Validation of two activity monitors in patients with COPD

Physical activity in daily life is increasingly used as an outcome measure in chronic respiratory disease. Valid and user-friendly instruments are needed to quantify daily activity. The DynaPort activity monitor (McRoberts, The Hague, The Netherlands) has been validated and used in patients with chronic obstructive pulmonary disease (COPD). The device is, however, technically difficult to handle and, due to its size (12.5 x 9.5 x 3 cm, 575 g), it is always noticeable. We therefore validated two smaller activity monitors in a sample of 10 patients with COPD (mean (SD) forced expiratory volume in 1 s (FEV1) 1.49 (16)% predicted; mean (SD) age 65 (8) years) and 10 healthy elderly volunteers (mean (SD) age 65 (9) years). Detailed characteristics of the study subjects are summarised in table 1 in the online supplement.

All patients simultaneously wore the DynaPort, the SenseWear Pro (SenseWear, BodyMedia, Pittsburgh, USA) activity monitor (8.5 x 5.0 x 1.5 cm, 85 g), the DynaPort Minimod (Minimod, McRoberts, The Hague, The Netherlands) activity monitor (8.5 x 5.0 x 1.0 cm, 70 g) and a portable metabolic system (Vmax51, 1.0, Viasys, MEDA, Belgium) during a 53 min protocol including different postures and activities (see table 2 in online supplement for a detailed description of the protocol). In a first analysis the accuracy of the Minimod and DynaPort to detect time spent in walking and time spent in different postures was validated against video analysis; the step count of the three activity monitors was then validated against manual step counting and, finally, estimates of energy expenditure from both the Minimod and the SenseWear were validated against indirect calorimetry. Additional information on material and methods is available in the online supplement.

The Minimod was as accurate as the previously validated DynaPort in detecting time spent in different postures and in walking (see table 3 in online supplement). During the protocol, a mean (SD) of 153 (6) MET-min; 717 (213) kcal was measured with the DynaPort, the SenseWear, and the Minimod. No significant differences were found between energy expenditure estimates from indirect calorimetry (mean (SD) 144 (5) metabolic equivalents (MET)-min), the Minimod (mean (SD) 153 (6) MET-min; +6%) and the SenseWear (mean (SD) 139 (6) MET-min; −4%). Correlations and agreement between energy expenditure estimates from activity monitors and indirect calorimetry are shown in figs 1 and 2 in the online supplement.

Of particular interest for physical activity intervention studies is the ability of devices to detect minutes of moderate intense physical activity (≥3 METs). Important health benefits have been described mainly for activities that are performed at moderate intensity (≥3 METs). No significant differences between the SenseWear and the Minimod were found for the ability to detect minutes spent sedentary (<3 METs) (84 (11)% agreement vs 84 (7)% agreement with minutes classified as sedentary by indirect calorimetry). The SenseWear, however, detected significantly more minutes of moderate intense physical activity than the Minimod (80 (11)% vs 70 (15)% agreement with minutes classified as moderately intense activity by indirect calorimetry; p = 0.05).

We conclude that the SenseWear and the Minimod provide complementary information on habitual physical activity and could be useful both as outcome measures and for self-monitoring of daily activities in physical activity intervention studies in COPD. The Minimod is a very accurate instrument for detecting postures, walking and steps. The SenseWear does not provide information on time spent in postures and walking, and step counts are not accurate. It was, however, the
Epoprostenol use in a National Pulmonary Hypertension Centre from 1997 to 2007

The cost-effectiveness of prostanoids in pulmonary arterial hypertension (PAH) has recently been called into question by the National Institute for Health and Clinical Excellence (NICE), and the possibility exists that this treatment would not be recommended by this body. This would be the first time that a treatment already in routine clinical practice would be withdrawn as a result of NICE recommendations. Guidelines published by the UK, European and US authorities still advocate prostanoid use in certain patient groups. Of the disease-targeted therapy available for PAH, only epoprostenol has been shown to improve patient survival in the context of a randomised controlled trial.

To assess the impact that withdrawal of intravenous epoprostenol in 1997 would have had, its use was retrospectively reviewed in a well-defined population of patients with PAH. This analysis includes eras before and after the licensing of oral agents in 2002.

All patients treated with intravenous epoprostenol by the Scottish Pulmonary Vascular Unit from 1997 to 2007 were identified. Case notes of this cohort were reviewed to determine (1) the reason for initiation of epoprostenol, (2) the outcome after 12 months of treatment as assessed by changes in conventional outcome measures and survival, and (3) the outcome in those patients whose treatment with epoprostenol commenced after licensing of oral disease-targeted therapy in 2002. Patient improvement was defined as either an improvement in functional class or an improvement in the 6-minute walk distance (6MWD) 3 months after initiation of treatment. Patients were then divided into the following groups: (1) improvement and survived (functional class, 6MWD, NT-proBNP, and quality of life (QOL) measurements were also analysed)

Fifty (20%) of 252 patients with PAH were identified as having received epoprostenol during this period. Of this group, 30 (60%) either improved or stabilised for >12 months. Data on the improvements in 6MWD, QOL, functional class and NT-proBNP are included in the online supplement. Figure 1 shows the survival advantage for patients whose functional class or 6MWD improved with intravenous epoprostenol. For the subset of patients following the introduction of oral disease-targeted therapy agents in 2002, 30 (15%) out of 199 required epoprostenol; 17 (57%) improved, 9 (30%) died before 12 months, 3 (10%) stabilised and 1 was intolerant of the agent. Included in this group were 12 patients who required epoprostenol after deterioration on oral agents; 7 improved, 3 died, 1 stabilised and 1 was intolerant. Data on the improvements in 6MWD, QOL, functional class and NT-proBNP in this group of patients are also shown in the online supplement.

Point prevalence data (see online supplement) still demonstrated an ongoing need for epoprostenol in the current era of oral agents.

This study suggests that, had intravenous epoprostenol not been available over the last decade as a treatment for PAH, a significant number of patients in Scotland would have been denied an effective treatment. Where data are available in the subjects, there were improvements in all outcome measures (functional class, 6MWD, NT-proBNP, QOL). More compelling, however, is the survival analysis of the entire cohort which demonstrated a large survival advantage in those patients in whom functional class or 6MWD improved. This situation remains true in the era of oral treatments. This should have implications for future NICE review of the role of epoprostenol in PAH.

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Do all occupational respiratory sensitisers follow the united airways disease model?

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