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AUDIT

Overview and audit of a motor neuron disease (MND) consultant's practice against MND Association guidelines: suggestions for earlier diagnosis, provision of treatment, and end-of-life care

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Abstract

BACKGROUND

Motor neuron disease (MND) is an incurable neurodegenerative condition. Recent guidelines from the MND Association UK (MNDA) emphasize prompt diagnosis and monitoring of quality of life. However, primary literature indicates that diagnosis is often delayed due to several factors including unawareness of how MND presents and delays through multiple secondary referrals. Our hospital operates an internationally recognized MND clinic whose service has not been audited against the MNDA guidelines for the last 3 years.

AIM

To assess how well the MND consultant's service ensures prompt diagnosis and the provision of end-of-life care or appropriate respiratory or nutritional support.

METHODS

Using the hospital's database, records from 77 patients consulted consecutively in the MND clinic were retrospectively obtained. Service parameters were compared against reference standards for diagnostic time, provision of treatment, and end-of-life care.

RESULTS

84.4% of referrals came from neurologists outside of the MND service, with 13% from general practitioners. On average, it took 15 months for patients to be seen in the MND clinic following symptom onset. Riluzole and percutaneous endoscopic gastrostomy were prescribed faster in bulbar-onset versus limb-onset patients, by 4 times and 9 times respectively. End-of-life care discussion was recorded for 26% of patients.

CONCLUSIONS

Diagnosing MND remains challenging for primary care physicians. This may be alleviated by disseminating recent Red Flag guidelines. Investigation and provision of treatment differed between MND subtypes, given the poorer prognosis associated with bulbar-onset MND. End-of-life care documentation remains low, which is an issue for the multidisciplinary team to resolve through incorporating palliative services.

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INTRODUCTION

Motor neuron disease (MND) denotes a spectrum of neurodegenerative disorders affecting motor neurons. Nearly all cases affect both upper and lower motor neurons, termed amyotrophic lateral sclerosis (ALS).[1] Other forms of MND affect purely upper motor neurons, termed primary lateral sclerosis (PLS), or purely lower motor neurons, termed primary muscular atrophy (PMA).[1]

MND has an incidence of 1–2 in 100 000 and prevalence of 4–6 in 100 000.[1] Survival following diagnosis is, on average, 2–4 years, depending on disease subtype and site of initial presentation.[2] General practitioners may only see 1–2 cases over their entire practice.[2] However, MND entails significant social and financial difficulty for patients and their families.[2,3]

The Motor Neurone Disease Association (MNDA) UK has produced outcome standards to improve the management of this condition. The domains for these standards are summarized in **Table 1**. [4]

Table 1. Domains adapted from the MNDA Outcome Standards. [4]

Domain 1	Reducing untimely death through prompt diagnosis and management
Domain 2	Improving patients' quality of life
Domain 3	Aiding patient functionality
Domain 4	Giving patients a positive experience of their care provision
Domain 5	Ensuring patient safety through environmental adaptations

Unfortunately, MND management is curtailed, firstly, by delays in diagnosis. This leads to late presentation, which adversely affects prognosis; currently, it takes on average 10–18 months for ALS to be diagnosed from symptom onset.[5] Secondly, end-of-life care encompasses several MNDA outcome standards, but only 15% of MND patients in the UK have advanced care plans in place.[6]

Current treatments for MND include riluzole, an antiglutamatergic agent that is thought to slow disease progression, and non-invasive ventilation (NIV), which increases life expectancy by 7 months.[2] Issues with compliance and informed consent limit the use of both of these treatments in practice. This can lead to NIV being provided on an emergency basis, causing significant distress.[7] Although its benefit on survival is disputed, nutritional support such as percutaneous endoscopic gastrostomy (PEG) placement may be required in advanced disease.

Our hospital is a tertiary referral centre for MND patients. This internationally recognized service has not been audited against the MNDA UK outcome standards for the last 3 years.

