro-urology	8	8	5	5	1.6	13	With trauma, rheumatics and urology	Multiple choice exam
Asturias-U. de Oviedo [U. of Oviedo]		Nephro-urological pathology	17	17	4	4	4.3	21	With urology	Multiple choice exam
Balearic Islands-U. de les Iles Balears [U. of the Balearic I.]	4	Medical/surgical: Urinary system	17	17	3	3	5.7	20	With urology	Assessment of practical work, seminars, coursework and multiple choice exam (50%)
Canary Islands-La Laguna [U. of La Laguna]	4	Renal, urinary tract and male reproductive system pathology	12	12	0	0	0.0	12	With urology	Multiple choice exam
Canary Islands-Las Palmas [U. of Las Palmas de Gran Canaria]	4	Diseases of the urinary and male reproductive system	23	17	5	4	4.3	28	With urology	Multiple choice exam with case studies (90%) and practical work (10%)
Cantabria-U. de Cantabria [U. of Cantabria]	4		17	17	0	0	0.0	17	With endocrinology	Multiple choice (30%) and short questions (70%) exam
Castile-La Mancha-Albacete [U. of Castile-La Mancha, Albacete Campus]	5	Nephro-urological pathologies	15	13	9	5	2.6	24	With urology	Practical assessment (30%) and theory 70% (modular and final exams)
Castile-La Mancha-Ciudad Real [U. of Castile-La Mancha, Ciudad Real Campus]	5	Nephro-urological pathologies	15	13	9	5	2.6	24	With urology	Practical assessment (30%) and theory 70% (modular and final exams)
Castile and León-Salamanca [U. of Salamanca]	5	Nephrology and urology	19	17	4	4	4.3	23	With urology	Multiple choice exam (50%) with open-ended questions (25%) and two case studies (25%)

– Table 6 (Continued)

University	Year	Topics	Theory hours	Theory topics	Seminar hours	Seminar topics	Theory topic/seminar ratio	Total hours	Comments	Assessment
Castile and León-Valladolid [U. of Valladolid]	3	Medical/surgical pathology of the urinary system	13	12	0	0	0.0	13	With urology	Multiple choice exam (100%)
Catalonia-Barcelona-Autónoma de Barcelona [Autonomous U. of Barcelona]	4	Medicine and surgery III (gastroenterology, nephro-urology and geriatrics)	13	12	4	4	3.0	17	With gastroenterology, urology and geriatrics	Assessment of practical (seminars 20% and practicals 10%) and theory work (70%)
Catalonia-Girona [U. of Girona]	3	<i>Intake, processing and elimination systems 3 Water, electrolytes and excretion</i>	12	12	0	0	0.0	12	With urology	Multiple choice exam and case studies
Catalonia-Lleida [U. of Lleida]	3	Cardiological and nephrological diseases	20	17	4	4	4.3	24	With cardiology	
Catalonia-Barcelona-Pompeu Fabra [Pompeu Fabra U.]	5	Medical/surgical pathology IV: nephrology, urology and infectious diseases	13	13	4	4	3.3	17	With urology and infectious diseases	Multiple choice exam (90%) and practical assessments (10%)
Catalonia-Tarragona-Reus-Rovira i Virgili [U. of Rovira i Virgili]	5	<i>Renal and urinary diseases</i>	20	14	4	1	14.0	24	With urology	Multiple choice exam
Catalonia-Universitat de Barcelona [U. of Barcelona]	5	<i>Diseases of the renal system and male reproductive system</i>	14	12	0	0	0.0	14	With urology	Practical work (care, portfolio and clinical evidence) and theory exam (60%)
Catalonia-Universitat Internacional de Catalunya [UIC Barcelona]	4	Nephrology	14	14	6	6	2.3	20	Nephrology only	Multiple choice exam
Catalonia-Vic [U. of Vic]	3	<i>Intake processing and elimination systems III. Water, electrolytes and excretion</i>	12	10	0	0	0.0	12	With urology	Group work (25%), participation (10%) and exam (65%)
Extremadura-Badajoz-Universidad de Extremadura [U. of Extremadura]	4	Nephrology and urology	22	16	0	0	0.0	22	With urology	Assessment of practical work and seminars (10%) and multiple choice exam (90%)
Galicia-La Coruña-Santiago [U. of Santiago de Compostela]	3	Renal and urinary diseases	23	18	2	2	9.0	25	With urology	Assessment of practical work (10%) and multiple choice exam (90%)
Madrid-Alcalá [U. of Alcalá]	5	Medical pathology 2	12	12	5	5	2.4	17	With infectious diseases, rheumatology, haematology and endocrinology	Multiple choice exam

