RESEARCH POSTER PREPARED FOR ISPOR EUROPE | NOVEMBER 2019 | COPENHAGEN, DENMARK | PND91

TREATMENT COST OF THERAPEUTIC PLASMA EXCHANGE VERSUS IMMUNOGLOBULINS IN AN INPATIENT SETTING

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1 – Terumo BCT

RESEARCH POSTER PRESENTATIONS – SESSION V
PND: NEUROLOGICAL DISORDERS
Wednesday, November 6, 2019
Display Hours: 9:30 -14:00
Poster Author Discussion Hour: 13:00-14:00

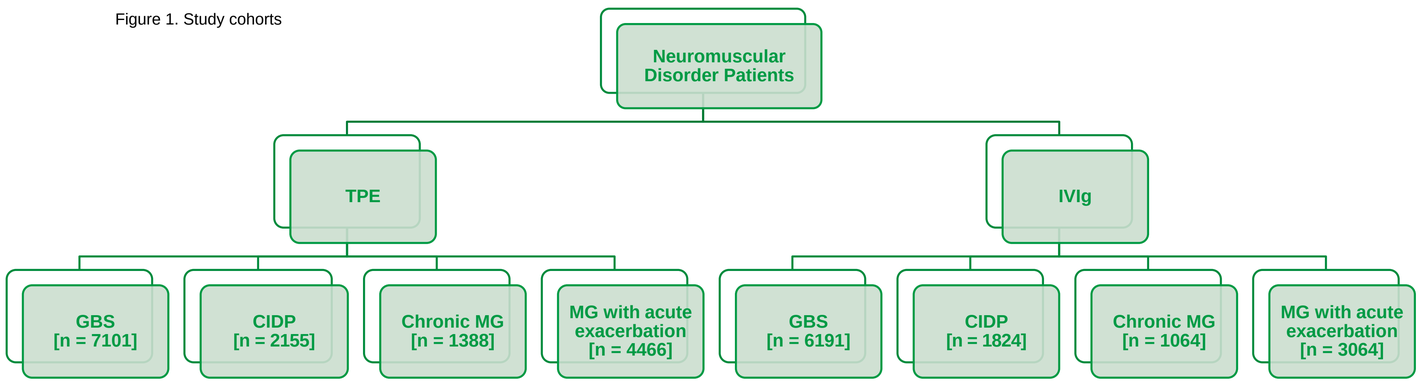
BACKGROUND

- Neuromuscular diseases are a broadly defined group of disorders that involve injury to or dysfunction of the peripheral nerves and/or neuromuscular junction with subsequent impairment of muscular function.[1-3]
- Several of these disorders are immune-mediated, including myasthenia gravis (MG), chronic inflammatory demyelinating polyneuropathy (CIDP), and Guillain-Barré syndrome (GBS).[1-3]
- Immune-modulating therapies, including therapeutic plasma exchange (TPE) and intravenous immunoglobulin (IVIg), have been found to be effective disease-stabilizing therapies for patients diagnosed with these immune-mediated neuromuscular diseases.[4]
  - IVIg is a biological product obtained through fractionation of blood in patients.
  - TPE is a blood separation technique to remove plasma that includes autoantibodies.
- To date, neither TPE nor IVIg has demonstrated clinical dominance for the treatment of immune-mediated neuropathies.
  - TPE and IVIg are considered to have equivalent efficacy for the selected immune-mediated neuropathies, and treatment selection is often based upon physician or patient preference, availability, underlying disease risk factors, or contraindications.

OBJECTIVE

- The objective of this study is to assess the utilization of TPE or IVIg in patients with MG (with and without acute exacerbation), CIDP, and GBS in a real-world clinical setting in order to compare total hospital costs and total TPE versus IVIg costs [Figure 1].

Figure 1. Study cohorts



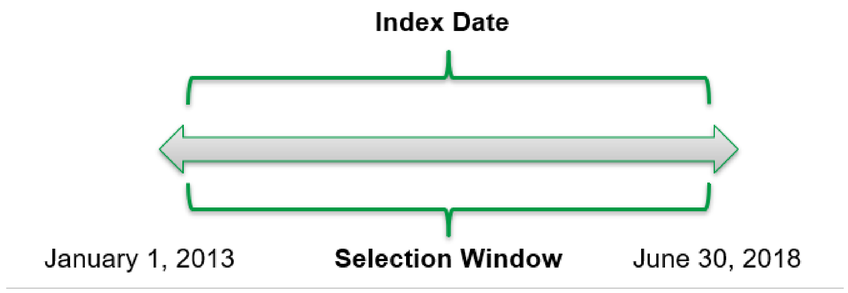
STUDY DESIGN AND DATA SOURCE

- This was a retrospective cohort study design utilizing hospital discharge records in the Premier Healthcare Database (PHD).
  - At the time the study was conducted, PHD contained data from more than 900 million patient encounters that accounted for one in every four hospital discharges in the US.

