

ORIGINAL ARTICLE

Evolution of interconsultal activity to endocrinology and nutrition in hospitalization floor in a third level hospital



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KEYWORDS

Interconsultation;
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Abstract

Introduction: Endocrinology and Nutrition (EyN) is an outpatient and hospital medical specialty. This study aims to understand the evolution of the activity of interdepartmental consultation (IC) carried out by EyN in hospitalization floor of a third level hospital, comparing its evolution with other medical specialties, and comparing endocrine IC with nutritional IC.

Material and methods: Longitudinal and retrospective study which analyzes IC notes of EyN and other medical specialties between 01-01-2013 and 31-12-2022.

Results: A total of 76093 IC notes (12623 patients) were performed by the EyN service (average age 65.4 years; 59% male) with an average of 4.8 notes per patient. Average annual growth was 7% in notes and 4% in patients (versus 6% and 3% of all other medical services, differences statistically significant). Of all patients hospitalized for 4 or more days, EyN went from attending 7.9% (2013) to 12.3% (2022). 66% of the IC performed by EyN was for nutritional cause and 34% for other pathologies.

Conclusions: The EyN service is the one that most patients attend in hospital IC activity, with growth over the last few years greater than other medical specialties. Nutritional pathology is the main reason for IC.

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PALABRAS CLAVE

Interconsulta;
Endocrinología;
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Hospitalización;
Especialidad médica

Evolución de la actividad de interconsultas a Endocrinología y Nutrición en planta de hospitalización en un hospital de tercer nivel**Resumen**

Introducción: La Endocrinología y Nutrición (EyN) es una especialidad médica ambulatoria y hospitalaria. Mediante este estudio se pretende conocer la evolución de la actividad de interconsulta (IC) en planta de hospitalización por el servicio de EyN de un hospital de tercer nivel, comparando su evolución con respecto al resto de especialidades médicas y comparando IC por motivo endocrinológico con respecto a nutricional.

Material y métodos: Estudio longitudinal y retrospectivo donde se analizaron las notas de IC del servicio de EyN y del resto de especialidades médicas entre el 01-01-2013 y el 31-12-2022.

Resultados: Se realizaron un total de 76093 notas de IC (12623 pacientes) por el servicio de EyN (edad promedio 65,4 años; 59% varones) con un promedio de 4,8 notas por paciente. El crecimiento anual promedio fue del 7% en notas y 4% en pacientes (versus 6% y 3% respectivamente, del resto de servicios médicos, diferencias estadísticamente significativas). Del total de pacientes hospitalizados durante 4 o más días, EyN pasó de atender como IC el 7,9% (2013) al 12,3% (2022). Un 66% de los motivos de IC realizados por EyN fue por causa nutricional y un 34% por otras patologías.

Conclusiones: El servicio de EyN es el que más pacientes atiende en régimen de IC hospitalaria, con un crecimiento a lo largo de los últimos años mayor que el resto de las especialidades médicas. La patología nutricional es el principal motivo de IC.

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Introduction

Endocrinology and Nutrition (E&N) is a medical specialty that encompasses a wide range of activities affecting different areas. It involves the study of the pathophysiology of the endocrine system, metabolism, natural and artificial nutrition, health promotion, and use of diagnostic and therapeutic techniques related to these fields.¹

E&N services perform clinical, teaching, management, and research functions. Clinical activities are conducted both at the hospital level (inpatient ward and day hospital) and on an outpatient basis in external consultations. Inpatient care includes patients admitted under E&N for conditions specific to the specialty, as well as patients admitted under other services who request consultation for the management of endocrinological or nutritional comorbidities. Most of the E&N activity in the inpatient ward comes from consultations for patients under other services.² This is partly because the characteristics of the conditions treated by endocrinologists on an outpatient basis are different from the endocrinological/nutritional processes for which consultations are requested during admission. Most endocrinological and nutritional diseases can be managed on an outpatient basis, as reflected in studies such as the Health Care Activity in Endocrinology and Nutrition Consultations of Castilla-La Mancha (AACENCAM), which shows that the main conditions treated in E&N outpatient clinics are diabetes mellitus, hypothyroidism, and thyroid nodular disease.³ However, in the inpatient setting, the most frequent diagnoses are nutritional disease and its therapy, as well as acute decompensations of glucose metabolism.²

