J R Coll Physicians Edinb 2019; 49: 5–11 | doi: 10.4997/JRCPE.2019.102 ORIGINAL RESEARCH PAPER

The use of IVIg in the treatment of inflammatory polyneuropathies and myasthenia gravis at The Walton Centre

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Abstract

Background Immunoglobulin is a blood product used in a variety of medical disorders, usually delivered intravenously (IVIg). Neurology patients, particularly those with inflammatory polyneuropathy, utilise a lot of IVIg. There is a national shortage of immunoglobulin and, thus, pressing need to ensure minimum effective dosing as well as rigorous outcome assessments to assess benefit at treatment start and subsequently, as placebo effects can be strong.

Methods Serial audit of IVIg use at The Walton Centre against national guidelines was carried out through analysis of clinical notes of day unit patients. Review of the national immunoglobulin database and of neurology outpatient notes to benchmark our practice and provide some comparison with the wider nation was also performed.

Results Serial audit led to improved adherence to guidelines, and analysis of practice identified wide variation in IVIg use.

Conclusion Local audit and benchmarking of practice can be used to promote quality and consistency of IVIg use across the NHS.

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Introduction

The Walton Centre is a specialist tertiary hospital in Liverpool and provides services in neurology, neurosurgery, pain management and rehabilitation. Patients with neuromuscular (NM) disorders are seen both as outpatients and inpatients, including those with chronic inflammatory demyelinating polyradiculoneuropathy (CIDP), multifocal motor neuropathy (MMN), myasthenia gravis (MG) and paraproteinaemic neuropathy (PPN), the subjects of this paper. They are seen in dedicated NM clinics by four neurology consultants and a rehabilitation consultant with specialist interest, but all consultant neurologists may see NM patients, especially in the 13 district general hospitals (DGHs) that are visited. The Walton Centre has a 3.5 million patient footprint and operates a hub-and-spoke model where neurologists are rented from The Walton Centre to visit DGHs in the region.

Intravenous immunoglobulin (IVIg), a blood product derived from multiple blood transfusions, is an established treatment for inflammatory polyneuropathy (CIDP, MMN and PPN) and MG. The Department of Health (DoH) published an evidence-based guideline review of IVIg use in 2008 and advised IVIg in the management of CIPD, MMN, MG and PPN.[1] These guidelines were updated in 2011: IVIg is authorised in long-term management of CIDP, MMN and PPN, but only for the short-term management of MG or Lambert–Eaton myasthenic syndrome.[2] IVIg is also used in other neurological conditions (inflammatory myopathy, stiff person syndrome or Rasmussen syndrome), immunology (mainly in low doses for those with deficiencies), haematology (immune thrombocytopaenia, red cell aplasia, haemolytic anaemia or coagulation factor inhibition; also haemolytic disease of the newborn, haemophagocytic syndrome and post-transfusion purpura) and some other conditions (autoimmune uveitis or congenital heart block, immunobullous diseases, Kawasaki disease, toxic shock syndrome, severe and recurrent *Clostridium difficile* colitis, Stevens–Johnson syndrome and in some solid organ transplantation patients).

Owing to the emergence of new therapeutic indications in many different medical specialties for IVIg, increasing off-label use and long treatment durations, there have long been concerns about overuse of IVIg.[1–3] It is particularly expensive and scarce in the UK, because plasma has to be

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internationally imported owing to theoretical risks of variant Creutzfeldt–Jakob disease.[1,2] A global shortage coinciding with increased indications for IVIg resulted in strict national (DoH) clinical guidelines for use of IVIg, to be managed by local Immunoglobulin Assessment Panels (IAPs).[1,4] IVIg usage must be approved by IAPs in all trusts to ensure proper usage of IVIg, rationalise demand and suggest alternative evidence-based therapies. A colour-coding system was introduced for prioritisation: red (highest priority as risk to life without treatment); blue (reasonable evidence but other options available); grey (evidence base weak, treatment considered case to case); and, black (no evidence and treatment not recommended).[1,2] To ensure patients undergoing IVIg therapy are benefitting from their treatment, annual review of treatment efficacy is performed. Although research has shown the benefit of rigid IVIg dosing structures,[5] in the UK doses and dosing intervals for patients requiring long-term treatment are generally tailored to patient need as per DoH guidance, as experience shows a wide variation in patient requirements.