Aims of audit

To compare the extent to which the MND service at our hospital complies with MNDA outcome standards. These guidelines are qualitative and help describe the optimal conditions for MND diagnosis and maintaining quality of life. This will achieved be through assessing:

- The timeframe from symptom onset to diagnosis as patients journey through the referral pathway (**Figure 1**)
- The frequency of clinical investigations in diagnosing MND
- The frequency of treatments provision in the management of MND
- End-of-life care discussion and advance care planning.

The importance of this audit lies in the fact that earlier treatment could improve quality of life. Therefore, it is important to identify barriers to prompt and early diagnosis.

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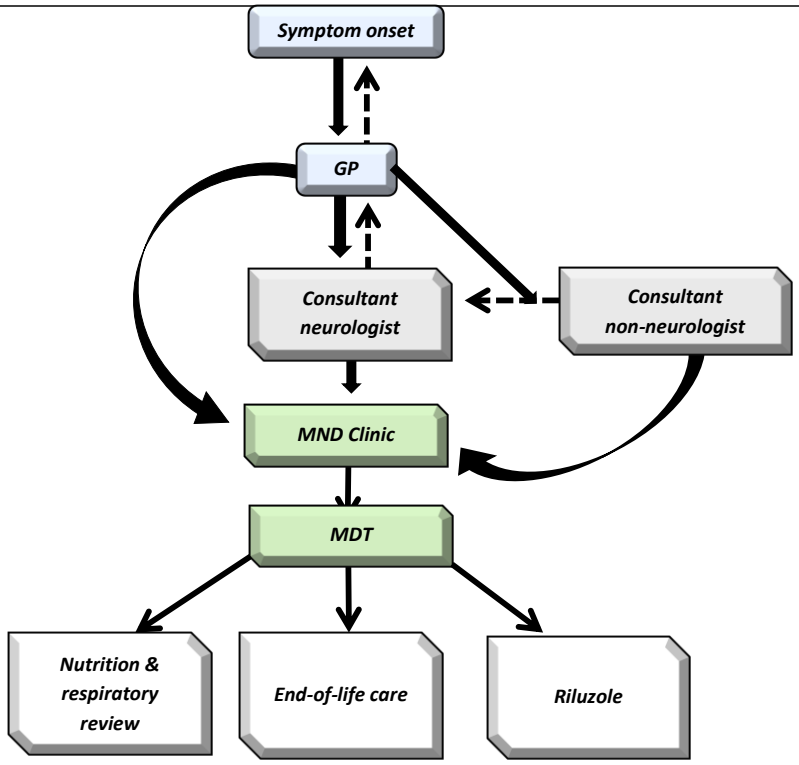

Figure 1. Expected patient journey from symptom onset to MND clinic in our hospital. Patients present with the symptoms of MND to GPs. They may encounter many other healthcare professionals in a (potentially) bidirectional manner before reaching the MND clinic and, eventually, end-of-life care provision. GP = general practitioner; MDT = multidisciplinary team.

METHODS

At the time of the audit, the consultant whose practice was assessed was one of two consultants who provides the MND service at our hospital. The MNDA guidelines were analysed by two authors and were complemented with background supporting literature on the topic. Seventy-seven online patient records were accessed via the hospital's clinical portal. All patients were diagnosed by the consultant at the MND clinic and had been reviewed consecutively over the last 3 years. Data were retrospectively collected by two authors for each individual patient's referral journey (**Figure 1**), using clinic and referral letters from their record. No exclusion criteria were applied to patient selection and patients were divided according to disease subtype. To ensure data quality, two authors simultaneously reviewed the data for each individual patient.

Data was recorded using an electronic spreadsheet. Variables included the time from onset of symptoms to diagnosis, investigations and provision of treatment, and end-of-life-care. In order to assess end-of-life care provision, formal documentation in the patients' notes was required. These variables were compared qualitatively to the MNDA outcome standards, without the use of formal statistical tests.[4] Where appropriate, standard errors were calculated for mean values. Following analysis, the authors considered potential suggestions for improving patient care, which may inform future research.