There are few studies that examine the consultation activity of E&N in the inpatient ward.² E&N addresses high-

prevalence conditions that increase hospital stay and costs, such as diabetes mellitus/hyperglycemia and, especially, malnutrition. Managing nutritional disease provides clinical and economic benefits to health services by reducing hospital morbidity and mortality without increasing adverse events.⁴

This study aims to evaluate the evolution of the consultation activity in the inpatient ward by E&N specialists at Complejo Hospitalario y Universitario de Albacete (CHUA), Albacete, Spain over the past years, as well as the type of disease treated in these patients. Additionally, it seeks to compare the evolution in the number of consultations between the E&N service and the rest of the medical specialties and determine if its growth has been proportional regarding endocrinological and nutritional aspects.

Materials and methods

This was a longitudinal and retrospective study analyzing the inpatient consultation activity corresponding to the consultation regimen of the E&N service at CHUA from January 1, 2013 through December 31, 2022.

For this purpose, consultation notes under the care of the E&N service and the following medical specialty services were analyzed: Internal Medicine, Infectious Diseases Unit, Neurology, Gastroenterology, Nephrology, Medical Oncology, Hematology, Cardiology, Pulmonology. Data were processed to eliminate duplicate consultation notes (collecting only 1 consultation note per day per patient) and to consider only consultations answered from Monday to Friday from 08:00 to 15:30 h (to avoid consultation activity during on-call hours).

The term *consultation* refers to specialized medical care conducted at the request of another medical-surgical service during the length of stay of a specific patient. Consultation notes are the record in the medical history of the care provided each day for a particular patient.

Variables analyzed

For patients treated under the consultation regimen by the rest of the medical specialties, the total number of consultation notes per year and the days between the first and the last consultation note were collected. Furthermore, patients treated under the consultation regimen by the E&N service, age, sex, and the total number of consultation notes per patient were collected.

To evaluate the reason for consultation of patients treated by E&N, up to two consultation reasons for which they were attended were collected from a stratified sample by year obtained from the previous data:

- Diabetes mellitus/hyperglycemia.
- Other endocrinological changes (including electrolyte changes).
- Total parenteral nutrition.
- Enteral nutrition.
- Diet adaptation and/or oral nutritional supplements.
- Nutritional assessment without indication of nutritional therapy.

If a patient underwent various types of nutritional therapy, they were recorded following an order of artificiality. If the primary reason for consultation was parenteral nutrition, the management of diabetes/hyperglycemia was not considered an additional reason; for any other scenario, a second reason for consultation was considered. If two reasons for consultation were recorded, the order of importance was left to the investigator's criterion.

Statistical analysis

The results of the treated patients were expressed as percentages, along with the 95% confidence interval.

Age, in years, was analyzed as a continuous variable. Its average was expressed as a Huber estimator, and its dispersion as a standardized median absolute deviation. Sex and the number of consultation reasons per episode were expressed as percentages.

Regarding the consultation reasons, the percentage of each reason, both the first and the second, and the set of reasons regardless of the order in which they were recorded, were calculated, along with their 95% confidence interval. Additionally, the percentage of days dedicated to each consultation reason was calculated for the total consultation days.

For each consultation reason, regardless of the order in which they were recorded, the age and proportion of women were calculated.

To analyze the evolution over time of consultations, Poisson regression was used, where the dependent variable was the number of consultations, and the independent variable was the year.

To analyze whether there was a difference in the temporal evolution of E&N consultations compared to the rest of medical services, Poisson regression with interaction was used, where the dependent variable was the number of consultations, and the independent variables were the year and whether the service providing the consultation was E&N or not.

For each admission episode, both the number of consultation notes and the number of days between the first and the last note were analyzed, including both.

To assess if the temporal evolution of the number of consultations between 2013 and 2022 had been proportional between endocrinological and nutritional disease, a sample of patients stratified by year was selected, and a new Poisson regression was used. In this case, patients were analyzed instead of notes, as conclusions could not be drawn from notes, having selected the sample based on patients and not on notes.

