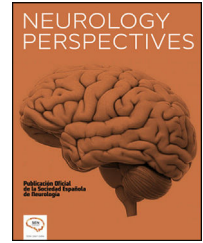




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ORIGINAL

Electronic consultation (e-consultation) between primary care and the neurology department: One-year experience in a healthcare area in Andalusia, Spain



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KEYWORDS

e-consult;
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Abstract

Introduction: The COVID-19 pandemic has prompted the implementation of telemedicine programmes to facilitate healthcare. In November 2020 we initiated an e-consultation programme between primary care and the neurology department, with asynchronous response, through a platform integrated into the corporate computer system of the Andalusian Public Health System. We present the results of the first year of operation.

Methods: We present a descriptive study of the e-consultations received in 2021 from a health area of approximately 300,000 inhabitants aged ≥ 14 years. The reasons for consultation were pre-established: "primary headache" (PH), "new-onset cognitive impairment" (CI), "complications of dementia" (DEM), and "epilepsy" (EPI). We defined inclusion criteria and the clinical information/tests that had to be provided. General practitioners could choose between e-consultation or face-to-face referral.

Results: A total of 1,806 e-consultations were received (approximately 6/1,000 population/year). By reasons for consultation: CI 34.3%, PH 32%, DEM 14.4%, EPI 11.7%, unspecified 7.6%. Responses were sent after an average of 2.25 days and were classified as: "refer for in-person consultation" (47.12%), "resolved" (39.98%), "criteria not met" (12.57%), or "follow-up by e-consultation" (0.33%). As expected, a high proportion of face-to-face referrals were required for CI (73.46%); the main value of the system for these patients was to prioritise appointments and select the most appropriate form of care. For the rest of the reasons for consultation, the proportion of "resolved" e-consultations reached 52.61%.

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Conclusions: Asynchronous e-consultation between primary care and the neurology department is a useful tool in the indicated conditions, offering a rapid, "one-stop" response to a significant proportion of clinical or therapeutic uncertainties, as well as optimising face-to-face appointments.

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PALABRAS CLAVE

e-consulta;
e-interconsulta;
Gestión sanitaria;
Teleconsulta;
Telemedicina;
Teleneurología

Interconsulta electrónica (e-interconsulta) entre Atención Primaria y Neurología: un año de experiencia en un área sanitaria de Andalucía, España

Resumen

Introducción: La pandemia por Covid-19 ha impulsado la implantación de programas de telemedicina para facilitar la asistencia sanitaria. En noviembre de 2020 iniciamos un programa de e-interconsulta entre Atención Primaria (AP) y Neurología, de respuesta asíncrona, a través de una plataforma integrada en la estación clínica corporativa del Sistema Sanitario Público de Andalucía. Presentamos los resultados de su primer año de funcionamiento.

Métodos: Estudio descriptivo de las e-interconsultas recibidas durante 2021 desde un área sanitaria de aproximadamente 300.000 habitantes ≥ 14 años. Se establecieron como motivos de consulta: "Cefalea primaria" (CEF), "Deterioro cognitivo de novo" (DC), "Complicaciones de la demencia" (DEM) y "Epilepsia" (EPI), definiéndose unos criterios preestablecidos y la información clínica/pruebas que se debían aportar. Los médicos/as de familia podían elegir entre e-interconsultar o derivar directamente para cita presencial.

Resultados: Se recibieron 1.806 e-interconsultas ($\approx 6/1.000$ hab./año). Por motivos de consulta: DC 34'3%, CEF 32%, DEM 14'4%, EPI 11'7%, no especificado 7'6%. Las respuestas se demoraron una media de 2'25 días y se clasificaron en: "precisa cita presencial" (47'12%), "alta" (39'98%), "no cumple criterios" (12'57%) o "seguimiento por e-interconsulta" (0'33%). Como era previsible, para el DC una alta proporción precisó cita presencial (73'46%); su mayor utilidad fue priorizar las citas y modalidad de asistencia. Para el resto de motivos, la proporción de "alta" alcanzó el 52'61%.

Conclusiones: La e-interconsulta asíncrona entre AP y Neurología es una herramienta útil en las condiciones indicadas, permitiendo resolver en un "acto único" y con escasa demora una significativa proporción de dudas clínicas o terapéuticas, así como optimizar las citas presenciales.