Alternative therapies to IVIg are available in CIDP, MG and PPN, particularly steroids for CIDP and MG and other immunosuppressants, such as azathioprine, in MG.[6] With MG, IVIg is generally reserved for relapsing patients on a short-term basis, to help patients through a flare of their condition or to give time for other therapies to work, particularly if there are concerns about respiratory or bulbar function.[7] There is insufficient evidence to support its use in chronic management, though in practice it can be useful in patients who are refractory to, or intolerant of, usual treatment. In CIDP, IVIg can be used as a first-line treatment option, though a steroid trial is usually recommended first if there are no contraindications. IVIg is the only evidence-based therapy for MMN and in some cases the use of steroids or plasmapheresis can worsen the disease (this can also occur in some CIDP patients).[8,9]

PPN patients usually fall into two categories depending on the two most commonly associated antibodies. The paraprotein in these conditions is of the IgM type and directed at either myelin-associated glycoprotein (MAG) or GQ1b (the same ganglioside that IgG antibodies are directed against in Miller Fisher variant Guillain–Barré syndrome). Anti-MAG neuropathy presents as slowly progressive distal sensory and sometimes motor decline and can at first appear innocuous, like an age-related axonal polyneuropathy, but later may be complicated by balance problems and tremor; nerve conduction tests classically show prolonged distal motor latencies (distal demyelination).[10] PPN with GQ1b antibodies are often associated with other ganglioside antibodies, of the disialosyl type, and presents subacutely with sensory ataxia, so is often described as 'chronic ataxic neuropathy' or 'chronic ataxic neuropathy with antidisialosyl IgM antibodies'; it does not usually have all the features that when present in entirety led to the acronym CANOMAD (chronic ataxic neuropathy, ophthalmoplegia, IgM paraprotein, cold agglutinins and disialosyl antibodies).[11] IVIg can be used first line in PPN and is often effective in chronic ataxic neuropathy, but less commonly so in anti-MAG neuropathy. Reducing paraprotein levels with rituximab or other agents is often favoured as a first-line strategy, certainly where the paraprotein is thought to be malignant (lymphoplasmacytic lymphoma or Waldenström's macroglobulinaemia), but increasingly in severe cases without malignancy, even where the paraprotein titre is very low small concentrations can still be pathogenic.[12]

We set out to audit how The Walton Centre used IVIg in CIDP, MMN, MG and PPN, and see how far we used IVIg in accordance with DoH guidelines. We then looked at how our IVIg use compared to other parts of England utilising the National IVIg Database, which records details about IVIg use across the country. Finally we examined clinic letters from outpatient visits of patients with CIDP, MMN, MG and PPN to see what other treatments are favoured. There are no other papers that have looked at both local and national use of IVIg in the treatment of inflammatory polyneuropathies and MG. In 1999 a CIDP-specific prevalence study was published covering a population of over 14 million in south east England, which showed a minimum prevalence rate of 0.67/100,000 for CIDP, but there were large regional reporting variations. A total of 87% of the patients for which data were available had received corticosteroids, whilst 24% had received IVIg.[13] Other centres and regions have published data on their IVIg use in neurological patients, usually as part of quality improvement work or audits, but not in a way that is easily comparable to this study.

Although this paper is focused on the most common uses of IVIg in neurology, the approach used in this study could be applied to patients in other disciplines, for example in those with immunobullous diseases, who may also require long-term treatment with IVIg. Furthermore, the use of local coding data and serial audit to assess treatments of inflammatory or other treatable disorders could be applied to a broad range of medical conditions and allow benchmarking between different centres – a major aim of the 'Getting It Right First Time' initiative from NHS Improvement.

Methods

Audit of IVIg use at The Walton Centre

The DoH guidelines (2nd edition) for immunoglobulin use was published in 2008[1] with an update published in 2011.[2] These stipulate that 1) alternatives to IVIg should be considered; 2) an objective treatment response should be documented; 3) use of ideal body weight (IBW) should be considered in dose calculation; 4) the dose should be reduced to a minimally effective maintenance dose (by optimising treatment interval length as well as reducing dose administered); and, 5) annual review should be conducted to ensure ongoing treatment efficacy.

