Physical Activity in COPD by Chris Garvey NP, UCSF Pulmonary Rehabilitation and Sleep Disorders

Pulmonary Rehabilitation (PR) is well established as the standard of care for improving function, disabling symptoms and health-related quality of life in persons with chronic lung disease.[1] Long term adherence to exercise and physical activity is needed to sustain improved outcomes, yet tools and strategies are needed to influence sustained behavior change in persons with chronic lung disease.[2]

Physical activity is defined by the WHO as any bodily movement produced by skeletal muscles that requires energy expenditure,[3] and has been described as what a person actually does vs. what one is capable of doing.[4] Risks and consequences of inactivity include increased skeletal muscle dysfunction and development of comorbidites.[5] The CDC has identified physical activity as a major public health priority http://www.cdc.gov/physicalactivity/index.html. Generally accepted standards for physical activity include moderate intensity exercise 30 minutes per day for at least 5 days per week (or 2 1/2 hours per week).

Strategies are needed to favorably impact physical activity levels following PR. Models that have shown benefit include use of group Nordic walking in Austrian COPD patients.[6]

Step counters or pedometers are not uniformly accurate, particularly in slow walking COPD patients. However, these small, inexpensive devices can provide feedback and potentially increase motivation and physical activity.[7] PR clinician should develop physical activity recommendations and goals in collaboration with the patient and medical team, with activity adherence monitored and reinforced over time. Clinicians should assist patients in identifying safe settings for physical activity and strategies for ongoing support and motivation, e.g. walking with friends, family members, community-based options, etc.

Future explorations should include development and evaluation of wireless applications for physical activity, e.g. smart phone apps and other e-health models to monitor progress, provide feedback with encouragement, and offer chat features, tips on activity, etc.[8] Based on expert recommendations, a few examples of devices and questionnaires are listed below. The list is not all inclusive and may omit effective, accurate tools and devices.

Pedometers

Fitbit: Clothing clip or wristband. http://www.fitbit.com/

- Activity tracker uses connectivity with free app for smart phone or computer.
    - Estimates and displays steps, distance, calories; ○ Watch type battery (2-3 month battery life). ○ Small, easy to wear; small size of clip device may risk accidental machine washing.

- Software for researchers allows data collection on multiple patients (similar to Omron Healthcare software). ○ Underestimates some activity ○ $65- clothing clip; $95 for wristband

Omron HJ-720 ITC store.omronhealthcare.com/
https://www.omronfitness.com/devicehelp/pedometer-support/

- USB port and cable for downloading data.
- 41-day memory, resets at 12am. Displays steps, aerobic steps, distance, calories. Watch type battery.
- 10 years of public use. Published validity studies available. ○ May be somewhat complex for some. Holster to clip it onto belt is large and somewhat awkward
- $45

SW-200 Yamax Digiwalker http://www.yamaxx.com/digi/sw-200-e.html

- Internal sensor mechanism uses a coiled spring-suspended lever arm. The device count is less accurate on overweight or obese and at speeds less than 2.5 mph.
- Battery life approximately 3 years
- $20

Accelerometers

ActiGraph GT3X+: http://www.actigraphcorp.com/support/devices/gt3xplus/

- Standard tri-axial research-grade accelerometer ○ Used in 8090% of physical activity studies. Device relatively constant over 20 yrs with updated model available.
  - Currently does not clip onto waist band. New version will have a touch screen display and will fit into a rubber holster for wrist or waist clip. ○ Current software is 'researcher-oriented' and may challenge some clinicians. Simplified software is in development.
  - $250 retail plus about $1000 for ActiLife software.
- DynaPort minimod triaxial accelerometer https://www.mcroberts.nl/products/movemonitor/dynaport
- Greater accuracy than some alternatives. May be expensive. Software for analysis is well developed

- Uses microSD, USB cable for communication and charging 1-2 week battery life.

Multisensors

Sensewear Armband http://www.bodymedia.com

- Activity monitor validated in patients with COPD (Rabinovich et al. ERJ 2013; 42:12051215). Multisensory device consists of an accelerometer plus a sensor that measures skin flux, galvanic skin response and skin temperature

- Typically worn on the upper right arm. Provides steps and estimate of total energy expenditure (TEE) during free living. The data can be uploaded and analyzed using welldeveloped computer software.

- A new version includes Bluetooth to allow connection through multiple applications on Smartphone or Tablet.

- Cost $99-119

Questionnaires

- Minnesota Leisure Time Physical Activity Questionnaire (MLTPAQ) or Survey (MLTPAS) http://appliedresearch.cancer.gov/paq/q038.html
- Baecke Physical Activity Questionnaire http://appliedresearch.cancer.gov/paq/q038.html
- Physical Activity Scale for the Elderly (PASE) http://www.ndorms.ox.ac.uk/prove/documents/assessors/questionnaire/Pase_Questionaire.pdf
- International Physical Activity Questionnaire (IPAQ – currently included as a registry data set http://www.ipaq.ki.se/downloads.htm

Thanks to the following experts for providing feedback regarding devices and questionnaires :
David R. Bassett, Jr. PhD
Rich Casaburi, PhD, MD
Fabio Pitta PhD
Ioannis Vogiatzis PhD
Richard ZuWallack MD

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