

# Impact of a Clinical Pharmacist in a Neurology Clinic Treating Patients with Myasthenia Gravis and Multiple Sclerosis

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## Research Article

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# Abstract

**Background:** Myasthenia gravis (MG) and multiple sclerosis (MS) are treated with complex pharmacological agents. Pharmacists play a vital role by optimizing care, providing medication counseling, and assisting with medication access. Currently, there are no published studies assessing the impact of a clinical pharmacist on MG management and limited studies evaluating impact in MS.

**Aim:** The objective is to evaluate the impact of a clinical pharmacist in interdisciplinary MG and MS clinics by identifying pharmacist-led direct and indirect services.

**Methods:** A retrospective chart review was conducted of MG or MS patients who had a clinical pharmacist visit between December 1, 2019 and August 31, 2020 to identify pharmacist interventions. Clinic-based pharmacist reports were used to identify indirect services provided by the pharmacist.

**Results:** A total of 137 encounters were analyzed. For direct patient care, the most common intervention was evaluating monitoring parameters of the medications, which occurred at 129 encounters (94.2%). Within these encounters, an average of 2.79 parameters were evaluated. Other common interventions included evaluating laboratory findings (77.4%), identifying medication discrepancies (77.4%), and providing medication counseling (76.6%). Regarding indirect patient care, a total of 1280 services were identified. The most common service was telephone encounters, with a total of 598 encounters over 9 months.

**Conclusion:** A clinical pharmacist improved the quality of care in the MS and MG management through direct and indirect services when integrated into a neurology clinic. This supports the role of pharmacists in specialty clinics by showing their impact on quality of care and medication management.

## Impact Statements

- This study shows that a clinical pharmacist can be a valuable asset when integrated into a neurology clinic. by improving the quality of patient care in the management of neurologic disease states through both direct and indirect services.
- This study describes the role of pharmacists in specialty clinic settings by showing the impact they have on quality of care and their role in medication management. This adds to the limited body of literature available in this practice setting.
- This study leads the way to develop further research projects on the financial implications and benefits of a pharmacist and to assess provider and team satisfaction of the pharmacist role.

## Introduction

Current pharmacy practice is more diverse than what it has been in the past. Traditional roles of the pharmacist related solely to medication product and delivery has grown. In advanced practice settings, pharmacists are involved with direct patient care through comprehensive disease management, medication management, health promotion and disease prevention, care coordination, and follow-up patient care. Pharmacists are an accessible health care professional; however, they are an under-utilized member of the health care team [1].

The role of the pharmacists is expanding. In North Carolina, the Board of Pharmacy may approve a licensed pharmacist to identify as a clinical pharmacist practitioner (CPP). As a CPP, the pharmacist is able to provide drug therapy management to manage patients under a supervising physician [2]. CPPs serve as fundamental members of the care team in a variety of clinics, allowing pharmacists to practice at the top of their licenses.

There is literature that supports the value of pharmacists as part of an interprofessional team in the primary care setting [1]. However, there is a limited number of studies that specifically evaluate the impact that pharmacists have in a specialty clinic on disease state management, such as in neurology. Myasthenia gravis (MG) is a chronic autoimmune neuromuscular disorder that affects over 700,000 people globally. The treatment of MG is individualized based on each patient, which limits the ability to develop an internationally accepted standard of care [3]. Multiple sclerosis (MS) is a complex inflammatory, demyelinating, and neurodegenerative disorder of the CNS [4]. Over the past decade, the treatment of MS has rapidly advanced as new drug targets are discovered. In 2010, fingolimod was the first oral agent FDA approved for the treatment of MS [5]. Since then, there are 23 oral, injectable, and infused medications that have been approved for the treatment of MS [6].

MG and MS are treated with complex pharmacological agents, including corticosteroids, monoclonal antibodies, immunosuppressants, and immunomodulators. Disease modifying therapies (DMTs) used to treat MS require monitoring for clinical effect, drug interactions, and adverse effects. Pharmacists can be an important resource and play a vital role by optimizing care, providing medication counseling, and assisting with medication access.

To our knowledge, currently there are no published studies assessing the impact of a clinical pharmacist on the management of MG. There is a limited number of studies that specifically evaluate the impact of a clinical pharmacist in an MS clinic. Most recently, in a retrospective chart review, May et al. found that 55% of a neurology clinical pharmacists interventions were medication access related in the Grady Health System neurology clinic in Atlanta and found high satisfaction among providers with clinical pharmacist involvement [7]. Therefore, the objective of the study is to evaluate the impact of a clinical pharmacist in interdisciplinary MG and MS clinics.