For the three cycles audit so far, we included all patients who received IVIg on The Walton Centre neurology day unit. The first and second cycles were retrospective audits for the periods covered (January–June 2013 and June–August 2014). The

Table 1 Numbers of patients treated at The Walton Centre day unit with IVIg

Diagnosis	2013	2014	2016
	Jan–Jun	Jun–Aug	Sep–Oct
CIDP	39	36	23
MMN	8	10	4
MG	17	16	7
PPN	4	2	4
LEMS	3	3	1
NMO	1	2	1
Myositis	0	0	1
Other	5	3	0
Total	77	72	41

CIDP: chronic inflammatory demyelinating polyradiculoneuropathy; IVIg: intravenous immunoglobin; LEMS: Lambert–Eaton myasthenic syndrome; MG: myasthenia gravis; MMN: multifocal motor neuropathy; NMO: neuromyelitis optica; PPN: paraproteinaemic neuropathy

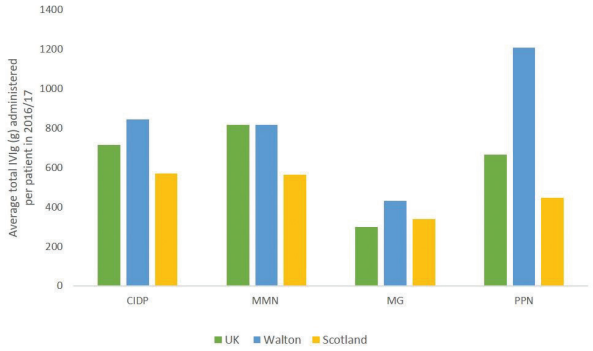
coding department provided spreadsheets with the details of all patients who had IVIg on the day ward for the audit periods. The audit period was reduced for the second audit as it was judged we would capture most patients who have regular IVIg with a 3-month window. There were 83 patients who received IVIg during the first audit period, with 77 cases audited as the case notes were unavailable for six patients. In the second cycle, there were 74 patients who received IVIg. One was excluded as they were deceased, and a second was excluded as they had been given the IVIg in error; the remaining 72 cases were audited.

For the third cycle, we prospectively audited all patients who had IVIg on the day unit over a 4-week period in September–October 2016; there were 42 in total. The audit window was further reduced as there had been substantial improvements in practice seen by the second cycle, and a long-term sustainable model for the audit was sought. A proforma was used for collecting the relevant data, with minor modifications between the cycles. The data were collected by final year medical students and spot checks on accuracy were performed by the supervising registrar. Data were collected into Excel (Microsoft, WA, USA) spreadsheets for analysis.

Comparison of IVIg use at The Walton Centre with the rest of the UK

The IVIg audit could provide 'snapshot' estimates of the numbers of patients we were treating with IVIg (Table 1), but accurate numbers of patients with CIDP, MMN, MG and PPN treated with IVIg in the 2016/17 financial year could be determined using the IVIg database.[14] The database also allowed average usage of IVIg in grams per person per year to be compared for each condition in The Walton Centre, and these data could also be compared with data for the entire UK and regions within (for example Scotland). This provided

Figure 1 Average amount of intravenous immunoglobulin (IVIg) per patient per condition during 2016/17 financial year. At The Walton Centre, the largest discrepancies were found in treatment of chronic inflammatory demyelinating polyradiculoneuropathy (CIDP) and myasthenia gravis (MG), where average immunoglobin (Ig) use per patient was higher than the UK average, particularly for MG. In Scotland, lower Ig volumes per patient were in use, except for MG, where average Ig use per patient was greater, though not to the extent seen at The Walton Centre. MMN: multifocal motor neuropathy; PPN: paraproteinaemic neuropathy



an opportunity to compare relative amounts of IVIg usage for different indications at The Walton Centre with the UK as a whole (Figure 1), and enabled estimates of expected vs actual IVIg usage at our centre for different conditions; we have performed a similar analysis for Scotland as a region as a comparison, for interest.