– Table 6 (Continued)

University	Year	Topics	Theory hours	Theory topics	Seminar hours	Seminar topics	Theory topic/seminar ratio	Total hours	Comments	Assessment
Madrid-Alfonso X [Alfonso X el Sabio U.]	5	Medical/surgical pathology 2	24	18	4	3	6.0	28	With urology, endocrinology, neurology and neurosurgery	Continuous assessment (10%) and multiple choice exam (90%)
Madrid-U. Autónoma de Madrid [Autonomous U. of Madrid]	4	Nephrology and urology	12	12	6	5	2.4	18	With urology	Continuous assessment (30%) and multiple choice exam (70%)
Madrid-CEU San Pablo [CEU San Pablo U.]	4	Medical pathology IV	31	20	4	4	5.0	35	With neurology	Continuous assessment (10%) and theory/practical exam (90%)
Madrid-Complutense [Complutense U. of Madrid]	5	Medical pathology 2	16	14	6	6	2.3	22	With infectious diseases, endocrinology and neurology	Theory exam (multiple choice or short questions)
Madrid-U. Europea [European U. of Madrid]	4	Endocrinology and the nephro-urinary and reproductive system	14	14	0	0	0.0	14	With endocrinology and urology	Assessment of clinical skills (15%), practical work (35%) and objective evidence (50%)
Madrid-Francisco de Vitoria [Francisco de Vitoria U.]	5	Medical/surgical pathology – Nephro-urinary system	12	11	2	1	11.0	14	With urology	Practical assessments (35%) and multiple choice exam (65%)
Madrid-Rey Juan Carlos [Rey Juan Carlos U.]	4	Medical/surgical pathology of the genito-urinary system	19	16	4	3	5.3	23	With urology	Multiple choice and practical exam (not specified)
Murcia-Murcia [U. of Murcia]	5	Urinary system (nephrology and urology)	20	14	0	0	0.0	20	With urology	Practical assessment (10%) and theory assessment with multiple choice exam and short questions (90%)
Murcia-Católica San Antonio [San Antonio Catholic U. of Murcia]	4	Nephro-urology	15	15	0	0	0.0	15	With urology	Practical assessments (OSCE 10% and practical work 10%) and multiple choice exam (80%)
Navarre-Navarra [U. of Navarre]	5	Nephrology-	27	18	3	2	9.0	30	Nephrology	Multiple choice exam
Navarre-Universidad Pública de Navarra [Public U. of Navarre]	4	Nephro-urology					0.0	0	With urology	
Basque Country-País Vasco [U. of the Basque Country]	4	Medical pathology 1	11	10	1	1	10.0	12	With others	Assessment of seminars (15%), practical work (5%) and multiple choice exam (80%)
Valencia-Castellón-U. Jaume I [Jaume I U.]	4	Cardio-circulatory and nephro-urological diseases	22	18	2	1	18.0	24	With cardiology and urology	Assessment with skills workshop (20%) and theory assessment with multiple choice exam and case studies (80%)

– Table 6 (Continued)

University	Year	Topics	Theory hours	Theory topics	Seminar hours	Seminar topics	Theory topic/seminar ratio	Total hours	Comments	Assessment
Valencia- Universidad Católica San Vicente Mártir [Valencia Catholic U. Saint Vincent Martyr]	5	Medicine and surgery of the nephro-urinary system	19	17	0	0	0.0	19	With urology	Practical assessment (20%) and multiple choice and open-ended questions exam (80%)
Valencia-CEU Cardenal Herrera [CEU Cardenal Herrera U.]	5	Nephro-urology	22	14	2	2	7.0	24	With urology	Continuous assessment (OSCE, periodic assessment: 45%) and final exam (55%)
Valencia-Castellón- CEU Cardenal Herrera [CEU Cardenal Herrera U.]	5	Pathology: nephro-urology	22	14	2	2	7.0	24	With urology	Continuous assessment (OSCE, periodic assessment: 45%) and final exam (55%)
Valencia-Alicante- Miguel Hernández [Miguel Hernández U.]	5	Medical/surgical pathology of the urinary system	15	13	0	0	0.0	15	With urology	Practical assessments (20%), multiple choice exam (30%) and resolution of case studies (50%)
Valencia-Valencia [U. of Valencia]	5	Nephrology and urology	11	10	6	4	2.5	17	With urology	Practical exam (50%) and theory exam with multiple choice questions and case studies (50%)

