Evidence Analysis Library: Chronic Obstructive Pulmonary Disease (COPD)
Methods to Estimate Energy and Protein Requirements

If measurements are not available, what are the best methods to predict energy needs in adults with COPD?
Subquestion: In adults with COPD, how does the *[predictive equation]* relate to measured energy expenditure?
What are valid and reliable predictive equations to estimate protein needs in adults with COPD?

List of Excluded Articles (N=163)

Article	Reason for Exclusion[1]
Ade-Oshifogun JB. Model of functional performance in obese elderly people with chronic obstructive pulmonary disease. *J Nurs Scholarsh*. 2012; 44(3): 232-41. PMID: 22882559 doi: 10.1111/j.1547-5069.2012.01457.x.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Agha MA, El Wahsh RA. Basal metabolic rate in bronchial asthma and chronic obstructive pulmonary disease patients. *Egypt J Chest Dis Tuberc*. 2013;62(1):39-44.	BMR was measured using IC, but IC was not compared to estimated energy needs, using a predictive equation. No comparison between measured and estimated protein needs.
Ahmadi A, Haghighat N, Hakimrabet M, Tolide-ie H. Nutritional evaluation in chronic obstructive pulmonary disease patients. *Pak J Biol Sci*. 2012;15(10):501-5. PMID: 24187906.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated nutrient intake only.
Ahnfeldt-Mollerup P, Hey H, Johansen C, Kristensen S, Brix Lindskov J, Jensahnfeldt-Mollerupen C. The effect of protein supplementation on quality of life, physical function, and muscle strength in patients with chronic obstructive pulmonary disease. *Eur J Phys Rehabil Med*.2015;51(4): 447-56. PMID: 25426541	No comparison between measured and estimated energy or protein needs using a predictive equation.
Andersson I, Gronberg A, Slinde F, Bosaeus I, Larsson S. Vitamin and mineral status in elderly patients with chronic obstructive pulmonary disease. *Clin Respir J*. 2007; 1(1): 23-9. PMID: 20298274 doi: 10.1111/j.1752-699X.2007.00003.x.	No comparison between measured and estimated energy or protein needs using a predictive equation; micronutrient intake only.
Andersson M, Slinde F, et al. Physical activity level and its clinical correlates in chronic obstructive pulmonary disease: a cross-sectional study. *Respir Res*. 2013;14:128. PMID: 24237876 doi: 10.1186/1465-9921-14-128.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Anker SD, Laviano A, et al. ESPEN Guidelines on Parenteral Nutrition: on cardiology and pneumology. *Clin Nutr* 2009;28(4):455-60. PMID: 19515464 doi: 10.1016/j.clnu.2009.04.023.	Not a research study; ESPEN guidelines for COPD.
Arvidsson D, Slinde F, Nordenson A, Larsson S, Hulthén L. Validity of the ActiReg system in assessing energy requirement in chronic obstructive pulmonary disease patients. *Clin Nutr*. 2006 Feb;25(1):68-74. PMID: 16239051 Epub 2005 Oct 18.	Examined validity of a PAM (ActiReg) compared to DLW. REE was measured using IC, but IC or DLW were not compared to estimated energy needs, using a predictive equation. No comparison between measured and estimated protein needs.
Auyeung TW, Lee JS, et al. Adiposity to muscle ratio predicts incident physical limitation in a cohort of 3,153 older adults--an alternative measurement of sarcopenia and sarcopenic obesity. *Age (Dordr)*. 2013;35(4):1377-85. PMID: 22614096 doi: 10.1007/s11357-012-9423-9.	Lung condition that is not COPD; Older adult population with a variety of diagnoses, not all COPD; data were not separated for COPD patients only.
Baldi S, Aquilani R, et al. Fat-free mass change after nutritional rehabilitation in weight losing COPD: role of insulin, C-reactive protein and tissue hypoxia. *Int J Chron Obstruct Pulmon Dis*. 2010;5:29-39. PMID: 20368909.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Barreiro E, Rabinovich R, et al. Chronic endurance exercise induces quadriceps nitrosative stress in patients with severe COPD. *Thorax*. 2009;64(1):13-9. PMID: 18835959 doi: 10.1136/thx.2008.105163.	Less than 10 subjects per study group.
Battaglia S, Spatafore M, et al. Ageing and COPD affect different domains of nutritional status: the ECCE study. *Eur Respir J*. 2011;37(6):1340-5. PMID: 21071469 doi:10.1183/09031936.00032310.	No comparison between measured and estimated energy or protein needs using a predictive equation.

Article	Reason for Exclusion[1]
Benton MJ, Wagner CL Alexander JL. Relationship between body mass index, nutrition, strength, and function in elderly individuals with chronic obstructive pulmonary disease. *J Cardiopulm Rehabil Prev*. 2010; 30(4): 260-3. PMID: 20410829 doi:10.1097/ HCR.0b013e3181d6f94f.	No comparison between measured and estimated energy or protein needs using a predictive equation; Dietary intake only.
Benton MJ, Wagner CL, Alexander JL. Relationship between body mass index, nutrition, strength, and function in elderly individuals with chronic obstructive pulmonary disease. *J Cardiopulm Rehabil Prev*. 2010;30(4):260-3. PMID: 20410829 doi:10.1097/HCR.0b013e3181d6f94f.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated nutrient intake only.
Boeselt T, Spielmanns M, et al. Validity and usability of physical activity monitoring in patients with chronic obstructive pulmonary disease (COPD). *PLoS One* 2016 Jun 15; 11(6): e0157229. doi: 10.1371/journal.pone.0157229. eCollection 2016. PMID: 27305105	No comparison between measured and estimated energy or protein needs using a predictive equation; determined validity and usability of a PAM (Polar A300) compared to another validated PAM (SWA) device.
Broekhuizen R, Creutzberg EC, et al. Optimizing oral nutritional drink supplementation in patients with chronic obstructive pulmonary disease. *Br J Nutr*.2005;93(6):965-71. PMID: 16022768.	REE was measured using IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Broekhuizen R, Wouters, EF, et al. Raised CRP levels mark metabolic and functional impairment in advanced COPD. *Thorax*.2006;61(1):17-22. PMID: 16055618 doi: 10.1136/thx.2005.041996.	REE was measured using IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Brusik M, Ukropec J, et al. Circulatory and adipose tissue leptin and adiponectin in relationship to resting energy expenditure in patients with chronic obstructive pulmonary disease. *Physiol Res*. 2012;61(5):469-80. PMID: 22881231.	REE was measured using IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Buyukkaplan US, Akkaya A, et al. Mineral status of COPD patients under long-term inhaled corticosteroid therapy. *J Prosthodont*. 2008;17(6):462-7. PMID: 18573148 doi: 10.1111/j.1532-849X.2008.00334.x.	No comparison between measured and estimated (predictive equation) energy or protein needs.
