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Evaluation of the referral system for electrodiagnostic testing in the main Alexandria University hospital

Mohammed Elsayed Nassif¹ and Nehad Mohamed Elshatby^{2*}

Abstract

Background Nerve conduction studies and electromyography (NCS/EMG) play a key role in the evaluation of patients with neuromuscular diseases. It serves as an extension of a clinical and neurological examination. Patients should be referred to electrodiagnosis (EDX) examination with an appropriate request, including history and neurological findings. When the referring diagnosis is appropriate, the examination is quicker, less invasive and limited to the verification of the provisional diagnosis. The referral system at the hospital involves only one paper asks for (NCS/EMG) with no specific information, the electromyographer is responsible for taking the patient history and performing clinical examination. Consequently, the current referral system had many flaws that needed to be corrected to enhance it.

Aim To evaluate the current referral system to the electrodiagnosis unit and to assess the electromyographers' satisfaction with the new referral system.

Methods A simple questionnaire was filled by all working electromyographers to assess their satisfaction about the referral system, then a new approved referral sheet was applied by a specialized physician to all patients attending the EDX unit for two months, then the same questionnaire to evaluate the new referral system was filled again by the same electromyographers.

Results There was a statistically significant difference regarding the electromyographers' satisfaction with the new referral system.

Conclusion The electrodiagnosis examination could be easier, quicker, and more organized if preceded by a proper referral system and electrodiagnosis sheet.

Introduction

Nerve conduction studies [NCS] and electromyography [EMG] play key roles in the evaluation of patients with neuromuscular diseases [1]. However, electrodiagnosis results alone are not pathognomonic for a specific

disease or can provide a definitive diagnosis [2]. But it is considered a continuation of clinical examination [3]. Patients should be referred for electrodiagnosis [EDX] with an appropriate request based on their history and neurological findings. When the referring diagnosis is appropriate, the examination is quicker, less invasive, and limited to the verification of the provisional diagnosis [4]. The proper EDX request demands important facts to be mentioned, such as clinical history, examination, and the reason for referral or provisional diagnosis [5]. It is time-consuming for the electromyographer to make an electrophysiological impression, without provided proper

*Correspondence:

Nehad Mohamed Elshatby
dr.nehad@yahoo.com

¹ Faculty of Medicine, Alexandria University, Medaan EL Khartoom Square, Al Azaritah, Alexandria, Egypt

² Department of Physical Medicine, Rheumatology and Rehabilitation, Alexandria University, Alexandria, Egypt

history and clinical examination. It is also a waste of hospital resources.

The referral system at the main university hospital involves only one paper sent routinely to every patient who asks for a nerve conduction study and electromyography, with no specific information, clinical notes, or provisional diagnosis concerning the patient's condition. Under this poorly organized system, the electromyographer is responsible for taking the patient history and performing a complete clinical examination for each case before the beginning of electrodiagnostic testing; otherwise, the vague referral system forces the electromyographer to perform more extensive electrodiagnostic tests, which not only wastes electromyographer time and hospital resources, but also exposes the patient to the invasive nature of the test. Consequently, we felt that the current referral system had many flaws that needed correction to enhance the referral system.

Aim

To evaluate the current referral system to the electrodiagnosis unit and to assess the electromyographers' satisfaction with the new referral system.

Methods

A sections questionnaire was distributed to all eight electromyographers working in the electrodiagnosis unit to evaluate the current referral system, in which part a represents objective scoring and part b represents overall rating (Additional file 1: Annex SI), then the new referral system was applied by a well-trained physician to evaluate the patients before starting the EDX tests through taking patients' demographic data, referring unit, full history, clinical and neurological examination, reporting the previous investigations, data consistent and inconsistent with the diagnosis, role of electrodiagnosis, electrodiagnosis procedure, expected findings and finally to put a provisional diagnosis or differential diagnosis in the EDX sheet (Additional file 2: Annex SII). After two working months, the same questionnaire was distributed again and answered by the same electromyographers. The new referral system obtained approval from the university's Quality Assurance Unit and the head of the department to be implemented in the EDX unit.

Results

A survey conducted among electromyographers revealed that 100% of the respondents believed that the certain system could be improved. The pre-implementation process of the system was rated disorganized by all the respondents (8 electromyographers), with a score ranging from 1 to 3 on a 6-point scale (where 1 denotes poor and 6 denotes excellent). Additionally,

75% of the respondents (6 electromyographers) deemed the process to be a waste of time and inefficient. Similarly, 75% of the respondents (6 electromyographers) rated the system as difficult to use. Furthermore, 87.5% of the respondents (7 electromyographers) indicated that the indication for electromyography and nerve conduction studies (EDX) was present only some of the time. Likewise, 75% of the respondents (6 electromyographers) reported that EDX only provided a provisional diagnosis some of the time, while 62.5% of the respondents (5 electromyographers) stated that it never allows for quick identification of the patient's condition. Moreover, 75% of the respondents (6 electromyographers) noted that the use of EDX was only cost-effective for hospital and primary healthcare services some of the time.

The post-implementation procedure of the new referral system was perceived to be more organized by 50% of the respondents (4 electromyographers) who rated it between 4 to 6 on a six point scale (where 1 denotes poor and 6 denotes excellent). Similarly, 75% of the respondents (6 electromyographers) rated the procedure as time-effective, while 87.5% (7 electromyographers) deemed it to be efficient and easy to use. Regarding the indication for electromyography and nerve conduction studies (EDX), it was reported to be present most of the time by 37.5% (3 electromyographers), and some of the time by 62.5% (5 electromyographers). Provisional diagnosis was stated to be present most of the time by 62.5% (5 electromyographers), and some of the time by 37.5% (3 electromyographers). Furthermore, 87.5% (7 electromyographers), mentioned that the system allowed for quick identification of the patient's condition most of the time, and that they had a clear idea of the job required most of the time. Additionally, 75% (6 electromyographers) believed that the system enabled the most cost-effective use of hospital and primary healthcare services.