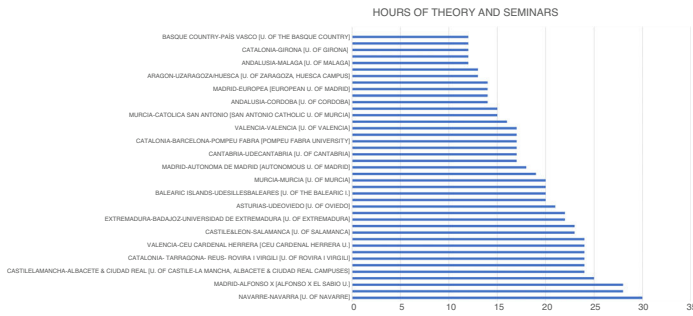


Fig. 4 – Total number of hours of theory lectures and seminars in medical schools.

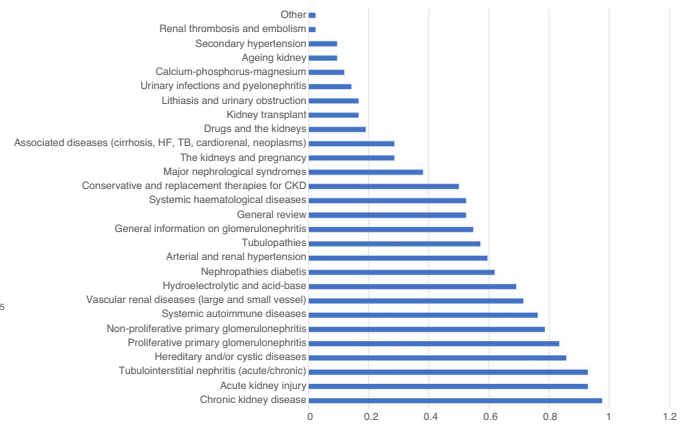


Fig. 8 – Distribution of theory topics among the different medical schools.

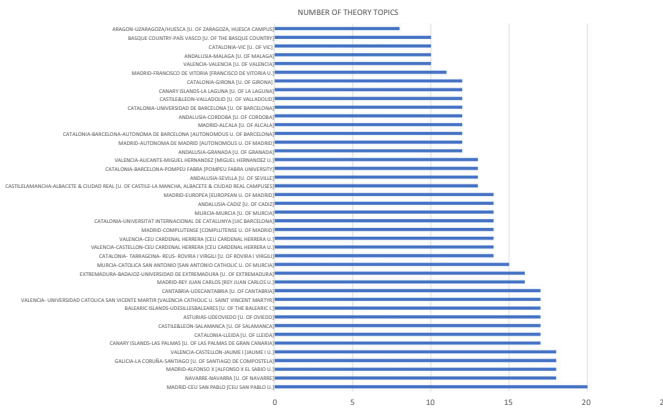


Fig. 5 – Number of theory topics imparted in the different medical schools.

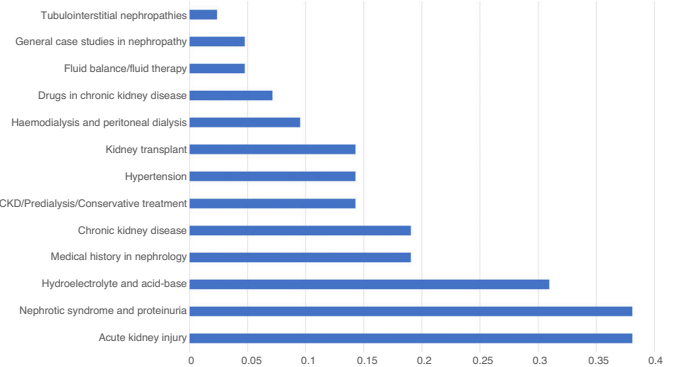


Fig. 9 – Distribution of seminars among the different faculties of medicine.