Cai B, Zhu Y, Ma Y, et al. Effect of supplementing a high-fat, low-carbohydrate enteral formula in COPD patients. *Nutrition* 2003; 19(3): 229-32. PMID: 12620524.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Calikoglu M, Sahin G, et al. Leptin and TNF-alpha levels in patients with chronic obstructive pulmonary disease and their relationship to nutritional parameters. *Respiration*.2004;71(1): 45-50. PMID: 14872110 doi: 10.1159/000075648.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Carter R, Holiday DB, et al. Predicting oxygen uptake for men and women with moderate to severe chronic obstructive pulmonary disease. *Arch Phys Med Rehabil*. 2003; 84(8): 1158-64. PMID: 12917855.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Casaburi R. Activity monitoring in assessing activities of daily living. COPD. 2007 Sep;4(3):251-5. *Review* PMID: 17729069	Review article.
Castro AA, Porto EF, et al. Oxygen and ventilatory output during several activities of daily living performed by COPD patients stratified according to disease severity. *PLoS One*. 2013;8(11): e79727. PMID: 24278164 doi: 10.1371/journal.pone.0079727.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Cavalheri V, Donaria L, et al. Energy expenditure during daily activities as measured by two motion sensors in patients with COPD. *Respir Med*. 2011; 105(6): 922-9. PMID: 21276720 doi: 10.1016/j.rmed.2011.01.004.	Examined accuracy of PAMs (SAB, DW pedometer) compared to IC, but IC was not compared to estimated energy needs, using a predictive equation. No comparison between measured and estimated protein needs.
Cavalheri V, Hill K, et al. Maximum voluntary ventilation is more strongly associated with energy expenditure during simple activities of daily living than measures of airflow obstruction or respiratory muscle strength in patients with COPD. *Chron Respir Dis*. 2012;9(4):239-40. PMID: 23129801 doi: 10.1177/1479972312458681.	Secondary analysis of Pitta et al, 2008 (excluded). No comparison between measured and estimated energy or protein needs using a predictive equation.

Article	Reason for Exclusion[1]
Cazzola M, Segreti A, et al. Energy expenditure and impact of bronchodilators in COPD patients. *Respir Med*. 2010;104(10):1490-4. PMID: 20471237 doi: 10.1016/j.rmed.2010.04.002.	No comparison between measured and estimated energy or protein needs using a predictive equation; used a PAM (SWA) to determine TEE.
Cochrane WJ, Afolabi OA. Investigation into the nutritional status, dietary intake and smoking habits of patients with chronic obstructive pulmonary disease. *J Hum Nutr Diet.* 2004;17(1):3-11; quiz 13-5. PMID: 14718026.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Cohen RI, Marzouk K, et al. Body composition and resting energy expenditure in clinically stable, non-weight-losing patients with severe emphysema. *Chest*.2003;124(4):1365-72. PMID: 14555567.	Population that is not COPD; emphysema population. Secondary criteria: published prior to 2005.
Constantin D, Menon MK, et al. Skeletal muscle molecular responses to resistance training and dietary supplementation in COPD. *Thorax*. 2013; 68(7): 625-33. PMID: 23535211 doi: 10.1136/thoraxjnl-2012-202764.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Creutzberg EC, Schols AM, et al. Characterization of nonresponse to high caloric oral nutritional therapy in depleted patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 2000;161(3 Pt 1):745-52. PMID: 10712317 doi: 10.1164/ajrccm.161.3.9808075.	Less than 10 subjects per study group. Secondary criteria: published prior to 2005.
Creutzberg EC, Wouters EF, et al. Efficacy of nutritional supplementation therapy in depleted patients with chronic obstructive pulmonary disease.*Nutrition*.2003;19(2): 120-7. PMID: 12591542.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Creutzberg EC, Wouters EF, et al. Disturbances in leptin metabolism are related to energy imbalance during acute exacerbations of chronic obstructive pulmonary disease.*Am J Respir Crit Care Med*.2000;162(4 Pt 1):1239-45. PMID: 11029324 doi: 10.1164/ajrccm.162.4.9912016.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Crisafulli E, Beneventi C, et al. . Energy expenditure at rest and during walking in patients with chronic respiratory failure: a prospective two-phase case-control study. *PLoS One*.2011;6(8):e23770. PMID: 21909356 doi: 10.1371/journal.pone.0023770. Epub 2011 Aug 31.	Determined validity of a PAM (SWA) compared to IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
de Batlle J, Romieu I, et al. Dietary habits of firstly admitted Spanish COPD patients. *Respir Med*.2009;103(12):1904-10. PMID: 19564102 doi:10.1016/j.rmed.2009.06.001.	No comparison between measured and estimated energy or protein needs using a predictive equation; compared dietary intake to Spanish nutritional standards.
De Benedetto F, Aceto A, et al. Long-term oral n-acetylcysteine reduces exhaled hydrogen peroxide in stable COPD. *Pulm Pharmacol Ther*. 2005;18(1):41-7. PMID: 15607126 doi:10.1016/j.pupt.2004.09.030.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Dennison EM, Dhanwal DK, et al. Is lung function associated with bone mineral density? Results from the Hertfordshire Cohort Study. *Arch Osteoporos*.2013; 8:115. PMID: 23322029 doi:10.1007/s11657-012-0115-y.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Deutz NE, Matheson EM, et al. NOURISH Study Group. Readmission and mortality in malnourished, older, hospitalized adults treated with a specialized oral nutritional supplement: A randomized clinical trial. *Clin Nutr* 2016 Feb; 35(1): 18-26. PMID: 26797412 doi 10.1016/ j.clnu.2015.12.010. Epub 2016	Malnourished hospitalized elderly population. Not all patients were diagnosed with COPD; data for COPD patients were not reported separately.