POPULATION AND TIME PERIOD

- The study included adult patients with an inpatient encounter between January 1, 2013 and June 30, 2018 with a primary or secondary discharge diagnosis code of GBS, CIDP, or MG (with or without exacerbation) and at least one TPE or IVIg treatment during the encounter [Figure 2].

Figure 2. Study time period



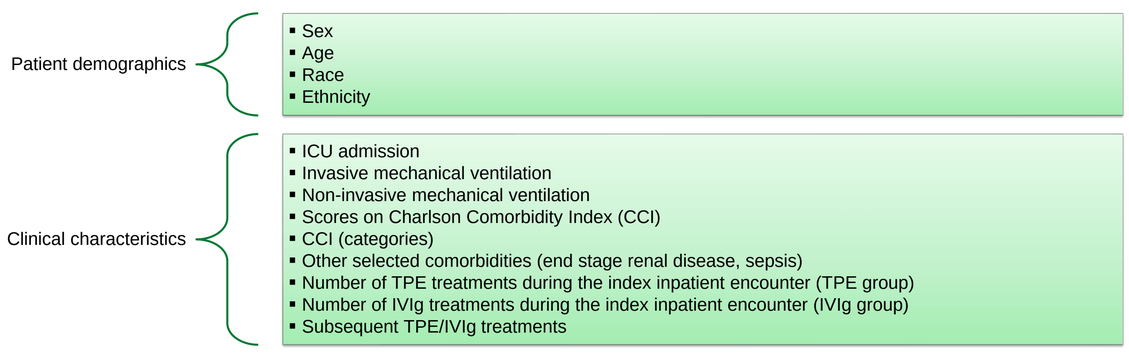
EXPOSURE AND OUTCOMES

- The study exposure included patients' receipt of either TPE or IVIg during an eligible inpatient encounter.
  - TPE or IVIg therapy was identified using a combination of ICD-9/10 diagnosis or procedure codes, CPT codes, and HCPCS codes or charge master descriptions.
- The study outcomes included:
  - Total hospital costs during an index inpatient encounter
  - Total therapy costs during an index inpatient encounter
  - Length of stay (LOS)
    - Intensive care unit (ICU) LOS
  - Days of invasive mechanical ventilation

MEASURES

- Selected patient demographic and clinical characteristics variables were collected [Figure 3].

Figure 3. Study measures



COST ANALYSIS

- Adjusted models were developed for the following outcomes:
  1) Total cost of index inpatient encounters.
  2) Total cost of therapy during index inpatient encounters.
- Generalized linear regression models with gamma link function were constructed to determine differences in cost between index inpatient encounters on TPE and IVIg therapy.
- Adjusted means with 95% CI were reported.
- Variables that were found to be significant in bivariate analyses were included for adjustment in the regression models.
  - All regression models were assessed for fitness and convergence of algorithm.
  - Regression diagnostics were conducted to assess multicollinearity between independent variables and did not warrant exclusion of any variables.
- Outliers for study outcomes, defined as being above the 99th percentile and below the 1st percentile, were assessed and excluded from the regression models. A $P < 0.05$ was used for making statistically significant inferences.
- All analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC).

REFERENCES

1. Gwathmey KG, Burns TM. Myasthenia gravis. *Semin Neurol.* 2015;35(4):327-339.
2. Tarakad S, Sater RA. Acute inflammatory demyelinating polyradiculoneuropathy. Medscape website. https://emedicine.medscape.com/article/1169959-overview. Accessed 10 October 2019.
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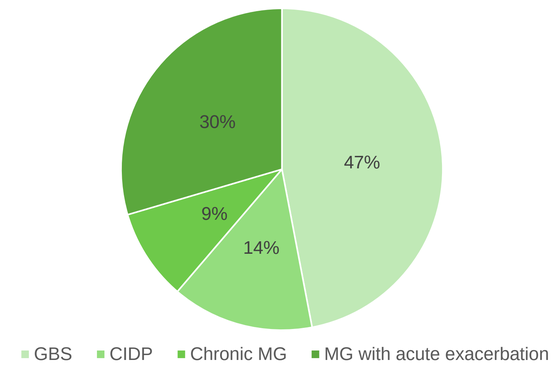
RESULTS

- Of the 15 110 inpatient admissions, the majority of patients were diagnosed with GBS (47.0%), followed by MG with acute exacerbation (29.6%) [Figure 4].