RESULTS

Of the 77 patients, 49 were male, and 28 were female, consistent with the male: female preponderance in the literature, and had an average age of 65.9 years.[1]

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At the time of analysis, 62 (81%) patients were alive and 15 (19%) were dead. The majority of patients (n = 54) had a disease duration greater than 12 months (12–24 months [n = 21] and >24 months [n = 33]). Upon stratifying patients according to MND subtype, ALS was the most common diagnosis (75%). Of these, limb-onset was the most common initial presentation (48%) (**Figure 2**). Rare variant presentations of ALS were found in 8 of the 77 patients.

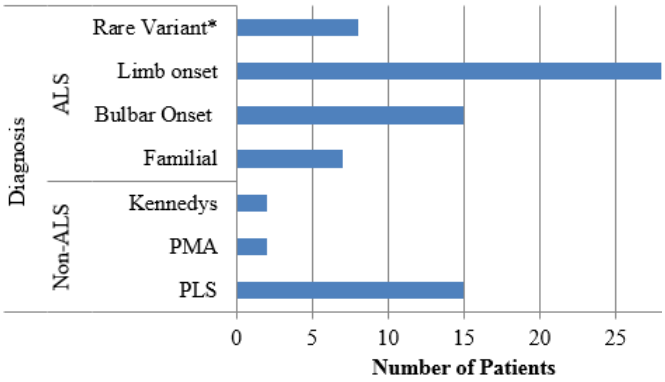

Figure 2. Primary diagnosis of MND patients in the audit dataset (n = 77). * = very slowly progressive ALS, "man-in-the-barrel" syndrome, monomelic amyotrophy; ALS = amyotrophic lateral sclerosis; PMA = progressive muscular atrophy; PLS = primary lateral sclerosis.

To understand the patient's journey, the source of their referral to the MND service was established (**Figure 3**). GPs provided 13% of direct referrals to the MND clinic. In contrast, 84% of direct referrals were made by consultant neurologists outside of the service, with 1.3% of referrals made by other multidisciplinary team (MDT) members. Following this, the relative times that patients spend at various points in their journey (**Figure 1**) prior to diagnosis was assessed (Domain 1). The median time from symptom onset to being seen by a non-specialist neurologist was 13 months, while median time from diagnostic suspicion to first presentation to the MND clinic was 2 months. The median time from symptom onset to diagnosis by the MND service was 15 months.

Investigations can aid diagnosis of MND and exclude potential mimics in order to provide prompt diagnosis (Domain 1) (**Figure 4**). Both neuroimaging, such magnetic resonance imaging (MRI), and electrophysiological techniques, such as nerve conduction studies (NCS) and electromyography (EMG), are considered key investigations in diagnosing MND. All patients received at least one of these investigations in their diagnostic work-up. However, neuroimaging was performed less often than electrophysiology. 44% patients received both brain and cervical MRI; 80% received both EMG and NCS.

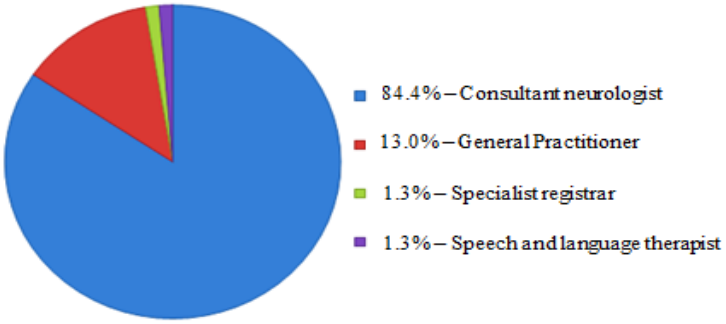

Figure 3. Source of referral to the hospital clinic. Secondary care professionals, particularly consultant neurologists, referred the greatest proportion of patients to the MND clinic.