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Introduction

Telemedicine is defined as all diagnostic or therapeutic medical interventions or actions performed remotely using information and communications technology.¹ The use of telemedicine in neurological care, or teleneurology, has increased considerably over the last decades.² In Spain, several teleneurology applications have been developed, with key examples being stroke care (telestroke) in the majority of autonomous communities¹ and programmes for the follow-up of specific diseases³⁻⁵; various guidelines and recommendations have also been published, such as those by the Spanish Society of Neurology's Headache Study Group.⁶

While telemedicine initially focused on circumstances in which in-person care was not possible, it was later extended to procedures in which remote care provision may be more convenient or efficient, such as communication between primary care (PC) and other specialists.⁷ Contact between

these professionals may be synchronous, with real-time connections (telephone calls, video conference) or asynchronous, using devices for data storage and transmission (e-mail, web applications, mobile applications).¹ One of the most practical approaches is so-called electronic consultation (e-consultation), an asynchronous form of telemedicine in which PC physicians upload a written description of their patients' clinical picture to an online platform and, on the same platform, receive advice from specialists on the management of the condition.^{1,8} This approach has been applied satisfactorily in healthcare areas in different countries, and has included neurology e-consultations⁹⁻¹⁵; in fact, neurology is the specialty in greatest demand in some programmes.^{10,12}

In 2019, an e-consultation platform ("Teleconsulta") was developed by the Andalusian Public Health System and integrated into the corporate computer system. The project was conceived as an expansion of existing experience with

“Telederma,” which enabled e-consultations between PC and dermatology departments, to other specialties. After a pilot phase in which the new platform was used by several specialties at Hospital Universitario Virgen Macarena (Seville), its progressive implementation in other healthcare districts began in February 2020. Each specialty at each centre was able to define its own system, establishing the healthcare areas and care processes offered. For each process, departments could define different criteria for e-consultations through the system and the clinical/testing information required. The increased worldwide interest in telemedicine as a result of the outbreak of the COVID-19 pandemic in March 2020,^{3,4,16} with a view to facilitating access to healthcare, also led to quicker implementation of the Teleconsulta platform in Andalusia.

In this context, our hospital's neurology department has, since November 2020, offered e-consultations to the primary care district for which we are the primary reference centre. This study reports our experience after one year of using the system.

Material and methods

We conducted a descriptive study of e-consultations between PC and our neurology department between 1 January and 31 December 2021 (the last 2 months of 2020 were considered the pilot period). The programme was implemented in the northern part of the Granada-Metropolitano healthcare district, whose reference hospital is Hospital Universitario Virgen de las Nieves, which serves a population of approximately 300,000 individuals aged ≥ 14 years. In the specific case of neurology (a specialty not offered at local hospitals in Andalusia), our department covers a larger area, serving approximately 425,000 individuals aged ≥ 14 years; however, these additional districts were not included in the programme.

Given the specific characteristics of the neurological practice, our objective in the implementation of e-consultations was to address clinical and therapeutic uncertainties regarding patients with existing diagnoses (diagnosed either at our department or by other neurologists), enabling a rapid response and avoiding unnecessary in-person consultations to the extent possible. To that end, we selected 3 care processes with pre-established criteria (Table 1): primary headache, complications of dementia progression, and epilepsy. We included an additional process, new-onset cognitive impairment, but with a different objective: to gather in advance clinical information enabling us to prioritise in-person appointments and to select the most appropriate form of care (subspecialised multidisciplinary unit vs general neurology consultation); we also sought to ensure that complementary tests were performed in advance in order to facilitate subsequent “one-stop” consultations. The aforementioned management process for cognitive impairment had already been in place for a decade, with the difference that PC physicians were required to send information by fax/e-mail, which resulted in irregular use of the process; furthermore, no formal record of that prior information was registered in patients' medical histories. The e-consultation system was viewed as an opportunity to improve this care pathway.

Table 1 shows the 4 care processes established, indicating the criteria for e-consultation for each, as well as the clinical/complementary test data that PC physicians were required to supply. The table was included in the platform for easy reference. In addition to the free-text description of the patient, the template for e-consultations required PC physicians to select one of these 4 care processes. At all times, depending on the clinical problem and associated criteria, they were able to choose between consultation through this system or direct referral for an in-person consultation, according to the standard procedure.