## Methods

### Ethics Approval:

This study was approved by the university's institutional review board as non-human subjects research.

### Study Design and Setting:

This was a retrospective chart review of patients who were seen at the University of North Carolina (UNC) Neurology Clinic, an academic health system, between December 1, 2019 and August 31, 2020 by a clinical pharmacist. Patients were identified through an electronic medical record (EMR) data repository.

Patients included in the analysis were those identified by *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM) codes for myasthenia gravis or multiple sclerosis. Patients had to have a visit with the clinical pharmacist within the designated timeframe. For patients with multiple visits, each visit was evaluated for pharmacist intervention and was included in the analysis.

The multidisciplinary team for the MG visits consisted of a physician and a CPP. For the MS visits, it consisted of a physician, CPP, physical therapist, occupational therapist, and speech therapist. During these visits, CPP responsibilities included providing comprehensive medication reconciliation, assessing symptom management, ordering and reviewing laboratory parameters, assessing drug interactions and adverse effects, providing medication counseling, contributing to changes in therapy, and assisting with medication access concerns.

Outside of face-to-face visits, the pharmacist was responsible for various activities that were documented in the EMR. These activities were quantified in clinic-based pharmacist (CBP) reports. Activities included telephone encounters and patient messages via the EMR portal, which consist of counseling on DMTs, aiding patients in choosing between therapies, assessing and managing adverse drug reactions, and navigating medication access issues. Additionally, CBP

reports included orders and documentation, which consist of ordering prescriptions, updating treatment plans, and placing lab orders for monitoring drug therapy.

## **Data Collection:**

A retrospective chart review was conducted to identify the types of interventions and evaluations made by the clinical pharmacist. All patients with MS or MG had to be seen by the CPP in the specified timeframe. Interventions were documented within the EMR by the pharmacist.

CBP reports generated by the institution's pharmacy analytics team were used to identify the indirect services provided by the pharmacist, such as number of telephone encounters, refills, patient message via the EMR, and orders and documentation.

## **Statistical Analysis:**

Results were reported using descriptive statistics, including total counts and averages.

## **Outcomes:**

The first aim of the study was to identify the various types of interventions and evaluations made by the clinic pharmacist. The second aim was to identify the different types of indirect services provided by the neurology clinical pharmacist.

## **Results**

A total of 137 encounters were analyzed from patients seen by the neurology clinical pharmacist within the designated timeframe. Of these patients, 104 (75.9%) had a diagnosis of MG and 33 (24.1%) had a diagnosis of MS. The most common medication evaluated was pyridostigmine in the MG group and interferon in the MS group. The complete list of medications is summarized in Table I.

For direct patient care activity, the most common pharmacist intervention was evaluating monitoring parameters of the medications, which occurred at 129 encounters (94.2%). Within these encounters, there was an average of 2.79 parameters evaluated. Additionally, other common interventions made included evaluating laboratory findings (77.4%), providing medication counseling (76.6%), implementing therapy changes (67.2%), and assessing disease symptoms (58.4%). A complete list of the frequency and average of interventions provided is provided in Table II.

The pharmacist identified a medication list discrepancy with 77.4% of patients, with an average of 3.67 discrepancies found in those lists. The most common action taken was the deletion of a medication for the patient's medication list. This accounted for 56.6% of the discrepancies found, followed by the addition of a medication (42.5%), and incorrect medication dosage listed (29.2%). The type and number of discrepancies is shown in Figure I.

In regards to indirect patient care activity, a total of 1280 services were identified. The most common service provided was telephone encounters, with a total of 598 encounters over 9 months and an average of 66.4 encounters per month. This was followed by orders and documentation with a total of 276 records and an average of 30.7, refill submissions with a total of 224 and average of 24.9, and patient messages with a total of 182 and average of 20.2. The number of indirect services performed by the pharmacist each month are summarized in Figure II.