Dhillon SS, Sima CA, et al. Physical activity measurement accuracy in individuals with chronic lung disease: a systematic review with meta-analysis of method comparison studies. *Arch Phys Med Rehabil*.2015 Nov;96(11):2079-88.e10. PMID: 26049088 doi:10.1016/ j.apmr.2015.05.015. Epub 2015 Jun 3. Review.	Review article; hand searched for relevant primary research.
Duckers JM, Shale DJ, et al. Cardiovascular and musculskeletal co-morbidities in patients with alpha 1 antitrypsin deficiency. *Respir Res*.2010 11:173. PMID: 21138571 doi: 10.1186/1465-9921-11-173.	No comparison between measured and estimated energy or protein needs using a predictive equation.

Article	Reason for Exclusion[1]
Egan C, Deering BM, et al. Short term and long term effects of pulmonary rehabilitation on physical activity in COPD. *Respir Med*. 2012;106(12):1671-9. PMID: 23063203 doi:10.1016/j.rmed.2012.08.016.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Engelen MP, De Castro CL, et al. Enhanced anabolic response to milk protein sip feeding in elderly subjects with COPD is associated with a reduced splanchnic extraction of multiple amino acids. *Clin Nutr* 2012;31(5):616-24. PMID: 22682082 doi: 10.1016/j.clnu.2012.04.006.	Less than 10 subjects per study group.
Engelen MP, Rutten EP, et al. Casein protein results in higher prandial and exercise induced whole body protein anabolism than whey protein in chronic obstructive pulmonary disease. *Metabolism*.2012;61(9):1289-300. PMID: 22512824 doi:10.1016/j.metabol.2012.03.001.	Less than 10 subjects per study group.
Engelen MP, Rutten EP, et al. Supplementation of soy protein with branched-chain amino acids alters protein metabolism in healthy elderly and even more in patients with chronic obstructive pulmonary disease. *Am J Clin Nutr*. 2007;85(2):431-9. PMID: 17284740.	Less than 10 subjects per study group.
Farooqi N, Slinde F, et al. Validation of SenseWear Armband and ActiHeart monitors for assessments of daily energy expenditure in free-living women with chronic obstructive pulmonary disease. *Physiol Rep*. 2013 Nov;1(6): e00150.PMID: 24400152 doi: 10.1002/phy2.150. Epub 2013 Nov 26.	Determined validity of a PAM (SWA and AH) compared to DLW, but DLW was not compared to estimated energy needs, using a predictive equation. No comparison between measured and estimated protein needs.
Farooqi N, Nordstrom L, et al. Changes in body weight and physical performance after receiving dietary advice in patients with chronic obstructive pulmonary disease (COPD): 1-year follow-up. *Arch Gerontol Geriatr*. 2011;53(1):70-5. PMID: 20619471 doi:10.1016/j.archger.2010.06.005.	Energy needs were estimated using HBE and protein needs estimated using kcal/kg but there was no comparison between estimated energy or protein needs and measured.
Farooqi N, Slinde F, et al. Assessment of energy intake in women with chronic obstructive pulmonary disease: a doubly labeled water method study. *J Nutr Health Aging*. 2015;19(5):518-24. PMID: 25923480 doi:10.1007/s12603-014-0575-4.	REE was measured using IC; TEE was measured using DLW but IC or DLW was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs; dietary intake only.
Forli L, Moum T, et al. The influence of underweight and dietary support on well-being in lung transplant candidates. *Respir Med*. 2006;100(7):1239-46. PMID: 16311026 doi::10.1016/j.rmed.2005.10.016.	Lung condition that is not COPD; lung transplant candidate population which included COPD, fibrosis and sarcoidosis patients. Results of the COPD patients were not reported separately.
Forli L, Pedersen JI, et al. Dietary support to underweight patients with end-stage pulmonary disease assessed for lung transplantation. *Respiration*. 2001;68(1):51-7. PMID: 11223731	Not all subjects were diagnosed with COPD. Grouped by intervention and did not report data for COPD patients only. Secondary criteria: published prior to 2005.
Førlil L, Boe J. The energy intake that is needed for weight gain in COPD candidates for lung transplantation. *COPD*. 2005 Dec;2(4):405-10. PMID: 17147005.	No comparison between measured and estimated energy or protein needs using a predictive equation. Estimated energy was based on linear regression (weight change and energy intake). Secondary criteria: published prior to 2005.
Foy CG, Wickley KL, et al. The Reconditioning Exercise and Chronic Obstructive Pulmonary Disease Trial II (REACT II): rationale and study design for a clinical trial of physical activity among individuals with chronic obstructive pulmonary disease. *Contemp Clin Trials*. 2006 Apr;27(2):135-46. Epub 2006 Feb 2. PMID: 16458075	Not a research study; study design only.
Franssen FM, Wouters EF, et al. Arm mechanical efficiency and arm exercise capacity are relatively preserved in chronic obstructive pulmonary disease. *Med Sci Sports Exerc*. 2002; 34(10): 1570-6. PMID: 12370557 doi:10.1249/ 01.MSS.0000035989.68599.4f.	REE was measured using IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs. Secondary criteria: published prior to 2005.

Article	Reason for Exclusion[1]
Furlanetto KC, Bisca GW, et al. Step counting and energy expenditure estimation in patients with chronic obstructive pulmonary disease and healthy elderly: accuracy of 2 motion sensors. *Arch Phys Med Rehabil*. 2010;91(2):261-7. PMID: 20159131 doi:10.1016/j.apmr.2009.10.024.	Evaluated accuracy of PAMs (SWA; DW pedometer) compared to IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Garcia-Aymerich J, Serra I, et al. Physical activity and clinical and functional status in COPD. *Chest*.2009:136(1):62-70. PMID: 19255291 doi:10.1378/chest.08-2532.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Garcia-Aymerich J, Felez MA, et al. Physical activity and its determinants in severe chronic obstructive pulmonary disease. *Med Sci Sports Exerc*. 2004; 36(10):1667-73. PMID: 15595285.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Gariballa S, Foster S. Associations between underlying disease and nutritional status following acute illness in older people. *Clin Nutr*. 2007;26(4):466-73. PMID: 17383777 doi:10.1016/j.clnu.2007.01.012.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Gariballa S, Forster S, Powers H. Riboflavin status in acutely ill patients and response to dietary supplements. *J Parenter Enteral Nutr*. 2009;33(6):656-61. PMID: 19644132 doi:10.1177/0148607109336602.	Less than 10 subjects per study group.