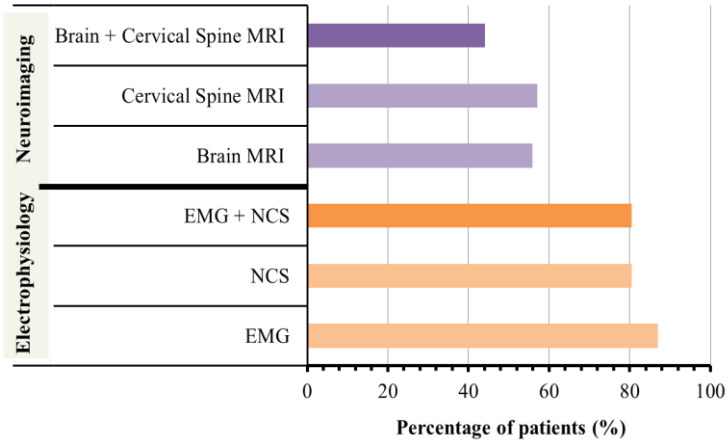

Figure 4. Provision of key investigations as part of MND assessment, as recommended by the revised El Escorial criteria.5 MRI = magnetic resonance imaging; EMG = electromyography; NCS = nerve conduction studies. Patients represented in the EMG+NCS column are also included in the individual NCS and EMG bars.

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Riluzole is the only licenced disease-modifying drug for MND in the UK, with very modest effect to prolong survival (Domains 1 and 2).[8] All ALS patients were offered riluzole treatment (**Figure 5**), although some declined to take it. Therapy was initiated four times faster in those with familial cases and bulbar-onset disease compared to those with limb-onset disease, and eleven times faster compared to rare variants.

Two other supportive measures that can increase quality and quantity of life include NIV and PEG placement (Domains 2 and 3). A greater proportion of bulbar-onset patients received NIV and PEG compared to their limb-onset counterparts (**Figure 6**). The opposite was true for the time taken to commence these interventions. Following diagnosis at the MND clinic, bulbar-onset patients commenced NIV over a month after limb-onset patients, yet were given a PEG nine times faster than limb-onset patients.

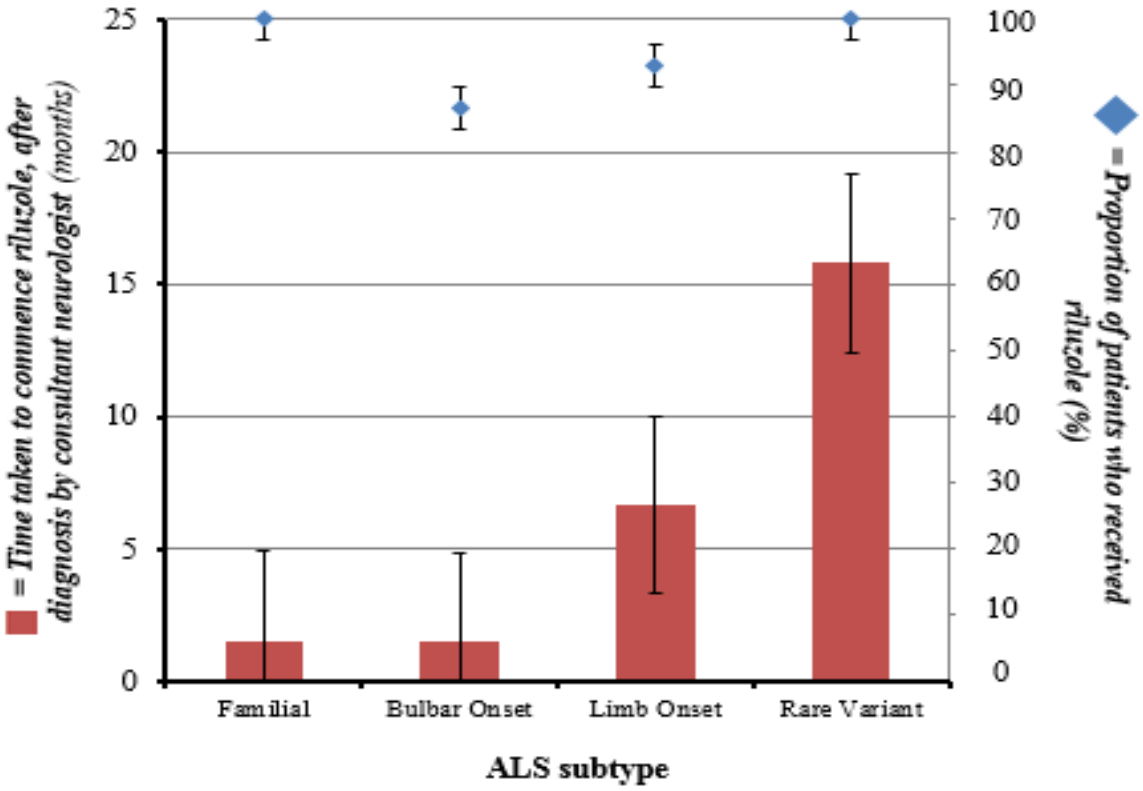

Figure 5. subtypes
where riluzole prescription is not indicated, e.g. primary lateral sclerosis.