## **Discussion**

To our knowledge, this is the first study assessing the impact of a clinic pharmacist on MG management and adds to the literature evaluating the impact of a clinic pharmacist in MS management. Evaluating monitoring parameters accounted

for most of the interventions made by the clinical pharmacist. Treatments for MS and MG involve medications with specific monitoring parameters. For example, interferon beta-1a is a medication made from of the endogenous interferons in the human body. This therapy carries the risk of hepatic injury, pancytopenia, and thrombocytopenia. Therefore, monitoring complete blood and differential white blood cell counts, platelet counts, and liver function tests are recommended during therapy [8]. Similarly for MG, immunosuppressive regimens used for treatment, such as prednisone, azathioprine, and mycophenolate require monitoring of blood counts, liver function, and blood glucose, among others [9]. Our study shows how the pharmacist can play a vital role in optimizing care by ensuring appropriate monitoring parameters are obtained and documented for treatment.

In our study, the pharmacist identified six different types of discrepancies in the majority of patients while performing medication reconciliation, with the most common being the removal of a medication from a list. Other common interventions included adding a medication to or correcting a medication's dose in the patient's medication list in the EMR. These identified discrepancies prevent potentially harmful adverse events that could occur at any level of the health care system. The Institute of Medicine states that at least 1.5 million preventable adverse drug events occur per year, costing more than \$4 billion annually. Studies have shown that pharmacists provide a more robust medication reconciliation and minimize the number of errors and discrepancies found in a patient's medication list compared to other health care providers [10]. A study comparing the impact of pharmacist versus nurse-obtained medication histories was conducted that showed more discrepancies were identified by a pharmacist and a higher percentage of patients received a clinical intervention ( $p < 0.001$ ) [11].

In addition to direct patient care activity, the clinical pharmacist had an impact on patient care through indirect services, showing the range of services a pharmacist can provide. The services do not include only medication reconciliation. Telephone encounters and patient messages via the EMR were documented at a large frequency, representing the volume of counseling on medications, managing adverse drug reactions, and navigating medication access issues the pharmacist can complete. The pharmaceutical knowledge that a pharmacist can provide helps to optimize patient care by improving patients' understanding of their regimen while providing financial support.

There are several limitations of this study. The retrospective design of the study makes data extraction reliant on complete and accurate documentation of pharmacist encounters and services in the EMR. Secondly, the data regarding indirect services was obtained by the institution's data analytics team. The method used to pull the data is unclear and at the time of this writing is current under review for redesign of the report, so the data received may not be completely representative of the services performed. It is important to note that, in our study, only one CPP was serving the entire neurology clinic. Thus, there are some MG and MS patients that the CPP may not be able to see due to time constraints. Additionally, our study only assessed direct patient care activity for MS and MG patients. The impact a pharmacist can have on other neuromuscular and neurological diseases was not captured.

Another limitation is that pharmacist involvement in medication access could not be included in the study. The method to obtain the number of medication access referrals was unable to limit the number to our specified timeframe. Finally, a portion of our study captured data that occurred during the coronavirus pandemic, which was from the middle of March until the beginning of June 2020. During this time, there was a decrease in indirect and direct services provided.

This study shows the services a clinical pharmacist can provide in a specialty clinic setting, which supports the role of including a pharmacist in the interdisciplinary team. The addition of a pharmacist can enhance patient care through medication assessment and counseling as well as navigation of medication access issues. Further research is needed to determine the financial implications and benefits of the addition of a pharmacist and to assess provider and team satisfaction of this addition.

## Conclusion

A clinical pharmacist can be a valuable asset when integrated into a neurology clinic. The pharmacist may improve the quality of patient care in the management of MS and MG through both direct and indirect services. Results from this study describe the role of pharmacists in specialty clinic settings by showing the impact they have on quality of care and their role in medication management.

## Declarations

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**Conflicts of interest:** The authors have no financial or other conflicts of interest to disclose.

**Availability of data and material:** Not applicable

**Ethics approval:** Not applicable

**Consent to participate:** Not applicable

**Consent for publication:** Not applicable

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## Tables

**Table I. Patient Demographics (N = 137)**

Age, yr – mean	51.7
Ethnicity – no. (%)	
Hispanic or Latino	5 (3.6)
Not Hispanic or Latino	119 (86.9)
Unknown	11 (8.0)
ICD-10 Diagnosis – no. (%)	
Multiple Sclerosis	33 (24.1)
Myasthenia Gravis	104 (75.9)
Myasthenia Gravis Medication – no. (%)	
Pyridostigmine	74 (71.2)
Mycophenolate	55 (52.9)
Prednisone	39 (37.5)
Other	31 (29.8)
IVIG	17 (16.3)
Azathioprine	14 (13.5)
Eculizumab	10 (9.6)
Rituximab	2 (1.9)
Methotrexate	2 (1.9)
Multiple Sclerosis Medication – no. (%)	
Interferon-beta	8 (24.2)
Dimethyl fumarate	7 (21.2)
Other	5 (15.2)
Glatiramer acetate	4 (12.1)
Cladribine	3 (9.1)
Natalizumab	3 (9.1)
Ocrelizumab	3 (9.1)
Dalfampridine	2 (6.1)
Teriflunomide	1 (3.0)
Diroximel fumarate	1 (3.0)
Fingolimod	0
Siponimod	0
Alemtuzumab	0
Ozanimod	0
Ofatumumab	0