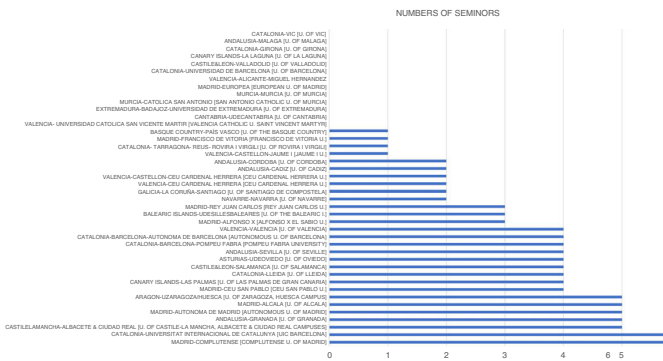


Fig. 6 – Number of seminars taught in medical schools.

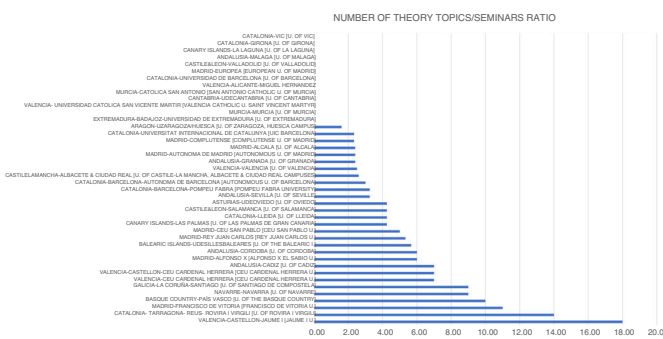


Fig. 7 – Number of theory topics/seminars ratio in medical schools.

assessing theory knowledge. In almost all cases the test are multiple-choice questions, and many medical schools also use teststhat includes short questions and/or case studies.

Finally, **Table 7** shows the number of nephrologists in each autonomous community working for the National Health System, the percentage of men and women and the ratio per 100,000 inhabitants. In our country, there is an acceptable number of nephrologists within the National Health System; the ratio of nephrologists per 100,000 inhabitants ranges from 1.38 in Cantabria to 3.68 in Catalonia. We have also observed that there are more women than men in almost all autonomous communities. In the some community the ratio is lower, but they also have more nephrologists working in private hospitals.

Discussion

This is the first study on the situation of nephrology teaching in our country since the degree in medicine was standardised according to the Bologna process.

We have observed that there are differences between the various autonomous communities with regard to the number of nephrologists working in the National Health System, and we have also noted the growing female presence and the high proportion of nephrologists under 50 years of age.

One important fact should be highlighted, the grade requirements to be admitted in medicine at public universities continue to be very high, reflecting the attractiveness of the medical profession among young students. This is a situation that repeats year after year and it is a privilege for lecturers to have students with an excellent cognitive profile on entry to our institutions.

Our study brings to light that numerous healthcare institutions are available to students during their training. We have not been able to analyse in detail the availability of health centres or other primary or specific care facilities. The number of beds per student is very heterogeneous varying between 0.2 and 4.7 beds and it is related to the number and type of hospitals associated with the medical schools. Although the number of beds can be used as a guide, our study has not been able to analyse other teaching environments that are also very

Table 7 – Nephrologists working for the national Health System in each autonomous community.

Autonomous community	Nephrologists	% Female	% Male	% Over age 50	Nephrologists/100,000 inhabitants ratio
Andalusia	174	64.4	35.6	37.9	2.07
Aragón	40	52.5	47.5	50	3.04
Asturias	29	48.3	51.7	41.4	2.82
Balearic Islands	33	60.6	39.4	36.4	2.84
Canary Islands	68	63.2	36.8	39.7	3.14
Cantabria	8	50	50	0	1.38
Castile-La Mancha	55	69.1	30.9	40	2.70
Castile and León	80	58.8	41.2	42.5	3.30
Catalonia	274	58.4	41.6	49.3	3.68
Extremadura	31	51.6	48.4	29	2.89
Galicia	71	59.2	40.8	46.5	2.77
Madrid	172	65.7	34.3	34.3	3.17
Murcia	43	74.4	25.6	44.2	2.92
Navarre, Chartered Community of	11	72.7	27.3	18.2	1.72
Basque Country	57	64.9	35.1	40.4	2.63
Valencian Community	92	54.3	45.7	38	2.29
La Rioja	11	54.5	45.5	54.5	3.52
Ceuta and Melilla	4	0	100	50	2.35
Total	1,253				