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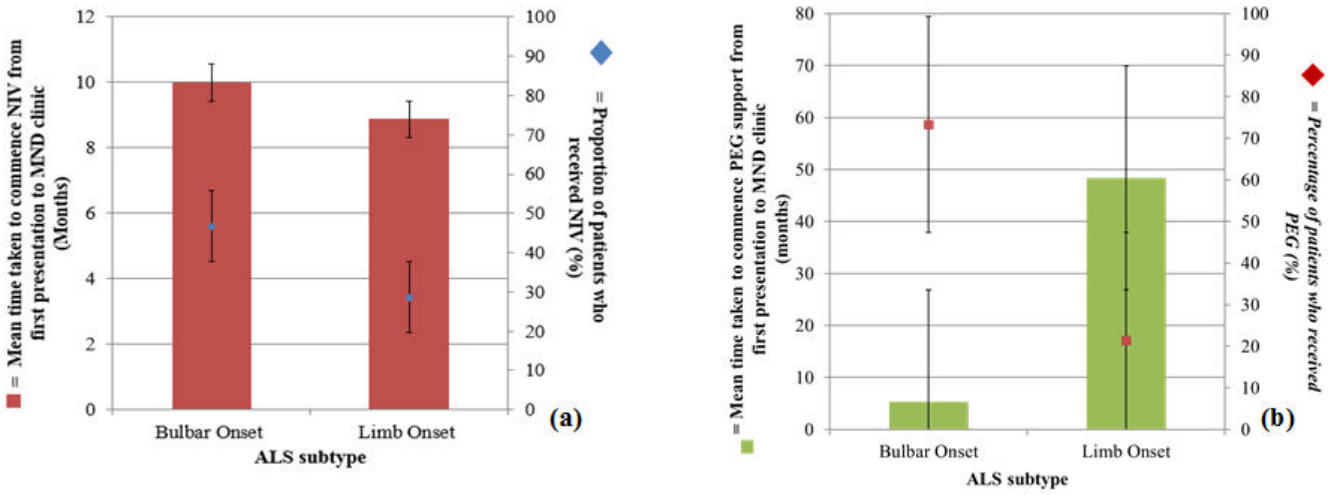

Figure 6. Percentage uptake and time taken for installation of treatment modalities for (a) non-invasive ventilation (NIV), and (b) percutaneous endoscopic gastrostomy (PEG). Bars show standard errors.

End-of-life care remains an integral part of MND management, in keeping with MNDA outcome standards (Domains 2 and 4). This involves advance care planning (ACP) and hospice referral. It has been suggested that lack of knowledge about ACP among healthcare professionals has led to its low uptake in MND patients.[6]

26% of all audited patients had recorded discussions regarding end-of-life care and its planning (**Table 2**). Similar results for advanced directive placement (24%) and referral to hospice referral (32%) were found. Bulbar-onset patients were most likely to be engaged in these discussions and to be referred to hospices. The prevalence of ACP was low in all patient groups.

Table 2. Data for end-of-life care: end-of-life discussions, use of advanced directives, and referral to hospice. Standard errors are shown for average values.