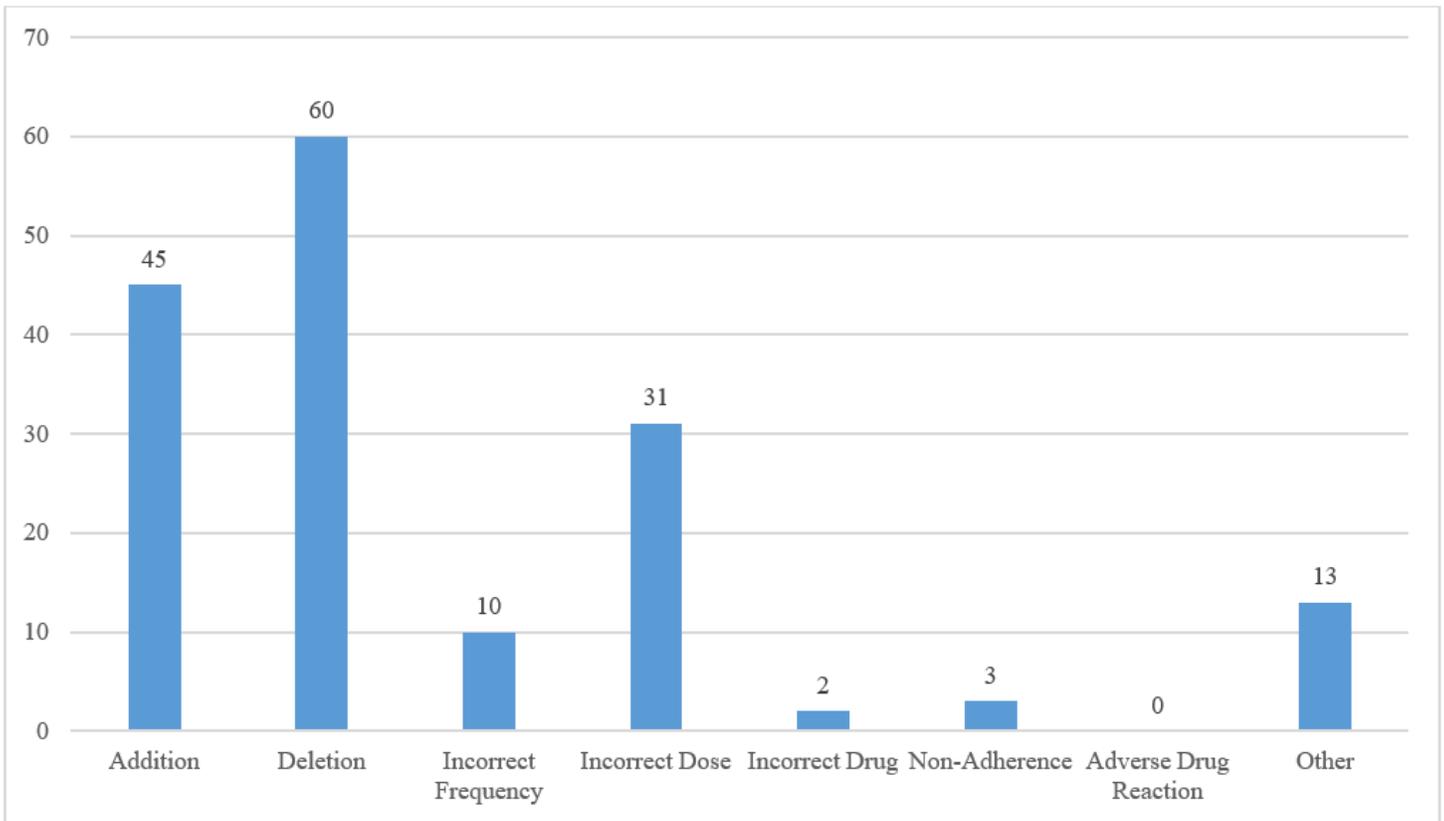
**Table II. Total Number and Average of Interventions Made by the Clinical Pharmacist**

