Are Your Patients Breathing **Comfortably?**

A test study to assess trends in risk factors of disease process, medication, co-morbidities and lifestyle contributing to low Peak cough flow values in people with Multiple Sclerosis.

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Therapists in ms

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The aim of the study

Was to get a snap shot of pwMS, their lifestyles, disease process and co-morbidities alongside peak cough flow (PCF) values for pwMS of different EDSS values. The study looked at potential trends as to what might be risk factors contributing to a low PCF and hence who might be at increased risk. The idea of the small study was to help inform what data is important to collect.

The plan is to carry out a much larger multicentre monitoring study in the future to identify any trends in PCF in pwMS throughout the course of their disease.

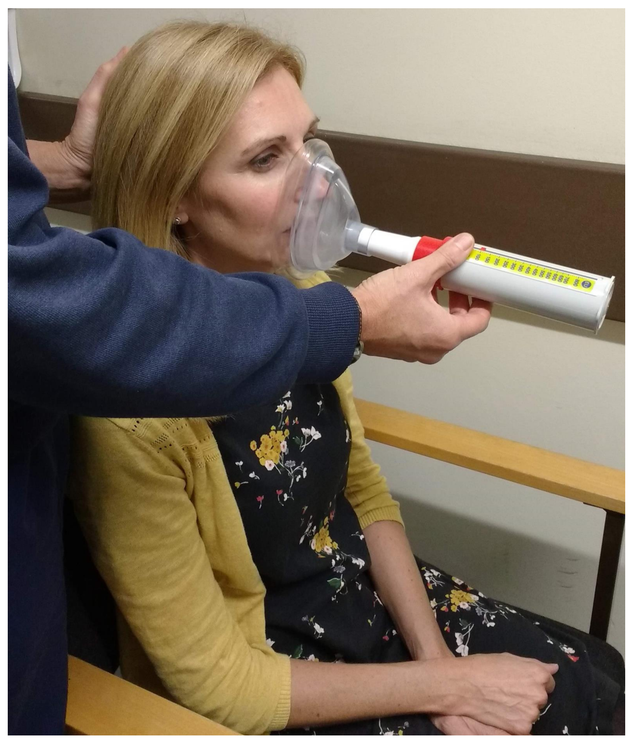
Methodology

- The study lasted approximately 1-2 months and the aim was to collect data **f**rom **3 centres** (2 NHS centres – community and clinic, 1 charitable MS therapy centre) and from **3 different EDSS groups**: EDSS 0-5, EDSS 5.5-7, EDSS 7.5-9.5. 16 subjects in each group.

- A **questionnaire** regarding demographics, lifestyle and medical history was completed with each person and the best of 3 PCF values was obtained. Subsequent interventions were also recorded.

- The questions asked concerned:
  Demographics - age, gender, height and weight,
  Lifestyle- work status, smoking status, their level of activity,
  Disease process- what type and how long they had had MS, any medical issues/ co-morbidities eg asthma, COPD, high blood pressure, obesity, cardiac illness, diabetes. Information regarding any hospital admissions for respiratory problems, what medication they take, their level of disability, any swallowing issues and whether they had an intrathecal baclofen pump.

- **Interventions/ treatment** were also recorded. eg breathing exercises, aerobic exercises, core stability exercises, sitting balance exercises, standing balance exercises or standing frame exercises, posture management, arm exercises, referral for swallow assessment, specialist respiratory referral etc.



<u>When assessing the Peak cough</u>:

1. Sit as upright as possible ideally in a chair.
2. Explain what you are asking them to do.
3. Ask them to place the mask, with the peak flow metre attached, over their nose and mouth (or you assist them) and you hold firmly in place.
4. Ask them to cough into the mask*.
5. Repeat this 3 times and take the BEST value as their score.
6. Record value.
7. Watch for signs of respiratory distress and stop testing if necessary.

*a mask and not a cardboard tube was used for the PCF test as it is difficult to obtain a good cough with a tube (as mouth seal not as good)

Results and discussion

Age and Time since diagnosis

As EDSS increased, the average age was higher and there was longer time since diagnosis. There were more people with progressive disease with higher EDSS.

Co-morbidities

With increasing EDSS, there was also an increase in co-morbidities e.g Asthma, scoliosis, cardiac disease, diabetes.

Obesity:

- There were fairly equal numbers of people who were of normal weight, overweight or obese in each EDSS group.
- 5.5-7 EDSS group- 2 of the low PCF values (160-270) were obese,
- 0-5 EDSS group- 1 person with low PCF value (220) was obese (may show a possible risk factor of low PCF value when considering overweight and obese people with lower EDSS).