With the aim of qualitatively analyzing the evolution of the content of E&N consultation notes, a word cloud was generated from the text of the notes from 2013 and another from the text of the notes from 2022.

Statistical analysis was performed using the R programming language version 4.1.2 (R Core Team 2021, Vienna, Austria). The *tm*1 version 0.7–11 and *wordcloud2* version 0.2.1 software packages were used to generate the word clouds.

Results

Regarding the E&N service, a total of 76 093 consultation notes were collected from January 1, 2013 through December 31, 2022, for 12 623 patients, 59% of whom were males and 41%, females; age 65.4 (0.2) years (Huber estimator [standardized median absolute deviation]). On average, 4.8 (3) notes were written per patient, and the days between the first and the last note were 6.9 (7.4).

Poisson regression showed an annual growth of 7% in E&N consultation notes vs 6% growth in consultation notes from the rest of medical services combined, with this difference being statistically significant in the analysis with interaction. The evolution of consultation notes is shown in [Table 1](#) and [Fig. 1](#).

When analyzing the number of patients treated per year through Poisson regression, an annual growth of 4% in patients treated as consultations by E&N was observed, compared to a 3% growth in patients treated as consultations by the rest of the medical services, with this difference being statistically significant in the analysis with interaction. The evolution of the number of patients treated is reflected in [Table 1](#) and [Fig. 2](#).

[Table 2](#) shows the evolution of patients admitted to the center during the years studied, with a subsection for those with a hospital stay of four days or more (including patients from medical, surgical, and critical areas, excluding Neonatology, Pediatrics, and Medium Stay Unit of Psychiatry). It shows the number of patients treated by E&N under the consultation regimen and the percentage they represent of the total and of those with a hospital stay of four days or more (we should mention that the number of patients treated under the consultation regimen by E&N includes

Table 1 Evolution of consultation notes and patients treated in consultation format for each medical specialty during the study period.

Camas disponibles en el hospital por año	561		572		579		576		574		579		574		589		604		605	
	2013		2014		2015		2016		2017		2018		2019		2020		2021		2022	
Service	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Cardiology	373	216	419	232	457	210	344	201	296	181	200	111	197	114	265	156	285	141	266	109
Gastroenterology	403	212	355	177	366	157	399	147	482	169	588	178	521	139	601	222	526	154	531	177
Endocrinology	5665	1059	6580	1172	6279	1166	6101	1096	7195	1158	7656	1249	7926	1316	7457	1213	10 092	1544	11 142	1650
Internal Medicine	2915	845	3184	850	3205	8.14	3300	865	4973	1009	4764	1084	5206	1048	2791	758	3946	855	4437	932
Nephrology	470	175	566	191	1261	281	1002	263	1384	337	1897	358	1881	355	2189	367	2324	416	2597	445
Pneumology	616	317	575	282	628	317	955	420	1401	412	1478	449	1286	441	709	271	1357	469	1158	400
Neurology	355	197	417	214	492	258	448	218	427	217	440	221	484	278	511	287	671	374	806	418
Oncology	164	93	150	73	146	63	136	72	135	60	124	62	115	46	148	62	134	49	124	51
Unit of Infectious Disease	1578	180	2092	192	2299	207	2377	266	2499	264	2924	312	2866	318	2322	272	2645	317	2716	332

N, consultation notes made; P, number of patients treated in consultation format.

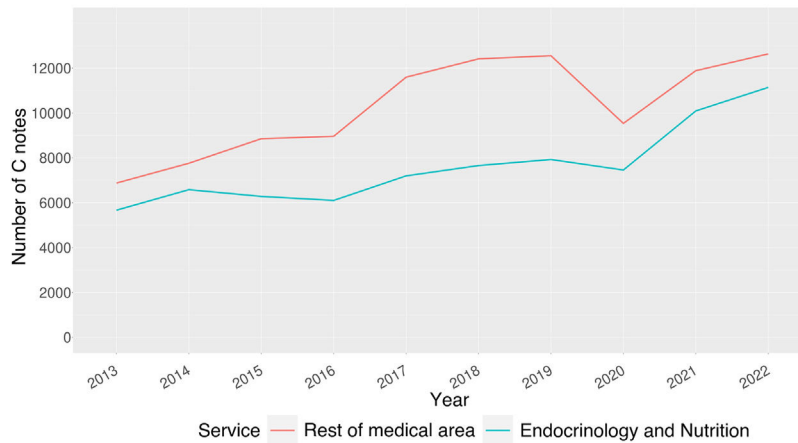


Figure 1 Evolution of Endocrinology and Nutrition consultation notes vs the rest of services combined. C, consultation.