Different treatments for CIDP, MMN, MG and PPN provided at The Walton Centre

To complement the above work, we sought to examine what other treatments were used in our patients with CIDP, MMN, MG and PPN. Patients attending The Walton Centre day unit and clinics are coded using the International Classification of Diseases 10th Revision (ICD-10) codes G70.0 for MG and G61.8 for inflammatory polyneuropathy (which CIDP, MMN and PPN are all coded under at The Walton Centre). For each patient identified with these conditions who attended The Walton Centre NM clinic in the 2016/17 financial year, notes were reviewed for treatment modality, including IVIg, steroids and other immunosuppressive agents. The analysis included 39 CIDP patients, 12 MMN patients, 114 MG patients and 10 PPN patients (Figure 2). These data are useful to analyse different treatment strategies, but will provide an underestimate of IVIg use, as some patients receiving IVIg are reviewed on the day unit when they attend rather than being seen regularly in clinic.

Results

Audit of IVIg use at The Walton Centre

The diagnoses of IVIg-treated patients in each cycle are detailed in Table 1 and the degree of compliance with DoH guidelines in Table 2. The results are also discussed below.

The first cycle showed weakness in documentation of the number of patients having an objective response to IVIg (17%, Table 2). This is a crucial aspect of effective treatment as it

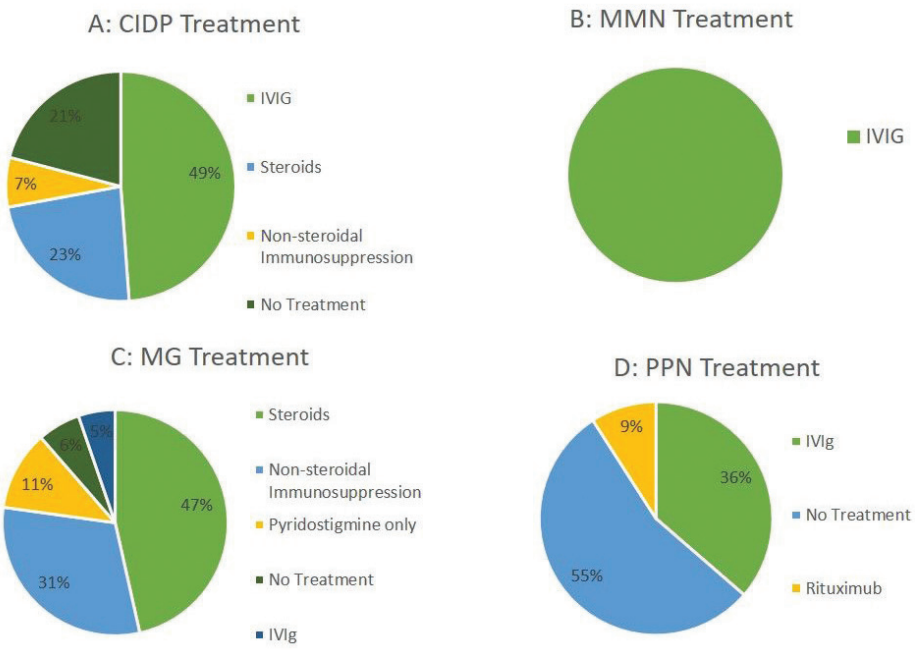


Figure 2 Treatment for patients with (a) chronic inflammatory demyelinating polyradiculoneuropathy (CIDP), (b) multifocal motor neuropathy (MMN), (c) myasthenia gravis (MG) and (d) paraproteinaemic neuropathy (PPN) at The Walton Centre 2016/17 financial year. Patient records coded for inflammatory polyneuropathy and MG were analysed for current main treatment method. For CIDP, nearly one-fifth (4 of 21 patients; 19%) of the intravenous immunoglobin (IVIg) patients also took steroids. For MG, nearly half (24 of 53 patients; 45%) of the steroid group also used nonsteroidal immunosuppression – the 31% detailed as using them did not use steroids (although may have done previously); all the long-term IVIg group used other treatments