Godoy I, Campana AO, et al. Cytokines and dietary energy restriction in stable chronic obstructive pulmonary disease patients. *Eur Respir* 2003;22(6):920-5. PMID: 14680079.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Gorek Dilektasli A, Ulubay G, et al.. The effects of cachexia and related components on pulmonary functions in patients with COPD. *Tuberk Toraks*. 2009; 57(3): 298-305. PMID: 19787469.	REE was measured using IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Goris AH, Vermeeren MA, et al. Energy balance in depleted ambulatory patients with chronic obstructive pulmonary disease: the effect of physical activity and oral nutritional supplementation. *Br J Nutr*. 2003;89(5):725-31. PMID: 12720592 doi:10.1079/bjn2003838.	Less than 10 subjects per study group. Secondary criteria: published prior to 2005.
Green HJ, Bombardier E, et al. Organization of metabolic pathways in vastus lateralis of patients with chronic obstructive pulmonary disease. *Am J Physiol Regul Integr Comp Physiol*. 2008;295(3):R935-41. PMID: 18635455 doi:10.1152/ajpregu.00167.2008.	Less than 10 subjects per study group.
Green HJ, Burnett ME, et al. Altered metabolic and transporter characteristics of vastus lateralis in chronic obstructive pulmonary disease. *J Appl Physiol* (1985). 2008; 105(3): 879-86. PMID: 18635880 doi:10.1152/ japplphysiol.90458.2008.	Less than 10 subjects per study group.
Gronberg AM, Slinde F, et al. Dietary problems in patients with severe chronic obstructive pulmonary disease. *J Hum Nutr Diet*. 2005; 18(6): 445-52. PMID: 16351703 doi: 10.1111/j.1365-277X.2005.00649.x.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Guzun R, Aquilaniu B, et al. Effects of training at mild exercise intensities on quadriceps muscle energy metabolism in patients with chronic obstructive pulmonary disease. *Acta Physiol (Oxf)*. 2012;205(2):236-46. PMID: 22118364 doi: 10.1111/j.1748-1716.2011.02388.x.	Less than 10 subjects per study group.
Hackett TL, Scarci M, et al. Oxidative modification of albumin in the parenchymal lung tissue of current smokers with chronic obstructive pulmonary disease. *Respir Res*. 2010;11:180. PMID: 21176186 doi: 10.1186/1465-9921-11-180.	No comparison between measured and estimated energy or protein needs using a predictive equation.
HajGhanbari B, Holsti L et al. Pain in people with chronic obstructive pulmonary disease (COPD). *Respir Med.* 2012;106(7):998-1005. PMID: 22531146 doi: 10.1016/j.rmed.2012.03.004.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Hamaoka T, Tatsumi K, et al. Metabolic activity in skeletal muscles of patients with non-hypoxaemic chronic obstructive pulmonary disease studied by 31P-magnetic resonance spectroscopy. *Respirology*. 2005;10(2):164-70. PMID: 15823180 doi:10.1111/j.1440-1843.2005.00696.x.	Less than 10 subjects per study group.

Article	Reason for Exclusion[1]
Harrison SL, Horton EJ, et al. Physical activity monitoring: addressing the difficulties of accurately detecting slow walking speeds. *Heart Lung*. 2013;42(5):361-4 e1. PMID: 23998384 doi: 10.1016/j.hrtlng.2013.06.004.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Hataji O, Naito M, et al. Indacaterol improves daily physical activity in patients with chronic obstructive pulmonary disease. *Int J Chron Obstruct Pulmon Dis*. 2013;8:1-5. PMID: 23293514 doi: 10.2147/copd.s38548.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Hill K, Dolmage TE, Woon L, et al. Measurement properties of the SenseWear armband in adults with chronic obstructive pulmonary disease. *Thorax*. 2010 Jun; 65(6): 486-91 PMID: 20522844. doi: 10.1136/ thx.2009.128702.	Compared a PAM (SAB) to IC, but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Hill K, Dolmage TE, et al. Rollator use does not consistently change the metabolic cost of walking in people with chronic obstructive pulmonary disease. *Arch Phys Med Rehabil*. 2012; 93(6): 1077-80. PMID: 22464094 doi: 10.1016/j.apmr.2012.01.009.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Hill K, Dolmage TE, et al. Defining the relationship between average daily energy expenditure and field-based walking tests and aerobic reserve in COPD. *Chest*. 2012;141(2):406-12. PMID: 21835907 doi:10.1378/chest.11-0298.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated a PAM (SAB) to determine TEE.
Hillman CM, Heinecke EL, et al. Relationship between body composition, peripheral muscle strength and functional exercise capacity in patients with severe chronic obstructive pulmonary disease. *Intern Med J*. 2012;42(5):578-81. PMID: 22616963 doi:10.1111/j.1445-5994.2012.02771.x.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Hirayama F, Lee AH, et al. Dietary intake of six minerals in relation to the risk of chronic obstructive pulmonary disease. *Asia Pac J Clin Nutr*. 2010; 19(4): 572-7. PMID: 21147720.	No comparison between measured and estimated energy or protein needs using a predictive equation; dietary intake only.
Holland AE, Hill K, et al. Estimating peak work rate during incremental cycle ergometry from the 6-minute walk distance: differences between reference equations. R*espiration.* 2011; 81(2):124-8. PMID: 20357426 doi: 10.1159/000308464. Epub 2010 Apr 1.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Hronek M, Kovarik M, et al. Skinfold anthropometry--the accurate method for fat free mass measurement in COPD. COPD. 2013;10(5):597-603. PMID: 23844827 doi: 10.3109/15412555.2013.781151.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated accuracy of measuring FFM.
Hunt T, Williams MT and Olds TS. Reliability and validity of the multimedia activity recall in children and adults (MARCA) in people with chronic obstructive pulmonary disease. PLoS One. 2013; 8(11): e81274. PMID: 24312284 doi:10.1371/journal.pone.0081274.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated three PAMs (Actigraph, SWA, pedometer) to measure TEE.