		Ever discussed?		Advanced directive		Referral to hospice	
	Diagnosis	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
ALS	Familial	17	83	17	83	20	80
	Bulbar Onset	73	27	36	64	62	38
	Limb Onset	54	46	33	67	44	56
	Rare Variant	13	88	13	88	13	88
NON-ALS	PLS	29	71	21	79	36	64
	PMA	0	100	50	50	50	50
	Kennedys	0	100	0	100	0	100
Average (%)		26 ± 10.5	74 ± 9.7	24 ± 6.3	76 ± 6.3	32 ± 8.3	68 ± 8.4

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DISCUSSION

MND is a neurodegenerative condition with high public awareness due to its devastating prognosis. Patients presenting with MND symptoms were most likely to be referred by their GP initially to non-MND-specialist neurologists. Overall, patients took a median of 15 months from symptom onset to formal diagnosis at the MND service. This is within the range reported in the literature.[5] It must be considered that potential sources of delay in this process include symptoms which are intermittent, misinterpreted, or denied by the patient and exacerbated by poor referral pathways for neurological review.[5] Early diagnosis could firstly benefit the patient, as they would be more responsive to riluzole, and secondly enhance patient management through future care planning.

Considering referrals made to the MND service, 13% came directly from GPs, with 84% from consultant neurologists outside the MND service. The MND clinic at our hospital accepts referrals from North Wales, Coventry, Warwickshire, and Greater Birmingham, providing tertiary care through a MDT. Whereas direct referral takes place from GPs in the city area to their local hospital, other areas would refer patients to their local neurologist service. Therefore, the low GP referral rates as suggested by our data reflect the existence of complex referral pathways based on geographic area, or unawareness of red flag MND symptoms. However, it is important to note that the GP's principle aim (even in this setting) is to recognize that a patient has an important neurological deficit that will require formal specialist assessment.

Suggestion: Increasing GP awareness will help identify potential cases of MND in the community that may benefit from referral. This could be through disseminating the Red Flag guidelines for MND.[9] These guidelines were created through collaboration between the Royal College of General Practitioners (RCGP) and the MNDA in 2014 in order to provide improved timely referral to neurology and, thus, aid earlier diagnosis. In addition, this optimization of the referral process to neurology could help curtail any delays in disease diagnosis.

The revised El Escorial criteria guides specialists when pursuing investigations for suspected MND cases.[5] Investigations function to both confirm diagnosis of acute and chronic motor nerve degeneration and exclude differentials, such as vitamin B12 deficiency and multifocal motor neuropathy. Current investigations of choice include EMG and NCS, as well as neuroimaging (CT/MRI).[5] Electrophysiology can demonstrate key hallmarks of MND (e.g. polyphasic motor units, fasciculations), while neuroimaging can exclude differentials such as cervical cord compression. Patients were more likely to have electrophysiological studies rather than neuroimaging.

Suggestion: Possible implementation of a "checklist" in line with the revised El Escorial Criteria documenting all investigations that should be undertaken for that patient in the assessment of MND (e.g. excluding differential diagnoses). In future audits of the service, we would hope that 90% of diagnosed MND patients will have received both electrophysiological studies.

While disease modifying drugs remain elusive, the antiglutamatergic riluzole extends life for 3 months if taken for 18 months.[8] In this audit, the time to riluzole prescription depended heavily on ALS subtype, with familial and bulbar-onset subtypes commencing treatment earlier.

As an MND complication, respiratory failure manifests as nocturnal hypoventilation and is a common cause of death.[7] NIV is known to extend life expectancy in MND patients and was used most in limb- and bulbar-onset patients. However, uptake of NIV remains low in the UK.[7] Although a higher proportion of the bulbar-onset group received this intervention, we were surprised that they did so later than patients with limb-onset disease.

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To counter the dysphagia associated with MND, measures such as thickening fluids suffice in early disease, but malnutrition and weight loss later in disease are associated with poor survival.[8] Hence, PEG feeding may be required. As we expected, bulbar-onset patients had gastrostomy feeding nine times quicker than limb-onset patients.

Suggestion: Assess patient suitability/concordance with prescribed interventions at each visit to the MND clinic. If suitable for NIV, uptake could be improved by a one-off, practical education session to alleviate fears and misconceptions surrounding their usage.[7] Likewise, regular nutritional assessment through established systems, e.g. the Malnutrition Universal Screening Tool (MUST)[10] to assess suitability for PEG could help with appropriate future uptake.

