bronchodilator ratio of forced expiratory volume in the first second (FEV_1) to forced vital capacity (FVC) < 0.70 and they were clinically stable (i.e., stable shortness of breath and sputum production). We report baseline data recorded before any specific interventions were undertaken. The data collection was conducted in accordance with the declaration of Helsinki and approved by ethics committees at each of the participating centres, according to local regulations. Written informed consent was provided by all participants.

5.2.2 Sensor measurements

Physical activity levels and sleep were assessed during daily life with the SenseWear Armband devices that include an accelerometer with different physiological sensors [68, 44]. Data were sampled at one minute intervals and, together with demographic characteristics, were used to estimate metabolic equivalent of task (MET) using proprietary algorithms developed by the manufacturer. The use of multisensory data in combination with pattern recognition algorithms ensured that the MET estimation was insensitive to noise and random motion artefacts [104]. METs data were divided into activity intensity levels using the thresholds proposed by the American College of Sports Medicine: very light intensity, < 2.0 METs; light intensity, 2.0 to 2.9 METs; and moderate-to-vigorous intensity, $\geq$ 3.0 METs [81]. For each minute, the device recorded steps count, information about the sleeping status of a patient (0=awake, 1=sleeping), and posture (0=lying down, 1=not lying down).

5.2.3 Data recordings

Study participants wore the sensor on the upper arm both during daytime and night-time so that continuous, real-life activities were recorded. Participants who wore the device for at least 22 hours per day, with a minimum of four assessed days (two weekdays + Saturday + Sunday) were included [44]. Time in bed and time out of bed were derived from the minutes coded by the activity monitor as “sleeping” and “lying down” using a custom-made algorithm described in the next section. Based on these data the following night-time and daytime sleep measures were derived: total night sleeping time, number of nocturnal sleeping bouts, duration of nocturnal sleeping bouts, sleep efficiency, wake after sleep onset, total day sleeping time, number of daytime sleeping bouts, and average duration of daytime sleeping bouts. In this study, “sleep quality” is used to refer to the collection of these sleep measures which definition is presented in Table VII. Sleeping bouts were defined as consecutive minutes marked by the sensor as sleeping. As physical activity measures, the number of steps performed during day time and the time spent in very light, light and moderate-to-vigorous activities were computed for each assessed day. Participants who did not have their sleep regularly distributed during night-time or who had less than four hours of time in bed were excluded to minimize the inclusion of shift-workers and to reduce the impact of sleep morbidities such as insomnia.