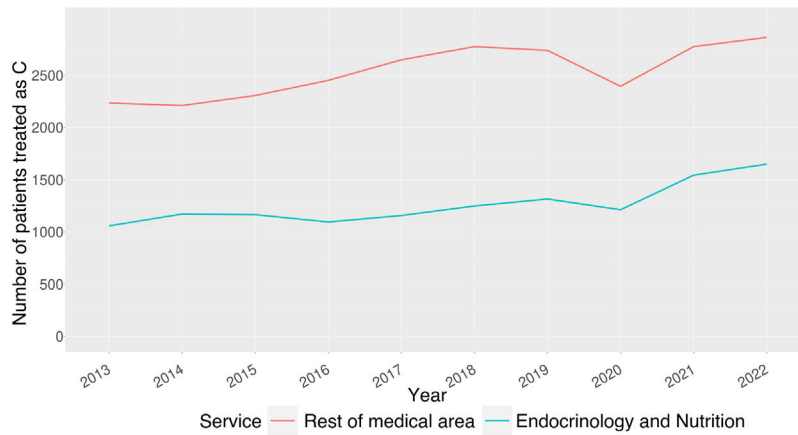


Figure 2 Evolution of patients treated under Endocrinology and Nutrition consultation vs the rest of specialties combined. C, consultation.

Table 2 Evolution of the proportion of patients admitted to Complejo Hospitalario y Universitario de Albacete treated in consultation format by Endocrinology & Nutrition.

Year	Patients admitted	Pacientes ingresados con estancia igual o mayor a cuatro días	Patients treated by E&N	% of patients treated overall	% of patients treated over those admitted with stays of 4 or more years
2013	22 708	13 370	1059	4.6	7.9
2014	22 968	13 552	1172	5.1	8.6
2015	23 790	13 986	1166	4.9	8.3
2016	23 190	13 602	1096	4.7	8
2017	23 384	13 604	1158	4.9	8.5
2018	23 073	13 673	1249	5.4	9.1
2019	23 747	13 713	1316	5.5	9.5
2020	21 638	12 737	1213	5.6	9.5
2021	22 337	12 874	1544	6.9	11.9
2022	23 321	13 314	1650	7	12.3

E&N, Endocrinology and Nutrition.

some patients with a stay of less than four days, but they are very few).

Regarding the primary reason for consultation to E&N, 66% were related to nutritional disease (between 61% and

71% with a 95% confidence interval) vs 34% for endocrinological reasons (between 29% and 40% with a 95% confidence interval). [Table 3](#) breaks down the percentages of each E&N consultation reason in the total number of years collected;

Table 3 Percentage of each consultation reason for patients treated by Endocrinology & Nutrition.

Reason for consultation	Percentage
Diabetes mellitus/hyperglycemia	26 (21–32)
Enteral nutrition	16 (10–22)
Total parenteral nutrition	24 (19–30)
Diet adaptation and/or oral nutritional supplements	20 (14–26)
Nutritional assessment without an indication for nutritional therapy	6 (0–12)
Other endocrinological disorders	8 (3–14)

no statistically significant difference was detected in the growth of consultations for nutritional vs endocrinological disease.

Fig. 3 shows the word clouds of the content of the consultation notes from 2013 and 2020.