While maximizing quality of life is an important consideration for all patients, MND is a progressive illness which will eventually require end-of-life care provision. This would fulfil domains 2 and 4 of the MNDA outcome standards by treating the patient with dignity and maintaining quality of life. Of audited patients, 26% had documented discussions of end-of-life care, which could affect referral to hospices and recordings of advanced directives. It has been suggested that lack of knowledge of ACP among healthcare professionals has led to low uptake in MND patients.[6] However, the MND service at the hospital exceeds the national average with regards to ACP provision, at 24% versus 16%.

Suggestion: To fully utilize the palliative care consultant (part of the MDT team) in order to increase referrals to hospices and recording of ACPs. According to the MNDA's all-party parliamentary group enquiry, primary care providers should have MND-specific referral pathways to palliative care at diagnosis.[11] It is important to acknowledge that these discussions should occur sensitively at an appropriate time in the disease's natural history and according to patient preference.

Future directions

- Further research is needed to explore if patients experienced any delays being diagnosed and in receiving investigations.
- To investigate the overall patient satisfaction with the MND service, in order to assess service provision and functionality.
- Explore patients' views regarding the routine use of PEG and NIV and how best to implement these in the clinical setting.
- To qualitatively identify both physician- and patient-associated barriers to advance directive placement and referral to hospice.
- Future MNDA outcome standards should provide clinicians with quantitative guidance in order to optimize care provision.

CONCLUSION

As an incurable neurodegenerative condition, diagnosing MND remains challenging for clinicians, particularly GPs. This may be alleviated by disseminating recent Red Flag guidelines. Despite appropriate investigations and treatment provision, differences in uptake were noted across MND subtypes in this audit. The implementation of an MND checklist could function to inform patients and clinicians of a patient's ongoing care needs. Barriers to end-of-life care discussion are known in MND. In this audit, documentation of these discussions was low, which is an issue for the MDT to resolve through the earlier engagement of palliative services. By implementing our suggestions, we hope that a future re-audit will demonstrate greater adherence to the MNDA outcome standards, in the hope that this will improve patient quality of life and experience of their care.

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Strengths	Limitations
• This audit explores the management of a highly debilitating neurodegenerative condition. • We have audited an internationally recognized, tertiary service which has not been audited against MNDA UK outcome standards for the last 3 years. • Through assessing multiple variables, we have encompassed multiple MNDA standard domains. Furthermore, we have analysed patients according to disease subtype. • We have highlighted how end-of-life care discussions remain a complex area for patients and clinicians to engage in.	• Qualitative data, such as patient satisfaction questionnaires, may have offered a better understanding of the service and whether key parts of the MNDA outcomes were being satisfied. • Retrospective analysis: our data relied on the quality of recorded notes and note taking. To remedy this, a prospective approach to patient care would have allowed us to better understand the patient's journey. • The MNDA outcome standards, while offering a key framework for MND, provide few statistics or quantitative targets. Instead, they offer an outline that any MND service should hope to provide. • Data presented here reflects only one consultant's practice at one centre and may vary from between consultants and centres.

What is known about the topic	What our audit highlights
• MND is a spectrum of conditions, with subtypes that alter patient outcomes to different extents. • Delays in diagnosis curtail MND management and worsen the disease's prognosis. • Investigations of choice are electrophysiology and neuroimaging. These function to diagnose MND and exclude possible mimics. • Treatment modalities, such as NIV and riluzole, only offer modest survival benefits; the latter being specific to the ALS subtypes. • End-of-life care is a challenge for MND, with low national uptake of advance care planning.	• Diagnosing MND remains a challenge for GPs, which could be alleviated by greater awareness of red flag symptoms. • Awareness of the El Escorial criteria through the implementation of a "checklist" would enable a full diagnostic work-up. • NIV uptake is low among ALS subtypes. This could be improved via a one-off, practical education session for NIV to remove barriers to its use. • Documentation of end-of-life care remains suboptimal. Early discussions and the involvement of palliative care services may help increase discussions surrounding advance care planning and referral to hospice. This would satisfy Domain 2 of the MNDA outcome standards.

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Competing Interest and Funding

Nothing to declare

Keywords

Nervous system disease; Motor Neurone Disease; Amyotrophic Lateral Sclerosis; Anterior Horn Cell Disease

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