Itoh T, Nagaya N, et al. Elevated plasma ghrelin level in underweight patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 2004;170(8):879-82. PMID: 15271696 doi: 10.1164/rccm.200310-1404OC.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Ives SJ, Harris RA, et al. Vascular dysfunction and chronic obstructive pulmonary disease: the role of redox balance. *Hypertension*. 2014; 63(3): 459-67. PMID: 24324045 doi:10.1161/ hypertensionaha.113.02255.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Jagoe RT, Goodship TH, Gibson GJ. Nutritional status of patients undergoing lung cancer operations. *Ann Thorac Surg*. 2001;71(3):929-35. PMID: 11269476.	Lung condition that is not COPD; lung cancer population; no outcomes focused on COPD patients. Secondary criteria: published prior to 2005.
Jonker R, Deutz NE, et al.. Hydrolyzed casein and whey protein meals comparably stimulate net whole-body protein synthesis in COPD patients with nutritional depletion without an additional effect of leucine co-ingestion. *Clin Nutr*. 2014;33(2):211-20. PMID: 23886411 doi:10.1016/j.clnu.2013.06.014.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Kao CC, Hsu JW, et al.. Resting energy expenditure and protein turnover are increased in patients with severe chronic obstructive pulmonary disease. *Metabolism*. 2011;60(10):1449-55. PMID: 21550084	Less than 10 subjects per study group.

Article	Reason for Exclusion[1]
doi: 10.1016/ j.metabol.2011.02.013.	
Karloh M, Araujo CL, et al. The Glittre-ADL test reflects functional performance measured by physical activities of daily living in patients with chronic obstructive pulmonary disease. *Braz J Phys Ther*. 2016 Apr 8; 20(3): 223-30. PMID: 27437713 doi: 10.1590/bjpt-rbf.2014.0155.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Katz P, Chen H, et al. The role of physical inactivity in increasing disability among older adults with obstructive airway disease. *J Cardiopulm Rehabil Prev*. 2011; 31(3): 193-7. PMID: 21124233 doi:10.1097/HCR. 0b013e3181fc09b7.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Koehler F, Doehner W, et al. Anorexia in chronic obstructive pulmonary disease--association to cachexia and hormonal derangement. *Int J Cardiol*. 2007;119(1):83-9. PMID: 17064790 doi:10.1016/j.ijcard.2006.07.088.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Kuleci S, Hanta I, et al. The effect of different treatment modalities on oxidative stress in COPD. *Adv Ther*. 2008;25(7):710-7. PMID: 18592146 doi:10.1007/s12325-008-0064-4.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Langer D, Gosselink R, et al. Validation of two activity monitors in patients with COPD. *Thorax*. 2009;64(7):641-2. PMID: 19561287 doi:10.1136/thx.2008.112102.	Evaluated accuracy of two PAMs (Minimod, SWA) compared to IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Laviolette L, Lands LC, et al. Combined effect of dietary supplementation with pressurized whey and exercise training in chronic obstructive pulmonary disease: a randomized, controlled, double-blind pilot study. *J Med Food*. 2010; 13(3): 589-98. PMID: 20521985 doi:10.1089/jmf.2009.0142.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Layec G, Haseler LJ, et al. Evidence that a higher ATP cost of muscular contraction contributes to the lower mechanical efficiency associated with COPD: preliminary findings. *Am J Physiol Regul Integr Comp Physiol*. 2011;300(5):R1142-7. PMID: 21307358 doi:10.1152/ajpregu.00835.2010.	Less than 10 subjects per study group.
Lee H, Kim S, Lim et al. Nutritional status and disease severity in patients with chronic obstructive pulmonary disease (COPD). *Arch Gerontol Geriatr*. 2013 May-Jun;56(3):518-23. PMID: 23352455 doi: 10.1016/j.archger.2012.12.011. Epub 2013 Jan 23.	No comparison between measured and estimated energy or protein needs using a predictive equation; dietary intake only.
Lewis, MJ, Annandale J, Lewis KE. Influence of long-term oxygen therapy on heart rate and QT time-series in hypoxic patients with chronic obstructive pulmonary disease. *Clin Physiol Funct Imaging*. 2009; 29(6): 431-9. PMID: 19719731 doi:10.1111/j.1475-097X.2009.00891.x.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Mantoani LC, Hernandes NA, et al. Does the BODE index reflect the level of physical activity in daily life in patients with COPD? *Rev Bras Fisioter*. 2011;15(2):131-7. PMID: 21789363.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated TEE using two PAMs (DynaPort, SWA).
McKeough ZJ, Alison JA, et al. Reduction in resting energy expenditure following lung volume reduction surgery in subjects with chronic obstructive pulmonary disease. *Chron Respir Dis*. 2004;1(4):197-202. PMID: 16281646.	REE was measured using IC and expressed in kcals (Weir equation), kcals/kg and % predicted HBE but there was no direct comparison of methods. Secondary criteria: published prior to 2005.
Medinas-Amoros M, Alorda C, et al. Quality of life in patients with chronic obstructive pulmonary disease: the predictive validity of the BODE index. *Chron Respir Dis*. 2008; 5(1): 7-11. PMID: 18303096 doi:10.1177/1479972307082329.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Menon MK, Constantin D, et al. Protein-carbohydrate supplementation does not influence the skeletal muscle functional or molecular response to high intensity resistance training in COPD. *Am J Respir Crit Care Med.* 2012; 185. Accession Number: CN-01107417.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Miller A, Strauss BJ, et al. Dual-energy X-ray absorptiometry is the method of choice to assess body composition in COPD. *Respirology*. 2009; 14(3): 411-8. PMID: 19353776.	No comparison between measured and estimated energy or protein needs using a predictive equation.

Article	Reason for Exclusion[1]
Mineo TC, Pompeo E, et al. Resting energy expenditure and metabolic changes after lung volume reduction surgery for emphysema. *Ann Thorac Surg*. 2006; 82(4): 1205-11. PMID: 16996909 doi: 10.1016/ j.athoracsur.2006.05.030.	Measured REE using IC but IC was not compared to estimated energy needs, using a predictive equation. No comparison between measured and estimated protein needs.
Nagaya N, Itoh T, et al. Treatment of cachexia with ghrelin in patients with COPD. *Chest*. 2005;128(3):1187-93. PMID: 16162705 doi:10.1378/ chest.128.3.1187.	Less than 10 subjects per study group.