The neurology department responded asynchronously to all e-consultations; most responses were from a single neurologist (only a limited number of neurologists took part in this activity). Initially, one morning per week was allocated to responding to e-consultations, with additional sessions added in line with increasing demand. The neurologist reviewed each patient's medical record and complementary test data. In the response to the PC physician, we always aimed to offer the best possible solution for the patient, even in cases in which the e-consultation request did not fully meet the stipulated requirements.

Finally, the neurologist classified his/her conclusion according to the following 4 categories:

- “Criteria not met”: for e-consultations that broadly did not meet criteria, supplying insufficient information for any decision to be made. PC physicians would subsequently have to decide whether to request a new e-consultation or refer the patient for in-person consultation.
- “Refer for in-person consultation”: when a face-to-face assessment was considered necessary; in these cases, the neurology department managed the appointment. The response to the PC physician may recommend specific studies or treatments to save time and to facilitate a subsequent “one-stop” consultation.
- “Resolved”: when the neurologist considered that, having addressed the issues raised in the e-consultation, the matter was resolved.
- “Follow-up by e-consultation”: when the neurologist recommended that the PC physician make an additional e-consultation after a given period.

On a monthly basis, the IT department provided aggregate data on the number of e-consultations received, their distribution by reason for consultation, mean response time, and distribution by category of response.

Results

In 2021, we received a total of 1,806 e-consultations, or approximately 6 e-consultations per 1,000 population. In the same period, a total of 3,929 direct referrals for face-to-face consultations were made within the same healthcare area (approximately 13 per 1,000 population). The number of e-consultations made per month grew over the course of the year, with a mean of 132/month during the first semester and 169/month during the second (Fig. 1). According to the reason for consultation selected by the PC physician, e-consultations were distributed as follows:

Table 1 Pre-defined reasons for e-consultation between primary care and the neurology department.

Reason for consultation	Criteria for e-consultation	Clinical data and complementary studies
New-onset cognitive impairment	New-onset cognitive impairment in patients requiring specialised diagnosis and treatment	<p>Clinical history/examination:</p> <ul style="list-style-type: none"> - Age. Relevant history. Current medication - Is the patient geriatric? (Advanced age associated with multimorbidity/polymedication, functional impairment, and/or social frailty). Is the patient institutionalised? - Main symptoms and progression time - Cognitive test: Mini-Mental State Examination or Fototest - Functional assessment: Barthel Index <p>Complementary studies:</p> <ul style="list-style-type: none"> - Laboratory analysis: complete blood count, biochemistry, TSH, vitamin B₁₂, folic acid, and syphilis serology - Head computed tomography scan
Complications of dementia progression	Consultation for clinical or therapeutic uncertainties regarding patients diagnosed with dementia	<p>Clinical history/examination:</p> <ul style="list-style-type: none"> - Age. Relevant history. Current medication - Is the patient geriatric? (Advanced age associated with multimorbidity/polymedication, functional impairment, and/or social frailty) Is the patient institutionalised? - Diagnosis of dementia: type and progression time - Current complication: type and progression time. Treatments tried - Functional assessment: Barthel Index, GDS/FAST stage <p>Clinical history/examination:</p> <ul style="list-style-type: none"> - Age. Relevant history - Current medication - Diagnosis of primary headache: type and progression time - Frequency of episodes (days per month), analgesic drugs and frequency of use, preventive drugs tried previously (dose and treatment duration)
Primary headache	Consultation for clinical or therapeutic uncertainties regarding patients diagnosed with primary headache	<p>Clinical history/examination:</p> <ul style="list-style-type: none"> - Age. Relevant history. Current medication - Diagnosis of primary headache: type and progression time - Frequency of episodes (days per month), analgesic drugs and frequency of use, preventive drugs tried previously (dose and treatment duration) <p>Clinical history/examination:</p> <ul style="list-style-type: none"> - Age. Relevant history. Current medication - Diagnosis of epilepsy: type and progression time. Type of seizures - Date of last assessment by neurology department - Baseline frequency of seizures. Current problem (related to seizures, adverse drug reactions, etc) and progression time <p>Complementary studies:</p> <ul style="list-style-type: none"> - Laboratory analysis: complete blood count, biochemistry, plasma levels of antiepileptic drugs
Epilepsy	Consultation for clinical or therapeutic uncertainties regarding patients diagnosed with epilepsy	

GDS/FAST: Global Deterioration Scale/Functional Assessment Staging system; TSH: thyroid stimulating hormone.

new-onset cognitive impairment, 34.3%; primary headache, 32%; complications of dementia progression, 14.4%; epilepsy, 11.7%; not specified, 7.6% (Fig. 2).