can avoid the repeated use of IVIg where it has not worked. Other treatment options were only considered in 45% of cases, IBW was only used in one patient, annual reviews were only formally performed in 26% of cases, and the dose was reduced over time in only 32% (Table 2). Following the first audit, changes to the system were made, including an IVIg guide giving clear instructions on outcome assessments. Medical staff were reminded of the requirement to evaluate IVIg patients (through email bulletins, discussion in consultant meeting and lunchtime lecture) and there were dedicated post-IVIg assessment slots created on the day ward. The IAP tried harder to identify patients who had 'slipped through the net' and not been reviewed in panel meetings by reviewing coding and pharmacy data.

On reaudit in 2014, there was a substantial improvement with 65% of patients having an objective response documented and 17% having IBW calculated. There were additional improvements in dose reduction (58%), annual review rates (72%) and in the percentage where other treatments were considered (67%). Following the second audit, further improvements were made. There was enhanced detection by the immunoglobulin advisory panel of patients without IVIg request forms as well as an e-mail reminder to consultants to reduce number of days (for each course) and overall dose after IVIg initiation. A NM specialist nurse was recruited partly to take over outcome assessments on the day unit and ensure IVIg dose reductions till reduced efficacy for all patients.

In the third cycle, there was a significant improvement in the key area of measuring objective responses (now at 90%). There was an increase in the percentage of patients who had their dose reduced from 59% to 78%. IBW calculation rates remained low at 12%. Given there were improvements in the outcomes, no changes were made to the system at this cycle. Another reason for this was that the NM nurse was in post only a few months prior to this cycle, and we expected further improvements in the appropriate use of IVIg owing to her being in post. Our fourth audit cycle is planned for late 2019. Regarding the low rates of IBW calculation, prescribers were reminded of the need to use this if the body mass index is >30, and this will be reaudited at the next cycle.

Comparison of IVIg use at The Walton Centre with the rest of the UK

IVIg use per patient at The Walton Centre compared with national figures

Data were collected from the national IVIg database for the 2016/17 financial year for total immunoglobin (Ig) used and the patient numbers for each condition (Table 3). Figure 1 displays the average annual IVIg dose per patient for each of the four conditions: for the UK, for The Walton Centre, for UK–Walton and for Scotland. Comparing The Walton Centre with the national figures first, this shows that The Walton Centre used 18% more IVIg per patient for CIDP than the national average, but our IVIg usage per patient for MMN was almost identical to national values. Looking at the national data, 12% less IVIg was used in CIDP per patient than in MMN, whereas at The Walton Centre very similar volumes were used per patient for CIDP and MMN (3% more given to CIDP patients). This tells us that in the UK as a whole MMN patients tend to be given slightly higher annual amounts of IVIg compared with CIDP, whereas at The Walton Centre similar volumes are given. The data also showed that The Walton Centre used 33% more IVIg per patient in 2016/17 for MG than the national average.

Because IVIg is usually reserved for short-term use in MG, volumes used per patient per year are lower than in other conditions. We suspect the high IVIg usage per patient in MG at The Walton Centre is due to relatively high numbers of patients on long-term IVIg for MG or receiving very frequent short-term treatment. Although the national data does not

Table 2 Audit of compliance to Department of Health intravenous immunoglobin (IVIg) guidelines at The Walton Centre after three audit cycles. These data were obtained from patients receiving IVIg at The Walton Centre Neurology Day unit. Calculations of IBW remain low, however, other compliance improved through each cycle

Criteria	2013 compliance	2014 compliance	2016 compliance
How frequently were other options considered?	45%	67%	67%
Was an objective response documented?	17%	65%	90%
Was an IBW calculated?	1%	17%	12%
Was the dose reduced over time?	32%	58%	78%
Was there an annual review?	26%	72%	74%

IBW: ideal body weight

include breakdown into short-/long-term use, this is not true of the local data, which showed that at The Walton Centre in 2016/17 there were more MG patients receiving long-term IVIg that those requiring it short term (Table 3).