Figure 4. Inpatient encounters for selected neuromuscular disorders (n = 15 110).



- Overall, a greater proportion of patients were treated with IVIg [Table 1].

Table 1. TPE/IVIg therapy in patients diagnosed with selected immune-mediated neuromuscular conditions (n = 15 110).

	Total	TPE		IVIg	
		n	%	n	%
GBS	7101	910	12.8%	6191	87.2%
CIDP	2155	331	15.4%	1824	84.6%
Chronic MG	1388	324	23.3%	1064	76.7%
MG with acute exacerbation	4466	1402	31.4%	3064	68.6%

- Unadjusted mean total hospital costs were lower in the TPE group than in the IVIg group among CIDP patients ($29 212 in the TPE group versus $30 092 in the IVIg group).
- When adjusted for several covariates; the differences in mean total hospital costs between IVIg and TPE were similar in direction but lower in magnitude compared to unadjusted estimates.
- In addition, among patients diagnosed with MG with acute exacerbation, adjusted mean total hospital costs among patients who received TPE were significantly higher than those among patients who received IVIg during index hospitalization ($22 388 in the TPE group versus $21 596 in the IVIg group, *P* value: 0.03) [Table 2].

Table 2. Unadjusted and adjusted cost-related outcomes between inpatients diagnosed with selected neuromuscular conditions with receipt of TPE versus IVIg (n = 15 110).*

	Unadjusted Estimates Mean (SD)			Adjusted Estimates Adjusted Mean (95% CI)		
	IVIg	TPE	*P* value	IVIg	TPE	*P* value
GBS	$14 307 ($11 056)	$5500 ($5511)	-	$12 316 ($10 789-14 058)	$4862 ($4045-5845)	<0.0001
CIDP	$12 918 ($12 923)	$4330 ($4394)	-	$9672 ($7539-12 408)	$3587 ($2551-5044)	<0.0001
MG	$10 961 ($9 140)	$3787 ($5070)	-	$8637 ($6249-11 939)	$2989 ($1938-4612)	<0.0001
MG with acute exacerbation	$13 489 ($11 925)	$5677 ($7551)	-	$11 098 ($9310-13 229)	$4423 ($3534-5550)	<0.0001

***GBS**: Adjusted for age (in category), race, admission source, admission type, discharge status, ICU admission, myocardial infarction (MI), congestive heart failure (CHF), cerebrovascular disease, chronic obstructive pulmonary disease (COPD), ulcer, diabetes mellitus (DM), DM with chronic complications, hemiplegia, renal disease, CCI (in category), end stage renal disease (ESRD) at point of admission, sepsis at point of admission, invasive mechanical ventilation, hospital geographic region, number of beds, teaching status, and urbanicity.*
***CIDP**: Adjusted for admission type, ICU admission, MI, renal disease, ESRD at point of admission, hospital geographic location, number of beds, and urbanicity.*
***MG**: Adjusted for age (in category), admission source, admission type, cerebrovascular disease, COPD, ulcer, renal disease, hospital geographic location, number of beds, and teaching status.*
***MG with acute exacerbation**: Adjusted for admission source, admission type, discharge status, ICU admission, CHF, peripheral vascular disease, DM, renal disease, ESRD at point of admission, sepsis at point of admission, invasive mechanical ventilation, hospital geographical region, number of beds, and teaching status.*

LIMITATIONS

- Similar to all retrospective studies that utilize administrative claims data or hospital databases, this study has limitations that merit consideration:
  - Hospital-reported data was used to define the study variables and outcomes and was subject to potential reporting bias.
  - The Premier Healthcare Database included follow-up of only patients who returned to the same facility (Premier member hospital) , possibly resulting in underestimation of the readmissions.
  - Cost data has been assessed only at the hospital level and no attempt has been made to validate it at the patient level.
  - The assignment of immune-modulating therapy (TPE versus IVIg) to patients was not at random and might have been subject to selection bias.
  - Several covariates were adjusted in the models; however, a possibility of unmeasured or residual confounding cannot be ruled out.

CONCLUSIONS

- Reviewing data about hospitalized patients diagnosed with four selected neuromuscular conditions (GBS, CIDP, and MG without and with acute exacerbation) in the PHD, therapy costs with TPE were found to be significantly lower than those with IVIg.
- Future studies could be conducted to further evaluate the departmental hospital costs between the two groups to gain additional insight into the differences.

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