The neurology department dedicated a total of 58 working days to e-consultations, responding to a mean of 31.14 per day, with a mean response time of 2.25 days. The neurologist's responses were categorised as follows: "refer for in-person consultation," 47.12%; "resolved," 39.98%; "criteria not met," 12.57%; and "follow-up by e-consultation," 0.33%. Fig. 3 shows the distribution of responses by reason for consultation. As would be expected, a high percentage of e-consultations due to new-onset cognitive impairment led to in-

person appointments (73.46%); the main value of e-consultations in this case was to identify priority cases and to select the most appropriate type of care. For the remaining reasons for consultation, a total of 52.61% were classified as "resolved" and 33.42% as "refer for in-person consultation."

In order to estimate the number of patients who, after their cases were "resolved" by e-consultation, were referred by their PC physician for an in-person appointment in the following months, we analysed the cases marked as "resolved" in January and February 2021 (n = 120), after a year had passed. Of these patients, 9 (7.5%; 95% CI, 2.8–12.2%) had been referred for in-person appointments for the

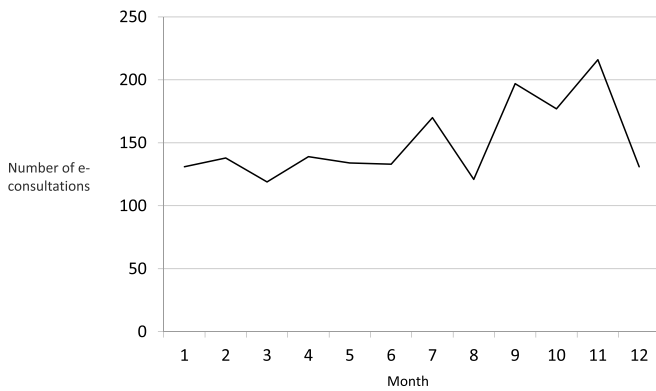


Fig. 1 Number of e-consultations per month in 2021. The number of consultations increased over the course of the study period (mean of 132/month in the first semester and 169/month in the second).

same reason as the e-consultation was made, with a mean interval of 76 ± 46 days after their case was “resolved.”

Discussion

In our experience, e-consultation between PC and the neurology department has been valuable in promptly resolving clinical or therapeutic uncertainties in patients with existing diagnoses of common diseases (primary headaches, dementia, and epilepsy), avoiding unnecessary in-person consultations. Thus, we avoided in-person consultations in over 50% of the cases reported, although this percentage would be slightly lower if we account for the

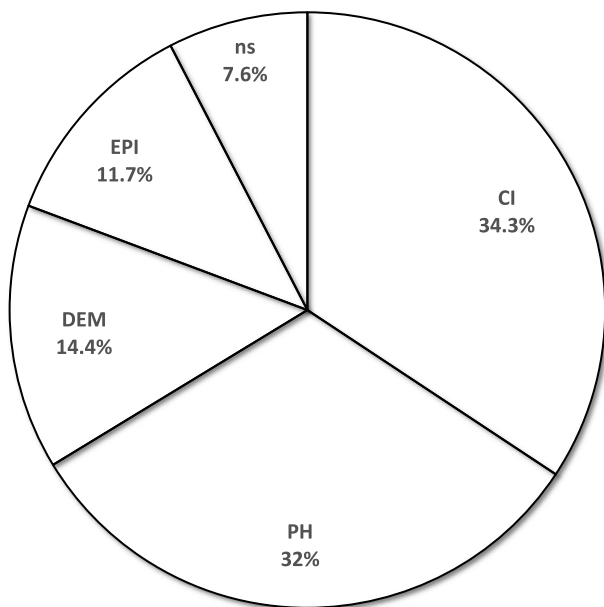


Fig. 2 Distribution of e-consultations by reason for consultation selected by the primary care physician. CI: new-onset cognitive impairment; DEM: complications of dementia progression; EPI: epilepsy; ns: not specified; PH: primary headache.