useful for training, such as outpatient clinics or special units (such as peritoneal dialysis, haemodialysis, interventional nephrology, imaging techniques, etc.). Without doubt, these other alternatives make a decisive contribution to training as they enable the student to come into contact with patients with very diverse pathologies. We also feel that in order to optimise practical training, it has to be organised appropriately, taking into account the periods of rotation through healthcare institutions of the various year groups in each medical school.

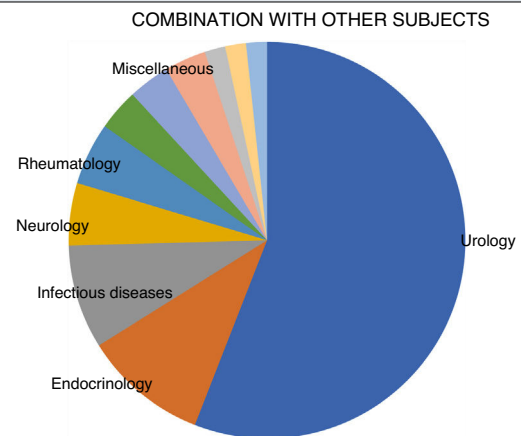
With regard to teaching staff, we note the low number of tenured professors or those with a stable connection with the university. Full professors and titular professors represent only 13% of the lecturers. Just 16 medical schools have either full or titular professors, two universities from Cataluña have senior lecturers and eight universities have PhD professors. Therefore it is necessary to have a significant number of associate professors to provide an additional teaching activity which includes lectures and patients care teaching. Moreover, it has been observed that during last three years six professors (full and titular) became emeritus professors. Of the 10 current full professors, seven plan to retire before 2025, and of the 12 titular professors, five plan to do so by the same date. Ultimately, a majority of the tenured professors are over 55 years of age. On the other hand, the distribution of these professors is heterogeneous and they are concentrated fundamentally in universities in Madrid, Catalonia and Andalusia.

Some communities have created the role of senior lecturer for physicians with the PhD degree, which may help to alleviate the situation of the limited number of lectures. It requires accreditation from ANECA or the equivalent organism in the autonomous community; this accreditation is currently less rigorous than that for a titular professor. In Catalonia, there is also the role of senior lecturer with a stable relationship with the university.

Although the role of adjunct professors is undeniable, we believe that the work requested is too much relative to the amount being paid, which in some cases does not cover for the months of the summer. We want to call attention to this aspect, which is a clear weakness in our teaching system. On the other hand, it is important to note that sometimes the selection of adjunct lecturers is modern criteria and at times it lacks transparency. Finally, although the ideal would be for all of them to have the PhD degree this is often not the case.

The proposal of the SEN University Group is to take actions to strengthen cooperative research between groups to improve the research *curriculum vitae* of its members since the weakness of the applicants in the ANECA accreditation system is often research. In addition, we propose the creation of an advisory committee within the group that would provide information and assistance to nephrologists for eventual accreditation within current institutions (such as ANECA at the national level or the responsible agencies in the autonomous community) as either senior lecturer with the title of Doctor or titular professor, as well as boosting training in the educational skills that are so important in the teaching of medicine.

Our study has also revealed other relevant aspects. One of the most significant has been the observation of the heterogeneity of the content imparted at the various universities. Based on an exhaustive review of course guides, all students on medicine degrees have contact with nephrology during practical training. However, it is surprising the large

**Fig. 10 – Combination of nephrology with other subjects in the degree in medicine.**

disparity in terms of the year in which the subject is taught (predominantly the fourth), its combination with other specialties (with urology in most medical schools) and the distribution of theory teaching (both theory classes and seminars). This situation goes against the aims of the Bologna process, which was to facilitate the mobility of students between universities. The traditions of the universities and their independence when designing teaching programmes, guides and courses has contributed to this reality. Theory syllabi and seminars are completely heterogeneous and although they contain, as they must, the principal nephrology topics, each institution does things differently. We feel that attempting to standardise course guides in our country is not a task for the SEN University group, since nephrology is locked into other courses, including in relatively rigid teaching plans. We propose a different plan; the generation of common teaching materials that can be freely used by lecturers, junior doctors and students, taking into account the experience of other countries as well as new clinical practice models based on the ageing of the population, the growing presence of comorbidities and interaction with primary care.