Pain:

- People experiencing a lot of pain in both the abdomen and back area also had low PCF values. One also had a high EDSS (8.5) (PCF 130) so there may have been other factors contributing to the low PCF value but the other only had an EDSS of 6 (PCF 210) was fairly active with no other risk factors.

Disease process

- The people with lower EDSS scores generally had much better PCF values and the lower readings were the exception in this group rather than the rule. They were on average a little younger, had been diagnosed with MS for less time, were more active and more were in employment. More were of normal weight, took few medications and fewer had swallow issues.
- The person with the highest PCF (510) was someone who had been diagnosed the most recently, had one of the lowest EDSS scores and with no other potential risk factors eg with regards weight, medication, activity, swallowing.

Medication

- People with higher EDSS were often on more medication to control symptoms and higher doses of those medications e.g Gabapentin.
- The most common drugs people were on included Gabapentin, antispasmodics e.g Baclofen and opioids all which can result in respiratory depression in higher doses.
- The person with the lowest PCF in the mid EDSS group, had the highest dose of gabapentin.

Lifestyle

Employment

0-5 EDSS : majority were employed. 7.5-9.5 EDSS: majority were not employed. (could be due to higher average age or disability)
5.5-7 EDSS: those in employment generally had a higher PCF. (the highest value was with a person with a physical job, sung and did yoga).

Smoking Only 5/48 in study smoked. 4 of those were in the 0-5 EDSS group. 3 were heavy smokers and had lower than normal PCF values- 130, 290, 300. scores There were no other potential risk factors in these subjects and hence might indicate a risk factor for low PCF even in the active person. In the 7.5-9.5 EDDSS group- no smokers

Level of activity

- The greater the EDSS, the more sedentary the person.
- The 7.5-9.5 EDSS group were predictably the least active.
- The least active person in the mid EDSS group had the lowest PCF value but also had the highest dose of Gabapentin (3200mg).

The people in the high EDSS group who had better PCF values (although lower than normal PCF values) were those with standing programmes, better postural management, were more active e.g. self propelling their wheelchair.
The SUMS randomised control trial which looked at home based standing frame therapy by Freeman and Hendrie et al 2019 supports this.(11)
It was interesting to note that a significant number of people in the high EDSS group were attending the MS therapy centre regularly for physiotherapy including standing programmes. This may account in part why there were so few respiratory related admissions in this group from the MS centre.

Reduced upper limb function

- There was a trend in the results showing that the less upper limb function a person had, the lower the PCF.
- The person with a PCF of 0 was in bed all of the time and had no upper limb function, the next lowest scores < (100) had limited or no upper limb function.
- Smeltzer et al 1988 (8) supports these findings in that there is generally normal spirometry in ambulatory pwMS but wheelchair dependant pwMS with reduced upper limb function had reduced spirometry and bed ridden pwMS had significantly lower spirometry. Spirometry declined with increasing EDSS and expiratory muscle weakness occurred the most often.

Swallow issues

- There were swallow issues in all EDSS groups.
- It was interesting to note that a significant number of people in the 0-5 EDSS group had some swallow issues.
- Swallow issues put pwMS more at risk of aspiration.
- The swallow was more compromised especially in the 7.5-9.5 EDSS group.
- The people with the lowest PCF values also had the greater swallow problems.
- The highest PCF scores were with people with no swallow issues.

Respiratory admissions

- Non elective admissions for respiratory problems in pwMS in the CCGs of the areas studied here averaged **£216,000** per annum between 2016 and 2019.
- Of this the highest ranking cost was for admissions with pneumonitis due to aspiration of food and vomit which average **£75,000** per annum between 2016 and 2019
- PCF values dropped off significantly in the 7.5-9.5 EDSS group.
- All the people who had admissions for respiratory issues were in the 7.5-9.5 EDSS group. This is likely to be linked to reduced aerobic fitness due to inactivity, poor sitting balance and core stability, reduced arm function, possible respiratory depression from medication, increased risk of aspiration and hence reduced ability to cough and clear secretions demonstrated by low PCF values.

Conclusion

- Respiratory complications are one of the most common causes of death in MS
- Non elective admissions for respiratory problems in pwMS in the CCGs of the areas studied here averaged £216,000 per annum between 2016 and 2019
- Research shows there is an insidious decline of respiratory function in pwMS from diagnosis and expiratory muscle weakness is the main issue showing a sharper decline when people stop walking which can lead to a weak cough.
- **PCF is an inexpensive and easy way of monitoring respiratory function and easy to implement.**
- This study shows trends of some of the risk factors leading to lower PCF values. A larger multicentre monitoring study will better indicate risks which can then provide supporting evidence to improve access to appropriate respiratory services for people with MS to help prevent complications.