patients who were eventually referred in the following months. We also avoided referrals from PC of patients who were under follow-up by the neurology department, which would have represented extra consultations in addition to their regular follow-up visits. This reduction in in-person consultations offers several advantages: avoiding unnecessary travel (and the associated complications, particularly in the context of the pandemic) and increasing the availability of in-person consultations for the patients who need them, reducing waiting times. The consultations that were avoided would at least partially compensate for the time dedicated by neurologists to responding to e-consultations. Moreover, we consider the main advantage of the programme to have been the speed of response (including in patients requiring in-person consultations), as we were able to offer specialist clinical or therapeutic recommendations with a mean delay of 2.25 days.

E-consultations also enabled us to optimise in-person consultations. Firstly, in the case of new-onset cognitive impairment, we were able to identify priority cases and select the most appropriate type of care (subspecialised multidisciplinary unit vs general neurology consultation). Unlike in the previous care pathway, in which the requested clinical information had to be sent by fax or e-mail, e-consultations simplified this task for PC physicians, which resulted in increased use, with the additional advantage that this prior information was registered in patients' medical records. Furthermore, for all reasons for consultation, it was possible in some cases to perform certain complementary studies or tests in advance, facilitating a subsequent “one-stop” consultation.

A key aspect of the programme is the integration of the e-consultation program into the corporate computer system. As a result, it was easily accessible to all PC physicians (who were able within the program to check the criteria for e-consultation), and registered both the consultation and the response in the patient's medical record. These represent clear advantages over other systems, such as those based on e-mail.¹⁷ Due to the speed of response, the system is also suitable for transmitting practical information to PC physicians, reinforcing or updating concepts that may be applied in successive patients.¹³ It may also help improve communication and relations between professionals.¹⁵

The e-consultation system was restricted to care processes with specific requirements. With the exception of new-onset cognitive impairment, for which we aimed to optimise the existing care pathway, the programme focused on patients previously diagnosed with common diseases. Neurology is one of the specialties presenting the greatest limitations in establishing new diagnoses in patients not seen in person, as specific history-taking and examination are crucial. Therefore, we believe that, were these restrictions not applied, a large number of cases would result in face-to-face referrals, compromising the effectiveness and efficiency of the programme. In practice, PC physicians did not always fully observe these restrictions; however, neurologists attempted to respond to all consultations (this was not possible in 12.57% of cases due to insufficient information). E-consultations regarding patients without an established diagnosis would have contributed to increasing the percentage of patients referred for in-person consultations; this is supported by the results observed with programmes that did