The data also suggest that The Walton Centre used 80% more IVIg per patient for PPN compared with the national average in the 2016/17 financial year, but as this was based on only five patients it is not a robust finding. This is especially true when you consider that many patients will not respond and so have low volumes (as may have had a couple of infusions only before stopping owing to lack of benefit) whilst others may respond and require quite high volumes. Furthermore, although 'true' PPN is associated with IgM paraprotein, the national data for PPN are classified as 'paraprotein-associated demyelinating neuropathy (IgG or IgA)' when this group often represent CIDP with an incidental IgG or IgA monoclonal gammopathy of uncertain significance. Looking at the data from The Walton Centre, it is clear that some PPN patients have been classified as 'paraprotein-associated demyelinating neuropathy (IgG or IgA)' even when they are associated with IgM paraprotein, so we suspect this occurs nationally and represents confusion amongst administrators at the data entry level. Although we include PPN in our figures and tables, it must be understood that these data are less certain for the above reasons, plus the fact that even within the 'paraprotein-associated demyelinating neuropathy (IgM)' group there are separate disorders (as discussed above in the introductory section) that show different responses to treatment.

Number of IVIg patients at The Walton Centre compared with national figures

The national figures can be used to provide 'expected' numbers of patients that we might be treating with IVIg (Figure 3). Our catchment area of roughly 3.5 million is smaller than the UK as a whole by a factor of 18.9 (based on a population in 2016/17 of 66 million), so dividing the numbers of patients in the UK by 18.9 for each condition of interest provides a crude expected number of patients. This only applies to The Walton Centre catchment area and some within that area may have access to other neurology centres (Manchester or Preston), so it will provide an overestimate. In view of this being a probable overestimate, comparison with our numbers lends support to suspicion that we may be treating more MG patients with IVIg, even though the number of MG patients were similar to expected numbers. Observed CIDP and MMN numbers were lower than expected, perhaps reflecting some in our catchment area being seen in other centres, although MMN numbers were nearly half those expected and suggests we genuinely have less MMN patients than anticipated. This would be unexpected as MMN should have the most reliable treatment figures because unlike CIDP, MG and PPN, the only treatment option is IVIg.

Number of IVIg patients and IVIg use per patient in Scotland compared with national figures

A similar analysis was performed on Scotland, where in 2016/17 there were 5.4 million people, which is smaller than the whole UK by a factor of 12.2. This suggests that Scotland may be treating more CIDP and especially more

Table 3 Absolute amounts of, and number of patients treated with, IVIg for CIDP, MG, MMN and PPN during the 2016/17 financial year in the UK, Walton Centre, UK minus Walton and Scotland. These figures were used to calculate the average amount of IVIg used per patient per condition in Figure 1

	UK	UK minus Walton	Walton	Scotland
	Ig total in grams/no pts = g/pt	Ig total in grams/no pts = g/pt	Ig total in grams/no pts = g/pt	Ig total in grams/no pts = g /pt
CIDP	1,156,842/1,617 = 715	1,112,132/1,564 = 711	44,710/53 = 844	96,192/169 = 569
MMN	566,371/693 = 817	552,506/676 = 817	13,865/17 = 816	37,210/66 = 564
MG	235,882/786 = 300	219,502/748 = 293	16,380/38 = 431	34,965/103 = 339
ST			2,280/17 = 134	
LT			14,100/21 = 671	
PPN	46,488/70 = 664	40,453/65 = 622	6,035/5 = 1,207	1,785/4 = 446

CIDP: chronic inflammatory demyelinating polyradiculoneuropathy; Ig: immunoglobin; IVIg: intravenous immunoglobin; LT: long term; MG: myasthenia gravis; MMN: multifocal motor neuropathy; PPN: paraproteinaemic neuropathy; pt: patient; ST: short term

Figure 3 Expected vs observed number of intravenous immunoglobulin (IVIg) patients per condition in The Walton Centre and Scotland during 2016/17 financial year. The Walton Centre appears to have more myasthenia gravis (MG) patients and less chronic inflammatory demyelinating polyradiculoneuropathy (CIDP) and multifocal motor neuropathy (MMN) patients on IVIg than expected, whilst Scotland has more CIDP and MG patients on IVIg than expected, when compared with national figures
PPN: paraproteinaemic neuropathy

MG patients with IVIg than the national average (Figure 3). Comparing this with the Scottish data for average IVIg use per patient per condition (Figure 1), the increased patients are balanced by reduced Ig volumes used per patient compared with national levels, except in MG. It could be that Scotland are conducting more treatment trials that are unsuccessful hence more patients but less Ig used per patient per year, although for MG there appears to be a lot more Scottish patients receiving IVIg and at slightly higher volumes than expected compared with the UK as a whole.