Nakayama M, Bando M, et al. Physical activity in patients with idiopathic pulmonary fibrosis. *Respirology*. 2015;20(4):640-6. PMID: 25728219 doi:10.1111/resp.12500.	Lung condition that is not COPD; idiopathic pulmonary fibrosis (without COPD).
Natanek SA, Gosker HR, et al. Pathways associated with reduced quadriceps oxidative fibres and endurance in COPD. *Eur Respir J*. 2013;41(6):1275-83. PMID: 23258787 doi:10.1183/09031936.00098412.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Nava S, Fuccella LM, Viglianti B. Physiological effects of intravenous fructose 1.6-diphosphate on diaphragmatic function in malnourished patients with COPD. *Monaldi Arch Chest Dis*. 2004;61(4):203-8. PMID: 15909609.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Nishijima Y, Minami S, et al. Influence of indacaterol on daily physical activity in patients with untreated chronic obstructive pulmonary disease. *Int J Chron Obstruct Pulmon Dis*. 2015; 10:439-44. PMID: 25767381 doi:10.2147/copd.s76836.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated a PAM (Lifecorder).
Obase Y, Mouri K, et al. Nutritional deficits in elderly smokers with respiratory symptoms that do not fulfill the criteria for COPD. *Int J Chron Obstruct Pulmon Dis*. 2011; 6: 679-83. PMID: 22259244 doi:10.2147/ copd.s25293.	REE was measured using IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Odencrants S, Theander K. Assessment of nutritional status and meal-related situations among patients with chronic obstructive pulmonary disease in Primary health care - obese patients; a challenge for the future. *J Clin Nurs*. 2013 Apr;22(7-8):977-85.PMID: 22861125 doi: 10.1111/j.1365-2702.2012.04184.x. Epub 2012 Aug 4.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Odencrants S, Ehnfors M, Ehrenberg A. Nutritional status and body composition among persons with chronic obstructive pulmonary disease. *J Nurs Health Chron Ill*. 2009;1(1):60-70 11p. Accession Number: 105310205. Entry Date: 20100319. Revision Date: 20150711. DOI: 10.1111/j.1365-2702.2008.01008.x.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Odencrants S, Ehnfors M, Grobe SJ. Living with chronic obstructive pulmonary disease: part I. Struggling with meal-related situations: experiences among persons with COPD. *Scand J Caring Sci*. 2005 Sep;19(3):230-9. PMID: 16101851.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Osman LM, Ayres JG, et al. A randomised trial of home energy efficiency improvement in the homes of elderly COPD patients. *Eur Respir J*. 2010;35(2):303-9. PMID: 19643937 doi:10.1183/09031936.00187708.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated impact of home energy efficiency on outcomes.
Perrault H, Gravel G, et al. Cycling efficiency is not compromised for moderate exercise in moderately severe COPD. *Med Sci Sports Exerc*. 2007; 39(6):918-25. PMID: 17545880 doi:10.1249/mss. 0b013e3180383d50.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Pitta F, Takaki MY, et al. Relationship between pulmonary function and physical activity in daily life in patients with COPD. *Respir Med*. 2008; 102(8): 1203-7. PMID: 18573647 doi:10.1016/j.rmed.2008.03.004.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated a PAM (SWA).
Planas M, Alvarez J, et al. Nutritional support and quality of life in stable chronic obstructive pulmonary disease (COPD) patients. *Clin Nutr*. 2005 Jun;24(3):433-41. Epub 2005 Apr 21. PMID: 15896431.	Estimated energy needs using HBE but HBE was not compared to measured energy needs. No comparison between measured and estimated protein needs.

Article	Reason for Exclusion[1]
Pobeha P, Ukropec J, et al. Relationship between osteoporosis and adipose tissue leptin and osteoprotegerin in patients with chronic obstructive pulmonary disease. *Bone*. 2011; 48(5): 1008-14. PMID: 21376149 doi:10.1016/ j.bone.2011.02.017.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Pouw EM, Ten Velde GP, et al. Early non-elective readmission for chronic obstructive pulmonary disease is associated with weight loss. *Clin Nutr*. 2000;19(2):95-9. PMID: 10867726 doi:10.1054/clnu.1999.0074.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Probst VS, Kovelis D, et al. Effects of 2 exercise training programs on physical activity in daily life in patients with COPD. *Respir Care*. 2011;56(11):1799-807. PMID: 22035826 doi:10.4187/respcare.01110.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated effects of two exercise training programs on TEE and total time for activity using PAMs (Dynaport, SWA).
Puente-Maestu L, SantaCruz A, et al. Effects of training on the tolerance to high-intensity exercise in patients with severe COPD. *Respiration*. 2003;70(4):367-70. PMID: 14512671	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Rabinovich RA, Louvaris Z, et al. PROactive Consortium. Validity of physical activity monitors during daily life in patients with COPD. *Eur Respir J*. 2013 Nov; 42(5): 1205-15. PMID: 23397303 doi: 10.1183/09031936.00134312. Epub 2013 Feb 8.	Evaluated validity and usability of six different PAMs compared to DLW but DLW was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Ramires BR, de Oliveira EP, et al. Resting energy expenditure and carbohydrate oxidation are higher in elderly patients with COPD: a case control study. *Nutr J*. 2012;11:37. PMID: 22672689 doi:10.1186/1475-2891-11-37.	REE was measured by IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Reed RM, Wise RA, et al. Elevated HDL cholesterol levels are associated with osteoporosis in lung transplant candidates with chronic obstructive pulmonary disease. *Respir Med*. 2010;104(12):1943-50. PMID: 20801628 doi:10.1016/j.rmed.2010.08.004.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Reeves A, White H, et al. Energy and protein intakes of hospitalised patients with acute respiratory failure receiving non-invasive ventilation. *Clin Nutr*. 2014;33(6):1068-73. PMID: 24321188 doi:10.1016/j.clnu.2013.11.012.	Lung condition that is not COPD; acute respiratory failure population which included COPD obstructive sleep apnea or obesity hypoventilation syndrome. Data for COPD patients were not reported separately.