We were also surprised by the different methods of assessment of knowledge. Our proposal would not be to use identical assessments, but rather sharing experiences of practical assessment (such as the use of similar portfolios by agreement, use of the miniCEX, skills workshops, assessment with case studies, OSCEs, etc.) or provide the possibility to have access to series of common questions that can be used by all lecturers if they wish. Lastly, it is important to encourage our students to learn nephrology and to apply this knowledge as junior doctors and throughout their career.

Finally, we would not want to miss the opportunity to point out that the way of teaching in general and medicine in particular is chang-

ing at an accelerated pace.^{14,15} The incorporation of simulation-based teaching and online methods more generally in our medical schools is a fascinating challenge, even more so since we've found ourselves in the current healthcare crisis in 2020. Although these methods are not a panacea, as physicians also need to learn attitudes and values relating to communication, teamwork and ethical aspects, among others, we have no doubt that technology today will lead us to change many things, including how we teach. There are many teaching experiences we can make use of that will help our students to understand the complexity of nephrology. It is essential to be able to transmit our passion for the specialty, with strategies that have been successful in other countries that highlight the value of care for patients with chronic kidney disease, our capacity to understand their personal and social problems associated with chronic disease, our enthusiasm when evaluating the lab work alterations, haemodialysis and peritoneal dialysis techniques, the assessment of kidney biopsies, the general incorporation of diagnostic techniques such as ultrasound, and the multitude of opportunities within our reach.^{16,17} In today's world, we cannot forget the possibilities offered by technology, and in particular social networks; the use of videos, podcasts, blogs, webinars and others is revolutionising teaching at all levels and nephrology must not be left on the sidelines, as has already been pointed out by many authors.^{18–21}

Moreover, our students are also demanding that we teach them other, not strictly scientific, aspects of medicine and nephrology, such as training in bioethics, skills for communicating with patients and how to manage the emotional burden of clinical practice.²² Our patients always offer us this opportunity, since they suffer from chronic diseases and frequently have to deal with ethical problems relating to their diagnosis and treatment. Moreover, our specialty has also been characterised since its origins by its tendency to overlap with other specialties to decide strategic planning of patient management, such as patient safety, organisation of material and human resources, disease prevention and other aspects that are becoming more important in the work of tomorrow's physicians.

From the S.E.N. University group, we can give an important boost to these new forms with standardised teaching materials for the whole country, created by nephrologists with expertise on each topic, using case studies for students, creating OSCE designs with patients, assisting one-another in the design and preparation of our students' theses, etc. Ultimately, fulfilling our ethical obligation to teach students, and by extension junior doctors and nephrology colleagues, with activities and materials that should not be limited to the academic sphere, but should transcend even our specialty to be used by other professionals in primary or specialist care.

Finally, our society should continue to have an open attitude towards these new ways of teaching, incorporating all useful innovations that might improve the training of students, junior doctors and nephrologists.

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Conflicts of interest

The authors have no conflicts of interest to declare.

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Our particular recognition goes to Dr Alberto Tejedor Jorge and his family, who has been a constant example since his time as a student, junior doctor, specialist and university lecturer for many generations of junior doctors and students, and who from the start has been an indispensable mentor and coordinator for the S.E.N. University group.

Appendix A. Members of the S.E.N. University Group

Manuel Arias Rodríguez, Aleix Cases Amenós, Gabriel de Arriba, Carmen Díaz Corte, Mario Espinosa Hernández, Josep María Galcerán Gui, Nuria García Fernández, Emilio González Parra, Pedro Ramón Gutiérrez Hernández, Pedro Antonio López Cillero, Alejandro Martín Malo,

Alberto Ortiz Arduán, Antonio Osuna Ortega, Javier Pérez Contreras, María Dolores del Pino y Pino, José Ramón Pons Prades, José Carlos Rodríguez Pérez, Mariano Rodríguez Portillo, Diego Rodríguez-Puyol, Ana Sánchez Fructuoso, Mercedes Salgueira Lazo, Rafael Santamaría Olmo, Ramón Saracho, Patricia de Sequera Ortiz, Alberto Tejedor Jorge.

