

Provision of home mechanical ventilation and sleep services for England survey

Abstract The Department of Health is promoting the generation of specialist networks to manage long term ventilatory weaning and domiciliary non-invasive ventilation patients. Currently the availability of these services in England is not known. We performed a short survey to establish the prevalence of sleep and ventilation diagnostic and treatment services. The survey focussed on diagnostic services and Home Mechanical Ventilation (HMV) provision, and was divided into (a) availability of diagnostics, (b) funding, and (c) patient groups. This survey has confirmed that the majority of Home Mechanical Ventilation set-ups are currently for Obesity Related Respiratory Failure and Chronic Obstructive Pulmonary Disease. We have found that there is variable provision of diagnostic services, with the majority of units offering overnight oximetry (95%) but only 55% of responders providing a home mechanical ventilation service. Even more interestingly, less than two thirds of units charged their primary care trust for this service. These data may assist in the development of regional networks and specialist home mechanical ventilation centres.

INTRODUCTION

In England, there is no national registry for diagnostic services and home mechanical ventilation provision,¹ which is in contrast to other European countries and Australasia.^{2,3} In line with the strategy of the NHS Commissioning Board to implement specialist commissioning for *Complex Home Ventilation Centres* and the requirement for accompanying regional networks providing local support,⁴ we performed a prevalence survey to determine the current available infrastructure for such services.

METHOD

We developed a 10-item survey, which was delivered by email to NHS Hospitals

across England. The survey focussed on diagnostic services and home ventilation provision. It was divided into (A) availability of diagnostics, diagnostic setting and test interpretation (B) funding and (C) patient groups (see online supplementary Survey Questionnaire figure E1).

RESULTS

One hundred and eleven NHS hospitals were contacted and 76 (68%) responses were received. Forty-two (55%) trusts reported the provision of a HMV service.

Availability of diagnostics, diagnostic setting and test interpretation

Although 95% of respondents had access to overnight oximetry, overnight capnometry, which is required to assess the efficacy of nocturnal non-invasive ventilation, was available in only 44% of units. Furthermore, complex sleep diagnostics, including electroencephalography, electromyography and complete respiratory polygraphy, was available in only 17% of units. Of those units that offered capnometry, limited respiratory polygraphy, overnight oximetry and autotitrating continuous positive airway pressure diagnostics, these were performed as an inpatient supervised service in 68%, 38%, 12% and 10% of units, respectively. With the exception of units providing extended polysomnography, only 24% of hospitals had more than one clinician reporting the studies (see online supplementary table E1).

Funding

Primary care trusts were charged by 85% of units performing extended polysomnography, 65% performing respiratory polygraphy, 57% performing overnight oximetry and 31% of units performing capnometry. Only 65% of units charged for the delivery of a home mechanical ventilation service with 12% of these services commissioned by an external provider. Median set-up frequency for the units charging was 42 patients per annum (IQR 23–73), whereas those units that failed to charge had a median annual set up only 11 (IQR 4–22).

Patient groups

Of all the HMV set-ups, 67% were for obesity-related respiratory failure and chronic obstructive pulmonary disease with the other restrictive lung conditions contributing the remainder (table 1). Clinicians reported a minimum acceptable level of adherence with HMV across all diagnostic groups as 6 h, although the range was variable (table 1).

DISCUSSION

There is a wide variation in the provision of diagnostic services and home ventilation provision across NHS hospitals in England. While some centres have access to complex inpatient overnight physiological monitoring, the majority do not. Furthermore, the low volume units do not have a reimbursement mechanism in place, which in the current financial climate is unlikely to be sustainable. The survey has confirmed that the majority of home ventilation set-ups are currently for obesity and chronic obstructive pulmonary disease, which is not unsurprising as complex neurological and other conditions are generally managed in the small number of specialist weaning, rehabilitation and home ventilation centres.⁵ There are significant limitations in the current service in England and the drive for specialist commissioning for *Complex Home Ventilation Centres* is welcomed. The introduction of a national registry with standardisation of diagnostic and treatment pathways will provide the clinical governance structure that has been lacking which will allow the delivery of high quality specialist respiratory care. The major goal will be to integrate the tertiary and secondary care centres to develop a clinical network to ensure equitable access to best care for all patients.

S Mandal,^{1,2} E Suh,^{1,2} M Davies,³ I Smith,³ T M Maher,^{4,5} M W Elliott,^{5,6,7} A C Davidson,¹ N Hart^{1,2,5,7}

¹Lane Fox Respiratory Unit, Guy's and St Thomas' NHS Foundation Trust, London, UK

²Division of Asthma, Allergy and Lung Biology, King's College London, London, UK

³Sleep and Ventilation Unit, Papworth Hospital, Cambridge, UK

⁴Department of Respiratory Medicine, Royal Brompton Hospital, London, UK

⁵NHS Commissioning Board Clinical Reference Group for Specialist Respiratory Services, UK

⁶Department of Respiratory Medicine, St James's University Hospital, Leeds, UK

⁷Home Mechanical Ventilation, UK

Correspondence to Dr N Hart, Lane Fox Respiratory Unit, Guy's and St Thomas' NHS Foundation Trust, St Thomas' Hospital, Westminster Bridge Road, London SE1 7EH, UK; nicholas.hart@gstt.nhs.uk

Contributors SM, ES, ACD and NH were involved with developing the survey, data collection analysis and

Table 1 Annual set-up of HMV and minimal acceptable level of adherence

| Disease category | Set-ups per annum | Minimum acceptable level of adherence (h/night) |
|---------------------------------------|-------------------|---|
| Obesity related respiratory failure | 7 (2–20) | 6 (5–6) |
| Chronic obstructive pulmonary disease | 5 (2–11) | 6 (4.25–6) |
| Neuromuscular disease | 4 (1–10) | 6 (6–8) |
| Chest wall disease | 2 (0–5) | 6 (6–8) |

Data are presented as median and IQR.

manuscript preparation. MD, IS and MWE were involved with manuscript preparation.