Different treatments for CIDP, MMN, MG and PPN provided at The Walton Centre

Figure 2 details the treatments provided at The Walton Centre. IVIg was the mainstay of treatment for CIDP (49%), with steroids used as the most common alternative. Nonsteroid immunosuppressants were used in a minority of CIDP patients, typically when unable to reduce steroid dose and thus introduce a steroid-sparing agent. While IVIg was typically used as the only treatment, four patients were treated with IVIg and steroids. A significant proportion of patients (21%) did not receive treatment. There were 12 patients treated for MMN in 2016/17, all with IVIg as the only treatment. One patient was given a single trial dose of IVIg with a working diagnosis of MMN; however, the diagnosis was not confirmed at the time of this study. In all other cases, there was a positive response to IVIg therapy.

In MG steroids were the most common treatment modality, followed by nonsteroidal immunosuppressants (mostly azathioprine, followed by methotrexate and mycophenolate). Pyridostigmine alone was used in some cases and few patients were managed with no treatment. While IVIg is not recommended for long-term use in MG, patients refractory to steroids were treated with IVIg in the long term; however, this was a minority of patients (5%). Whilst IVIg is used in the management of some PPN patients, namely chronic ataxic neuropathy, anti-MAG neuropathy is typically refractory to treatment, although may respond to IVIg or to rituximab.[12] This was reflected in our patient set, where anti-MAG patients typically had no treatment (six no treatment, one IVIg, one rituximab), whereas all three chronic ataxic neuropathy patients were treated with IVIg.

Discussion

When going through outpatient coding to find patients with specific diagnoses, patients were occasionally misclassified. Furthermore, as G61.8 is a general classification for 'other inflammatory polyneuropathies', some patients with this code did not have CIDP, MMN or PPN. This could be checked for the coded patients at The Walton Centre when reviewing letters, but we could not check diagnoses for the IVIg database. Furthermore, patients with a working diagnosis of an inflammatory polyneuropathy are often given a trial of IVIg before the diagnosis is confirmed. Therefore, these patients are recorded in the database by their diagnosis, which may skew the data if their diagnosis is changed and no follow-up treatment is given. In addition, unscrupulous clinicians might knowingly give a false diagnosis when they wish to give IVIg for a questionable indication. There is still some bias in the outpatient coding data towards IVIg, because DGH patients requiring IVIg may be transferred to The Walton Centre, where those managing on oral therapies would remain in DGH clinics.

The audit work demonstrates adherence of The Walton Centre to national guidelines, as well as areas in which improvement was needed, and has helped us improve our service. Analysis of the IVIg national database suggested we have slightly more MG patients that are receiving substantially more IVIg compared with elsewhere, probably owing to more long-term patients. This insight has led to efforts to review long-term patients and consider alternatives, plus we have warned colleagues to avoid overuse of IVIg in this patient group. Other regions may find this kind of analysis helpful, for example Scotland could interpret the data to suggest that they are treating too many MG patients with IVIg and should have a higher threshold for deciding IVIg is required. This work shows how the national IVIg database is useful in allowing the practice of individual trusts to be compared against the wider country, although care must be taken not to misinterpret data. This paper also shows how outpatient coding, a practice at The Walton Centre that is unusual in other trusts, has been useful as a means to review practice within our organisation, and provide useful data about how these conditions are being managed in the real world – data that is otherwise very hard to obtain, often requiring the setting up of complex disease-specific registries that require active maintenance. The approach used in this paper may be of interest to those in other medical specialties who seek to assess how their hospital or department is treating disease, to ensure adherence to guidelines or to allow benchmarking against comparable teams in other areas.

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