Discussion

Until recently, one of the main conditions treated by E&N in the hospital ward involved managing hyperglycemia in hospitalized patients, constituting more than a quarter according to the AAPENCAM study, which evaluated the hospital activity of the E&N specialty within the Public Health Service of Castilla-La Mancha (SESCAM), Spain being the first multicenter study ever conducted which analyzed this area.² The prevalence of stress hyperglycemia or diabetes mellitus in hospitalized patients is very high, and its direct relationship with morbidity and mortality is well known. A study in 2007 reflected that the diagnosis of diabetes mellitus was present in 12.9% of hospital discharges in Spain.⁵ In a 2017 study, the prevalence of hyperglycemia or known diabetes mellitus was 33.5% among hospitalized patients in Castilla-La Mancha.⁶ These data resemble other studies conducted in the United States, with prevalences ranging from 12% to 26%.⁷

However, nutritional therapy (understood as therapeutic diet, oral nutritional supplements, enteral nutrition, or parenteral nutrition) in the hospital setting is increasingly gaining importance. This is reflected in the AAPENCAM study, where nutritional assessment and therapy accounted for 56.9% of consultations and 68.3% of consultation days.² This is partly due to evidence of the high prevalence of malnutrition in hospitalized patients, up to 19.4% and 23.7% according to national studies, which involves an increased morbidity, mortality, length of stay, and hospital costs.^{8,9} This, added to the evidence that nutritional intervention is effective in reducing morbidity and mortality in patients with disease-related malnutrition,⁴ along with the promotion of nutritional assessment within health systems, may result in a significant presence of nutritional assessment and therapy within the health care activity of E&N services in the form of consultations in the hospital ward, as reflected in our data, where it amounts to 66% of the reasons for consultations taken care of. The fact that a greater number of consultations are conducted for nutritional assessment or therapy vs the management of hyperglycemia, despite being conditions of similar magnitude, can be partly explained by

the awareness-raising efforts of the E&N service within the hospital environment regarding the importance and impact of disease-related malnutrition in hospitalized patients. Also, by the fact that consultations on nutritional disease from services managing hyperglycemia in their patients are taken care of. However, although much of the growth of E&N has been at the expense of nutritional disease and the growth of E&N consultations has been significant, there is no statistically significant difference in the growth of consultations for nutritional vs endocrinological disease in our study.

In hospitalized patients at CHUA, the E&N service is the one that assists the highest percentage of patients under the consultation regimen. Considering the number of adult patients admitted to our center for four or more days, and the number of patients treated as consultations by the E&N service, and even considering that among the consultations collected by E&N there are patients (very few proportionally) with stays <4 days, the E&N service manages consultations for almost 1 out of every 8 adult patients hospitalized for four or more days. The increased activity of the hospital ward is part of an overall increase in medical area consultation activity. However, our growth is greater than that of other specialties, as, although the difference may seem small (1%), it is a geometric progression, so each year it becomes cumulative, making it a relevant difference. In this regard, as can be seen in our results, E&N conducts almost as many consultations (or notes) as the rest of the medical area combined. This underscores the relevance that other specialists give to endocrinological and nutritional disease and its consequences. In addition to increasing the number of patients, the number of consultation notes per patient has also increased (without an increase in the number of days between the first and last consultation note), which implies either greater complexity or a change in the action policy in the sense that the care provided is more frequently reflected in the form of a consultation note.

The qualitative analysis of the content of consultation notes through word cloud shows an increasing importance of dietary management of malnutrition within the work conducted in the ward as consultation in E&N.

On the other hand, the age of patients treated by E&N as consultations has increased, which probably implies greater clinical complexity.

As strengths of our work, we can highlight that it is the only one ever conducted that analyzed the evolution of clinical activity in the form of consultations of the E&N specialty over such a long period of time. In addition, it analyzes all E&N consultations and those of the entire medical area obtained from electronic health records.

As weaknesses, we can reflect that it is a study based on a single center. It would be advisable to know if this evolution is similar in other hospitals, as there are differences in the structure and activity of E&N services between autonomous communities in our national health system, as reflected in the RECALSEEN studies of 2019 and 2021, although they did not evaluate consultation activity in the hospital ward.^{10,11} Data from 2020, being different due to the pandemic context, may affect the regression model since they correspond to 10% of the study period. The comparison between consultations for nutritional and endocrinological disease is based on a sample of the collected data, so chance may cause the results not to correspond to the total consultations.

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