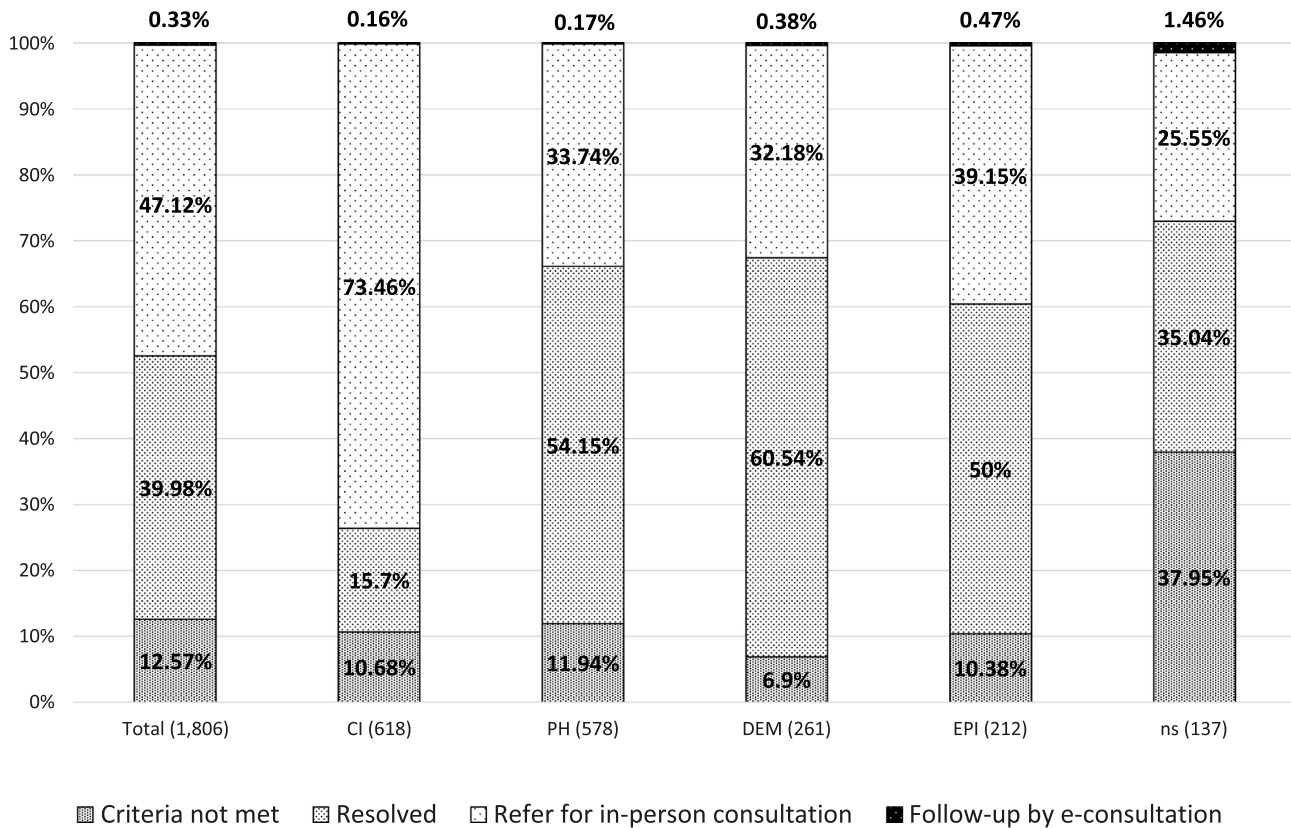


Fig. 3 Distribution of e-consultations by response. CI: new-onset cognitive impairment; DEM: complications of dementia progression; EPI: epilepsy; ns: not specified; PH: primary headache.

not include restrictions on reason for consultation.^{9,11} Headache and epilepsy were among the most frequent reasons for consultation in these studies^{9,11}; both conditions were pre-selected in our programme, and accounted for 32% and 11.7%, respectively, of all e-consultations.

Some specialties at our hospital have established e-consultations as the only means of referral from PC. This strategy would nullify the PC physician's capacity to decide whether to e-consult or refer, which would be entirely the responsibility of the specialist. While this may be a useful approach for some specialties, we believe that, in general terms, it would undermine the relationship between professionals (the essence of e-consultation), and does not take into account the expectations of the PC physician or the patient; moreover, in such specialties as neurology, it may be inefficient. We believe that the pre-selection by PC physicians of the issues that they are able to manage without referring patients for in-person consultations was crucial to our outcomes, with a significant proportion of e-consultations classed as "resolved." This involvement of PC physicians may be lost if e-consultations became the sole means of accessing specialist care; as the great majority of patients do require in-person appointments, the programme would be of unclear value, beyond the change in the computer system for managing referrals. In order to attend these e-consultations with similar levels of quality, 3 times as many working days would have to be dedicated at the

neurology department (based on the calculation $1,806 + 3,929 = 5,735$ e-consultations per year); with the same staff, this would result in a reduction in the availability of in-person consultations, which would be particularly inefficient. However, we lack real-world data on such a system; therefore, these considerations are purely speculative.

In future, we plan to include other common processes (eg, Parkinson's disease) in the programme, and to extend it to other healthcare districts served by our department and to other hospital specialties. To address the limitations of the study, future research should aim to evaluate physician and patient satisfaction,^{10,15} analyse PC physicians' adherence to the recommendations received,¹² and calculate the cost effectiveness of this type of system.¹⁸

In conclusion, in our experience asynchronous e-consultation between primary care and the neurology department, integrated into medical records, has been a useful tool that enables a rapid, "one-stop" response to a significant proportion of clinical or therapeutic uncertainties, avoiding unnecessary referrals and optimising those face-to-face consultations that are necessary.

Funding

This study has received no funding.

Ethical considerations

This study meets our hospital's ethical requirements.

Informed consent

Informed consent was not required as the study reports anonymised, non-clinical data.

Conflicts of interest

The authors have no conflicts of interest to declare.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.neurop.2023.100109>.

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