Renvall MJ, Friedman P, Ramsdell JW. Predictors of body mass index in patients with moderate to severe emphysema. *COPD*. 2009;6(6):432-6. PMID: 19938965 doi: 10.3109/15412550903433034.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Rinaldo N, Bacchi E, et al. Effects of Combined Aerobic-Strength Training vs Fitness Education Program in COPD Patients. *Int J Sports Med*. 2017 Nov; 38(13): 1001-1008. PMID: 28982202 doi: 10.1055/s-0043-112339. Epub 2017 Oct 5.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Rutten EP, Engelen MP, et al. Metabolic and functional effects of glutamate intake in patients with chronic obstructive pulmonary disease (COPD). *Clin Nutr*. 2008;27(3):408-15. PMID: 18433945 doi:10.1016/j.clnu.2008.03.001.	Less than 10 subjects per study group.
Sabit R, Bolton CE, et al. Arterial stiffness and osteoporosis in chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 2007;175(12):1259-65. PMID: 17363772 doi:10.1164/rccm.200701-067OC.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Sadowska AM, Manuel-y-Keenoy B, et al. Effect of N-acetylcysteine on neutrophil activation markers in healthy volunteers: in vivo and in vitro study. *Pharmacol Res*. 2006; 53(3): 216-25. PMID: 16384711 doi: 10.1016/j.phrs.2005.11.003.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Saglam M, Vardar-Yagli N, et al. Functional capacity, physical activity, and quality of life in hypoxemic patients with chronic obstructive pulmonary	No comparison between measured and estimated energy or protein needs using a

Article	Reason for Exclusion[1]
disease. *Int J Chron Obstruct Pulmon Dis*. 2015;10:423-8. PMID: 25750524 doi:10.2147/copd.s78937.	predictive equation; TEE was measured using a PAM (Caltrac accelerometer).
Sant'Anna T, Escobar VC, et al. Evaluation of a new motion sensor in patients with chronic obstructive pulmonary disease. *Arch Phys Med Rehabil*. 2012; 93(12): 2319-25. PMID: 22705466 doi: 10.1016/j.apmr.2012.05.027.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated two PAMs (SAB, PW).
Schiffelers SL, Blaak EE, et al. beta-Adrenoceptor-mediated thermogenesis and lipolysis in patients with chronic obstructive pulmonary disease. *Am J Physiol Endocrinol Metab*. 2001;280(2):E357-64. PMID: 11158941.	Less than 10 subjects per study group. Secondary criteria: published prior to 2005.
Sergi G, Coin A, et al. Body composition and resting energy expenditure in elderly male patients with chronic obstructive pulmonary disease. *Respir Med*. 2006; 100(11): 1918-24. PMID: 16635565 doi: 10.1016/ j.rmed.2006.03.008.	REE was measured using IC; REE was also estimated using an unpublished formula. However, there was no direct comparison of methods.
Shields GS, Coiossi GS, et al. Bioenergetics and intermuscular fat in chronic obstructive pulmonary disease-associated quadriceps weakness. *Muscle Nerve*. 2015;51(2):214-21. PMID: 24831173 doi:10.1002/mus.24289.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Shin KC, Chung JH, Lee KH. Effects of TNF-alpha and leptin on weight loss in patients with stable chronic obstructive pulmonary disease. *Korean J Intern Med*. 2007; 22(4): 249-55. PMID: 18309683.	REE was measured using IC but IC was not compared with estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Slinde F, Ellegard L, et al. Total energy expenditure in underweight patients with severe chronic obstructive pulmonary disease living at home. *Clin Nutr*. 2003;22(2):159-65. PMID: 12706133.	BMR was measured by IC and TEE was measured by DLW and compared with predictive equations to estimate energy needs. However, study did not meet secondary criteria: published prior to 2005.
Slinde F, Grönberg A. Energy requirement in COPD. *Clin Nutr*. 2005 Oct;24(5):862; author reply 863. No abstract available. PMID: 16039018	Not a research study; letter to the editor re: Planas et al, 2005
Slinde F, Kvarnhult K, et al. Energy expenditure in underweight chronic obstructive pulmonary disease patients before and during a physiotherapy programme. *Eur J Clin Nutr*. 2006; 60(7): 870-6. PMID: 16452911 doi:10.1038/sj.ejcn.1602392.	REE was measured by IC and TEE was determined by DLW but IC or DLW were not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Slinde F, Gronberg AM, et al. Individual dietary intervention in patients with COPD during multidisciplinary rehabilitation. *Respir Med*. 2002; 96(5):330-6. PMID: 12113383.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Steiner MC, Barton RL, et al. Bedside methods versus dual energy X-ray absorptiometry for body composition measurement in COPD. *Eur Resp J* . 2002; 19(4): 626-631. Accession Number: CN-00477052.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Steiner MC, Barton RL, et al. Nutritional enhancement of exercise performance in chronic obstructive pulmonary disease: a randomised controlled trial. *Thorax*. 2003;58(9):745-51. PMID: 12947128.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Sugawara K, Takahashi H, et al. Effect of anti-inflammatory supplementation with whey peptide and exercise therapy in patients with COPD. *Respir Med*. 2012; 106(11): 1526-34. PMID: 22857881 doi:10.1016/j.rmed.2012.07.001.	REE was measured using IC; HBE was also used to estimate energy needs but there was no direct comparison between HBE and IC.
Sugawara K, Takahashi H, et al. Effects of nutritional supplementation combined with low-intensity exercise in malnourished patients with COPD. *Respir Med*. 2010; 104(12): 1883-9. PMID: 20627502 doi: 10.1016/ j.rmed.2010.05.008.	REE was measured using IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Sugino M, Yoshimori K, et al. Nutritional status and resting energy expenditure in patients with chronic obstructive pulmonary disease. *Revista Espanola de Nutricion Humana y Dietetica* - Volume 20, Issue 0, pp. 440 - published 2016-01-01	Not a research study; ERS International Congress abstract.

Article	Reason for Exclusion[1]
Sundvall P, Grunberg A, et al. Energy and nutrient intake in patients with chronic obstructive pulmonary disease hospitalized owing to an acute exacerbation. *Scan J Nutr*. 49 (3); 2005, 116-121.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Takabatake N, Nakamura H, et al. A novel pathophysiologic phenomenon in cachexic patients with chronic obstructive pulmonary disease: the relationship between the circadian rhythm of circulating leptin and the very low-frequency component of heart rate variability. *Am J Respir Crit Care Med*. 2001; 163(6): 1314-9. PMID: 11371394 doi:10.1164/ ajrccm.163.6.2004175.	Less than 10 subjects per study group. Secondary criteria: published prior to 2005.