<b>Intervention</b>	<b>Number of Encounters (%) N = 137</b>	<b>Average Number of Intervention Per Encounter<sup>a</sup></b>
Symptom Assessment	80 (58.4)	2.2
Monitoring Parameters Evaluated	129 (94.2)	2.79
Adherence Issues	36 (26.3)	1.47
Evaluated Labs	106 (77.4)	2.37
Labs Updated	3 (2.8)	. <sup>b</sup>
Drug Interactions	13 (9.49)	1
Side Effects	50 (36.5)	1.88
Changes to Therapy	92 (67.2)	. <sup>b</sup>
Med-Specific Counseling	105 (76.6)	1.7
Discrepancy Found	106 (77.4)	3.67

<sup>a</sup>Values describe the average number of interventions per encounters using the total number of interventions that occurred.

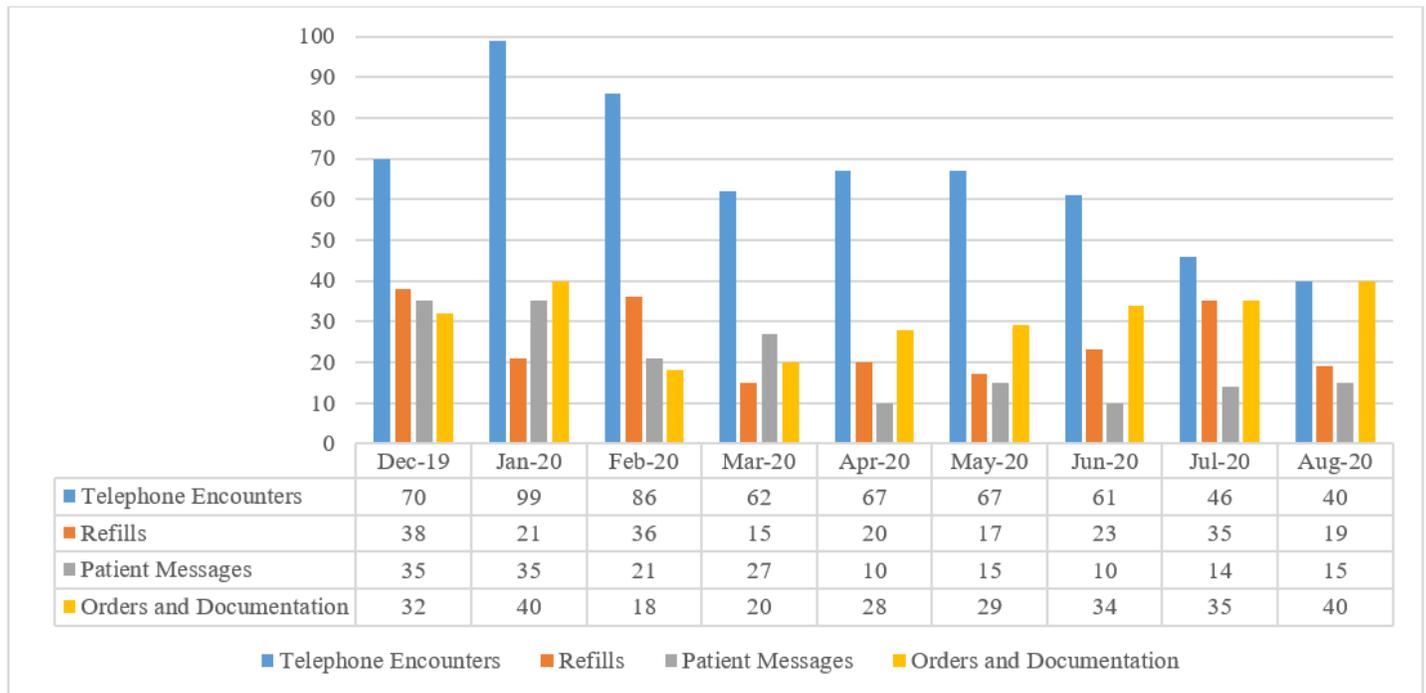
<sup>b</sup>Average could not be calculated because the interventions were gathered using close-ended yes-or-no questions.

## Figures



**Figure 1**

Type and Number of Discrepancy Identified by the Clinical Pharmacist Other designates discrepancies found that were not specified.



**Figure 2**

Indirect Services Provided by the Clinical Pharmacist