Appendix B. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi: <https://doi.org/10.1016/j.nefro.2021.07.006>.

REFERENCES

1. Sociedad Española de Nefrología. El libro blanco de la nefrología Española (I). *Nefrología*. 2000;20:109–29.
2. Sociedad Española de Nefrología. El libro blanco de la nefrología Española (II). *Nefrología*. 2000;20:214–33.
3. Sociedad Española de Nefrología. El libro blanco de la nefrología Española (III). *Nefrología*. 2000;20:396–402.
4. Bernis Carro C. Evolución de las plazas asignadas a nefrología en las convocatorias MIR (1985–2008). *Nefrología*. 2011;31:155–61.
5. Hsiao L-L, Wu J, Yeh AC, Shieh EC, Cui C, Li A, et al. The Kidney Disease Screening and Awareness Program (KDSAP): a novel translatable model for increasing interest in nephrology careers. *J Am Soc Nephrol*. 2014;25:1909–15.
6. Hoenig MP, Shapiro E, Hladik GA. Lessons learned from the ASN Renal Educator Listserv and survey. *Clin J Am Soc Nephrol*. 2013;8:1054–60.
7. Ministerio de Educación y Formación Profesional. Available from: <https://www.educacionyfp.gob.es> (Accessed 9 May 2020).
8. Conferencia Nacional de Decanos de Medicina. Available from: <http://www.cndmedicina.com/> (Accessed 9 May 2020).
9. Conferencia de Rectores de las Universidades Españolas (CRUE). Available from: <http://www.crue.org/SitePages/Inicio.aspx> (Accessed 9 May 2020).
10. Instituto Nacional de Estadística. Available from: <https://www.ine.es> (Accessed 9 May 2020).
11. Catálogo Nacional de Hospitales. Available from: <https://www.mscbs.gob.es/ciudadanos/prestaciones/centrosServiciosSNS/hospitales/home.htm> (Accessed 9 May 2020).
12. Barber Pérez P, Gonzalez López-Valcarcel B, Suárez Vega R. Estimación de la oferta y demanda de médicos especialistas. España 2018-2030. Universidad de Las Palmas de Gran Canaria; 2018. Available from: <https://www.mscbs.gob.es/profesionales/formacion/necesidadEspecialistas/doc/20182030EstimacionOfertaDemandaMedicosEspecialistasV2.pdf> (Accessed 22 May 2020).
13. Miller GE. The assessment of clinical skills/competence/performance. *Acad Med*. 1990;65:S63–7.
14. Woods M, Rosenberg ME. Educational tools: thinking outside the box. *Clin J Am Soc Nephrol*. 2016;11:518–26.
15. Calderon KR, Vij RS, Mattana J, Jhaveri KD. Innovative teaching tools in nephrology. *Kidney Int*. 2011;79:797–9.
16. Jhaveri KD, Chawla A, Shah HH. Case-based debates: an innovative teaching tool in nephrology education. *Ren Fail*. 2012;34:1043–5.
17. Hoenig MP. Share your passion for nephrology: ten tips to invigorate attending rounds and precepting sessions. *Am J Kidney Dis*. 2015;66:28–32.
18. Diniz H, Melilli E. The rise of #SocialMedia in the Nephrology world. *Nefrología*. 2020;40:597–607. <http://dx.doi.org/10.1016/j.nefro.2020.02.003>.
19. Sparks MA, Topf JM. NephMadness after 5 years: a recap and game plan for the future. *Am J Kidney Dis*. 2018;71:299–301.
20. Topf JM, Sparks MA, Iannuzzella F, Lerma E, Oates T, Phelan PJ, et al. Twitter-based journal clubs: additional facts and clarifications. *J Med Internet Res*. 2015;17:e216.
21. Jhaveri KD, Perazella MA. Nephrologists as educators: clarifying roles, seizing opportunities. *Clin J Am Soc Nephrol*. 2016;11:176–89.
22. Callizo Silvestre A, Carrasco Picazo JP. The Medicine degree. A vision from students. *Educ Med*. 2015;16:100–3.