Respiratory complications are one of the most common causes of death in MS. In one large study, respiratory complications accounted for approximately 47% of all deaths in MS patients (1).

Between 2016 and 2019 in the CCGs of the areas studied the average cost of non elective admissions for respiratory problems in pwMS was £216,000. Of this, the highest ranking cost was for admissions with pneumonitis due to aspiration of food and vomit, which was £75,000.

It has been shown that there is an insidious decline of respiratory function in people with multiple sclerosis (pwMS) from diagnosis (2). Pulmonary function is affected even at the level of early disability in MS patients, and muscles that provide core stabilization are affected. It is seen that decreasing core stabilizer muscle strength in MS patients causes impaired pulmonary function, HRQOL, functional level and increasing fatigue levels (7).

Respiratory impairment in neuromuscular or infectious disorders such as MS includes difficulty in ventilation due to inspiratory muscle weakness, difficulty in coughing due to weakness of the expiratory muscles, upper-airway (glottic) muscles, and inspiratory muscles risk of aspiration of fluids due to upper-airway muscle weakness (3). Hence it is important that lung health is maintained and monitored throughout the course of the disease (9).

Expiratory muscle weakness has been shown to be the main issue and there is a sharper decline when people stop walking and this can lead to a weak cough (1).

Currently, respiratory function of people with MS in the clinical setting is generally not routinely monitored with any definitive outcome measures. There is limited data as to what happens to respiratory function with pwMS throughout the course of their disease.

NICe guidelines state that respiratory function should be assessed as part of the annual review and tailored to the needs of the individual, referring on to appropriate services if needed (12).

A universal finding of all studies is decreased indices of maximal inspiratory pressure (MIP), and the maximal expiratory pressure (MEP) in MS (1). The MIP reflects the strength of the diaphragm and other inspiratory muscles, while the MEP reflects the strength of the abdominal muscles and other expiratory muscles (4). Peak cough flow (PCF) is considered an acceptable alternative to measuring MEP in assessing expiratory muscle weakness in pwMS (5). If insufficient pre-cough volume is obtained due to inspiratory muscle weakness, cough capacity decreases in spite of functional expiratory muscles. Both MIP and MEP showed significant correlations with PCF (6).

Peak cough flow (PCF) is a simple and inexpensive way of monitoring a person’s cough strength. A PCF above 350 is considered normal, below 270 there is a need for increased monitoring and intervention to assist with airway clearance e.g breathing exercises, lung volume recruitment, increased activity, improved posture and below 160 additional intervention/ onward referral is needed to assist airway airway clearance e.g assessment for a cough assist (10).

The goal is to identify respiratory issues of pwMS early so there can be early and appropriate intervention.

This poster looks at a respiratory pathway for pwMS. It was developed with consideration of the above research and advice from the Southampton specialist respiratory service. The pathway looks at issues someone with MS might have at each stage of their condition, what assessment would be optimal and where this should take place. Also some suggested interventions are discussed. Considerations are noted which then informed the questions we asked our participants in the test study which relate to the risk factors. (See adjoining post)

<table>
<thead>
<tr>
<th>STAGE OF MS</th>
<th>ASSESSMENT</th>
<th>RESPIRATORY PATHWAY FOR pwMS</th>
<th>INTERVENTION</th>
<th>CONSIDERATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early 4-EDS 0-5</td>
<td>Initial Assessment on diagnosis or transfer to service. Where: Annual assessment thereafter in clinic or at home. If person takes a DMO, to be screened in neurology clinics.</td>
<td>Discussion re healthy living, smoking cessation, diet, keeping fit/ aerobic exercise activities. Core stability exercises eg Pilates/ yoga. With increasing disability may require more specific intervention eg teaching correct breathing pattern, breathing exercises, core stability exercises.</td>
<td>Arm and sitting balance exercises. Standing frame if appropriate. May need referral to specialist respiratory service if Peak cough &lt;270 for assessment with Lung Volume Recruitment (LVR) bag or &lt;160 for a cough assist assessment.</td>
<td>Co-morbidities eg asthma, COPD, back, abdominal or thoracic pain, obesity or smoker.</td>
</tr>
<tr>
<td>MID-EDS 5-5.7</td>
<td>With increasing EDSS the person may become more sedentary. They may have reduced core stability and balance, static and pain which may alter pattern of breathing and posture.</td>
<td>Where: 3/6/12 monthly assessment at home or in clinic dependant on issues.</td>
<td>Where: 3/6/12 monthly assessment at clinic or home.</td>
<td>Co-morbidities plus any medication which may reduce respiratory drive eg opiates, Gabapentin in higher doses and especially if taken in combination.</td>
</tr>
<tr>
<td>Late EDSS 7.5-9.9/ Palliative</td>
<td>People may have issues with fatigue and posture. Likely to be sat most of the time so at risk of reduced aerobic fitness++, reduced or poor sitting balance. May have volatile issues, reduced or absent upper limb function, poor or absent active cough. As MS becomes more advanced person may develop swallowing management issues, increasing swallow issues. At risk of aspiration and infection.</td>
<td>Assess glottis closure by asking person to repeat an “E” several times, if weak cough volume is obtained due to inspiratory muscle weakness, cough capacity decreases in spite of functional expiratory muscles. Where: Where swallowing issues (before referral to specialist swallowing assessment).</td>
<td>Where: Swallow issues. Monitor issues also with self referral to specialist swallowing assessment.</td>
<td>If has intrathoracic bactefin (ITB) pump possibly more at risk.</td>
</tr>
</tbody>
</table>

References