There was statistically significant difference between pre- and post-implementation objective score and overall rating as shown in Table 1 ($p \leq 0.001$).

Table 1 Comparison between pre- and post-implementation objective scoring and overall rating

	Pre-implementation	Post-implementation	P value
Objective scoring	9.2±0.9	13.5±1.6	<0.001*
Overall rating	8±3.7	17.8±4.1	<0.001*

Significant $P < 0.05$

*P value of the Mann-Whitney test

Discussion

The importance of a referral system is based primarily on facilitating communication among medical professionals to ensure that patients receive the best possible care. An efficient referral system requires collaboration from all levels of the healthcare system and should also help with the efficient use of hospitals and primary health care services, as well as ensuring that patients who truly require care receive it in a timely and effective manner [6].

However, this is not the case in the Physical Medicine, Rheumatology and Rehabilitation department, which have disorganized referral process which can be attributed to several factors including the lack of proper evaluation, inadequate communication, and limited collaboration among different levels of the healthcare system. Referrals are made without taking into account the indication for electrodiagnostic testing, leading to a lack of clear understanding of patients' specific needs or conditions. Moreover, the current system relies on the routine sending of only one paper per patient, which may not convey crucial information about the patient's medical history, symptoms, or diagnostic tests. Consequently, medical professionals may lack the necessary details to make informed decisions regarding further treatment or management plans. These inefficiencies have significant implications for the quality of care delivered and the associated costs. Patients who genuinely require specialized care may experience delays in receiving appropriate interventions, while suboptimal referrals may result in unnecessary diagnostic procedures or treatments. Furthermore, the disorganized referral process consumes valuable hospital resources and primary care services, contributing to increased costs and long waiting lists exceeding six months. Addressing these issues necessitates the implementation of an organized and streamlined referral process that ensures thorough evaluation before making referrals while facilitating effective communication among medical professionals involved at various stages of patient care delivery. By doing so, the referral process can be optimized to ensure that patients receive timely and appropriate care, while also promoting efficient use of healthcare resources.

The implementation of the proposed referral system, which incorporates an electrodiagnostic sheet and a thorough clinical examination process, aligns harmoniously with the Guidelines for Ethical Behavior Relating to Clinical Practice Issues in Neuromuscular diseases and Electrodiagnostic testing [7]. The primary objective is to establish a cooperative relationship among physiatrists and other healthcare professionals while ensuring clear communication channels that prioritize patient care quality. This approach adheres to the principles outlined by The American Association of Neuromuscular

& Electrodiagnostic Medicine (AANEM), emphasizing timely, courteous written and oral exchanges with fellow practitioners. By integrating an organized framework within the new referral system, several key objectives are achieved. Firstly, during patients' waiting period, a dedicated physician will conduct comprehensive clinical examinations and meticulously record all observations on the provided electrodiagnostic sheet. This serves multiple purposes: facilitating efficient communication between healthcare providers involved in patient management; enabling swift responses to referring physicians' inquiries; and enhancing cooperation through concise yet informative data presentation. Furthermore, this new referral system aims to optimize resource utilization across hospital departments as well as primary healthcare services. In addition to improving immediate patient care outcomes, implementing this enhanced referral system offers ancillary benefits as well. Junior doctors gain invaluable exposure through active involvement in conducting comprehensive clinical examinations for referred cases involving neuromuscular disorders and central brain lesions. Consequently, their professional growth is nurtured by hands-on experience garnered from diverse scenarios encountered throughout this collaborative journey. Moreover, maintaining an organized medical database containing these electrodiagnostic sheets yields valuable advantages beyond individual case management. It facilitates seamless knowledge sharing during departmental workshops/presentations while also providing a reliable foundation for future research initiatives undertaken within the department.

Conclusion

The electrodiagnosis examination could be easier, quicker, and more organized if preceded by a proper referral system and electrodiagnosis sheet.

Limitations

The importance of this project lies in addressing a major issue that plagues the department and impairs the quality of care that is provided to patients.

The major limitation of this project was the lack of a valid questionnaire to assess the referral system to the EDX unit. So, the used questionnaire is quoted from a similar questionnaire applied in a quality improvement project to improve medical SHO weekend handover at a tertiary referral center but with some modifications [8]. Another limitation was the small sample size, which involved only eight electromyographers in the department. We were limited to 8 working physicians at the time of referral system evaluation. This referral system is designed to overcome the challenges faced by the physical medicine, rheumatology, and rehabilitation

departments; therefore, it is specific to this department and cannot be generalized to other departments, limiting its application on a larger scale.

Abbreviations

NCS	Nerve conduction studies
EMG	Electromyography
EDX	Electrodiagnosis
AANEM	The American Association of Neuromuscular & Electrodiagnostic Medicine
SHO	Senior House officer

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s41983-023-00728-1>.

Additional file 1. Referral system.

Additional file 2. Electrodiagnosis referral sheet.

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Author contributions

MN: idea of the research, collection of data, analysis of data, writing of the paper. NM: collection of data, making the study design and writing of the paper. All authors have read and approved the manuscript.

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Availability of data and materials

All data and materials are presented in the main paper.

Declarations

Ethics approval and consent to participate

The Ethics Committee formally approved this study of the Faculty of Medicine, Alexandria University. (FWA 00018699/0201111, date: 16/12/2021, serial number 0305398). The study was explained to the participants and a written informed consent was given by each participant.

Consent for publication

A written informed consent was given by each participant regarding the publication of their information.

Competing interests

None to our knowledge.

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