Competing interests None.

Provenance and peer review Not commissioned; internally peer reviewed.

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/thoraxjnl-2013-203566>).

To cite Mandal S, Suh E, Davies M, *et al.* *Thorax* 2013;**68**:880–881.

Received 14 March 2013
Accepted 20 March 2013
Published Online First 20 April 2013
Thorax 2013;**68**:880–881.
doi:10.1136/thoraxjnl-2013-203566

REFERENCES

- 1 Wise MP, Hart N, Davidson C, *et al.* Home mechanical ventilation. *BMJ* 2011;**342**:d1687.
- 2 Lloyd-Owen SJ, Donaldson GC, Ambrosino N, *et al.* Patterns of home mechanical ventilation use in

Europe: results from the Eurovent survey. *Eur Respir J* 2005;**25**:1025–31.

- 3 Garner DJ, Berlowitz DJ, Douglas J, *et al.* Home mechanical ventilation in Australia and New Zealand. *Eur Respir J* 2013;**41**:39–45.
- 4 NHS Commissioning Board Complex Home Ventilation (draft document). 2012–2013.
- 5 Murphy P, Hart N. Who benefits from home mechanical ventilation? *Clin Med* 2009;**9**:160–3.

We would be very grateful if you could complete this survey regarding sleep and ventilation service provision. It should only take 10 minutes. Thank you.

***1. Please state your institution.**

***2. Does your unit initiate patients with chronic hypercapnic respiratory failure on domiciliary non-invasive ventilation?**

- Yes
 No

Other (please specify)

***3. Which of the following equipment for the assessment and diagnosis of sleep disordered breathing do you have access to in your unit?**

| | Yes | No | Don't know | Not applicable |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| Full polysomnography | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Respiratory sleep study e.g Embletta, Alice | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Overnight Oximetry | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Transcutaneous capnography | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| CPAP autotitration | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Other (please specify)

4. If you do not have access to all of the above, please state to whom patients are referred and which patient groups are referred.

***5. Do you admit patients to perform the following?**

| | Yes | No | Unsure | Not applicable |
|--------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Respiratory sleep study | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Overnight oximetry | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Overnight transcutaneous capnography | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| CPAP autotitration | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Other (please specify)

***6. Who reports your monitoring/diagnostic studies?**

| | Doctor | Nurse | Technician | External company | Not Applicable |
|--------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Full polysomnography | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Respiratory sleep study | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Overnight oximetry | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Overnight transcutaneous capnography | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| CPAP autotitration | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Other (please specify)

7. Who advises patients regarding the following:

| | Doctor | Nurse | HCA | Technician | Ventilator provider | Don't know | Not applicable |
|------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Mask issues | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Ventilator faults | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Ventilator maintenance | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Other (please specify)

***8. Does your hospital specifically charge the PCT for the following services?**

| | Yes | No | Unsure | Not applicable |
|--------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Fully polysomnography | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Respiratory sleep study | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Overnight oximetry | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Overnight transcutaneous capnography | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Domiciliary non-invasive ventilation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Other (please specify)

***9. Please estimate the number of the following groups of patients initiated on domiciliary non-invasive ventilation per annum.**

| | |
|---------------------------------------|----------------------|
| Obesity related respiratory failure | <input type="text"/> |
| Chronic obstructive pulmonary disease | <input type="text"/> |
| Neuromuscular weakness | <input type="text"/> |
| Restrictive chest wall defect | <input type="text"/> |

***10. Please provide an estimate of what you feel is an appropriate level of concordance with nocturnal ventilation (hours per night) for each of the following patient groups.**

| | |
|---------------------------------------|----------------------|
| Obesity related respiratory failure | <input type="text"/> |
| Chronic obstructive pulmonary disease | <input type="text"/> |
| Neuromuscular weakness | <input type="text"/> |
| Restrictive chest wall defect | <input type="text"/> |

| | Reporting | | | | | Troubleshooting measures | | |
|-------------------|-----------|-----|----------|------------|-----------|--------------------------|-------------------|------------------------|
| | PSG | RP | Oximetry | Capnometry | Auto-CPAP | Mask Issues | Ventilator Faults | Ventilator Maintenance |
| Doctor | 77% | 79% | 78% | 88% | 41% | 29% | 17% | 9% |
| Nurse | 0% | 5% | 8% | 15% | 25% | 47% | 35% | 27% |
| Technician | 85% | 39% | 22% | 21% | 50% | 55% | 51% | 52% |
| HCA | 0% | 0% | 0% | 0% | 0% | 4% | 1% | 3% |
| Company | 0% | 0% | 0% | 0% | 0% | 5% | 10% | 12% |
| Other | 0% | 2% | 0% | 0% | 3% | 3% | 1% | 0% |

Table E1: Staff involved in reporting diagnostic studies managing clinical issues. All values are expressed as a %.

*Abbreviations: HCA =Health Care Assistant PSG =Polysomnography ; RP = Respiratory Polygraphy
CPAP = Continuous Positive Airway Pressure; Auto-CPAP = Auto Continuous Positive Airway Pressure*