Tang NL, Chung ML et al. Total daily energy expenditure in wasted chronic obstructive pulmonary disease patients. *Eur J Clin Nutr*. 2002;56(4):282-7. PMID: 11965503 doi: 10.1038/sj.ejcn.1601299.	REE was measured using IC; HBE was used to estimate energy needs. However, study did not meet secondary criteria: published prior to 2005.
Thorsdottir I, Gunnarsdottir I. Energy intake must be increased among recently hospitalized patients with chronic obstructive pulmonary disease to improve nutritional status. *J Am Diet Assoc*. 2002;102(2):247-9. PMID: 11846120.	BEE was estimated using HBE but HBE was not compared to measured REE; nitrogen balance was reported for N=9 subjects. Secondary criteria: published prior to 2005.
van de Bool C, Mattijssen-Verdonschot C, et al. Quality of dietary intake in relation to body composition in patients with chronic obstructive pulmonary disease eligible for pulmonary rehabilitation. *Eur J Clin Nutr*. 2014;68(2):159-65. PMID: 24327123 doi: 10.1038/ejcn.2013.257.	No comparison between measured and estimated energy or protein needs using a predictive equation; dietary intake only.
van der Vaart H, Postma DS, et al. Bronchodilation improves endurance but not muscular efficiency in chronic obstructive pulmonary disease. *Int J Chron Obstruct Pulmon Dis*. 2011;6:229-35. PMID: 21660300 doi:10.2147/copd.s17482.	REE was measured using IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
van der Vaart H, Koeter GH, et al. First study of infliximab treatment in patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care* Med. 2005;172(4):465-9. PMID: 15937294 doi:10.1164/rccm.200501-147OC.	Less than 10 subjects per study group.
van Gestel AJ, Clarenbach CF, et al. Predicting daily physical activity in patients with chronic obstructive pulmonary disease. *PLoS One*. 2012;7(11):e48081. PMID: 23133612 doi:10.1371/journal.pone.0048081.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated a PAM (SWA Pro).
Van Remoortel H, Raste Y, et al. Validity of six activity monitors in chronic obstructive pulmonary disease: a comparison with IC. *PLoS One.* 2012;7(6): e39198. PMID: 22745715 DOI: 10.1371/journal.pone.0039198.	Compared six different PAMs to IC but IC was not compared to estimated energy needs using a predictive equation. No comparison between measured and estimated protein needs.
Varraso R, Fung TT, et al. Prospective study of dietary patterns and chronic obstructive pulmonary disease among US men. *Thorax*. 2007;62(9):786-91. PMID: 17504819 doi: 10.1136/thx.2006.074534.	No comparison between measured and estimated energy or protein needs using a predictive equation; evaluated diet patterns.
Velloso M, Jardim JR. Study of energy expenditure during activities of daily living using and not using body position recommended by energy conservation techniques in patients with COPD. *Chest*. 2006;130(1):126-32. PMID: 16840392 doi:10.1378/chest.130.1.126.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Vermeeren MA, Wouters EF, et al. Nutritional support in patients with chronic obstructive pulmonary disease during hospitalization for an acute exacerbation; a randomized controlled feasibility trial. *Clin Nutr*. 2004;23(5):1184-92. PMID: 15380912 doi:10.1016/j.clnu.2004.03.008.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Vermeeren MA, Wouters EF, et al. Acute effects of different nutritional supplements on symptoms and functional capacity in patients with chronic obstructive pulmonary disease. *Am J Clin Nutr*. 2001;73(2):295-301. PMID: 11157327.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Villaca DS, Lerario MC, et al. Clinical value of anthropometric estimates of leg lean volume in nutritionally depleted and non-depleted patients with chronic obstructive pulmonary disease. *Br J Nutr*. 2008;100(2):380-6. PMID: 18184453 doi:10.1017/s0007114507886399.	No comparison between measured and estimated energy or protein needs using a predictive equation.

Article	Reason for Exclusion[1]
Walda IC, Tabak C, et al. Diet and 20-year chronic obstructive pulmonary disease mortality in middle-aged men from three European countries. *Eur J Clin Nutr*. 2002; 56(7): 638-43. PMID: 12080403 doi:10.1038/ sj.ejcn.1601370.	No comparison between measured and estimated energy or protein needs using a predictive equation; dietary patterns only. Secondary criteria: published prior to 2005.
Wang Y, Shen Y, et al. Evaluation of ghrelin level and appetite regulation in patients with acute exacerbations of chronic obstructive pulmonary disease. *Int J Chron Obstruct Pulmon Dis*. 2014; 9: 863-70. PMID: 25152618 doi: 10.2147/copd.s65195.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Waschki B, Kirsten AM, et al. Disease Progression and Changes in Physical Activity in Patients with Chronic Obstructive Pulmonary Disease. *Am J Respir Crit Care Med*. 2015;192(3):295-306. PMID: 26020495 doi:10.1164/rccm.201501-0081OC.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Watz H, Waschki B, et al. Extrapulmonary effects of chronic obstructive pulmonary disease on physical activity: a cross-sectional study. *Am J Respir Crit Care Med*. 2008; 177(7): 743-51. PMID: 18048807 doi: 10.1164/ rccm.200707-1011OC.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Weekes CE, Emery PW, Elia M. Dietary counselling and food fortification in stable COPD: a randomised trial. *Thorax*. 2009;64(4):326-31. PMID: 19074931 doi:10.1136/thx.2008.097352.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Westerterp KR. Physical activity and physical activity induced energy expenditure in humans: measurement, determinants, and effects. *Front Physiol*. 2013 Apr 26; 4:90. PMID: 23637685 doi: 10.3389/fphys.2013.00090. eCollection 2013.	Review article.
Woo J, Chan W, et al. A community model of group therapy for the older patients with chronic obstructive pulmonary disease: a pilot study. *J Eval Clin Pract*. 2006; 12(5): 523-31. PMID: 16987114 doi:10.1111/j.1365-2753.2006.00651.x.	No comparison between measured and estimated energy or protein needs using a predictive equation.
Yazdanpanah L, Shidfar F, et al. Energy and protein intake and its relationship with pulmonary function in chronic obstructive pulmonary disease (COPD) patients. *Acta Med Iran*. 2010 Nov-Dec; 48(6): 374-9. PMID: 21287476	No comparison between measured and estimated energy or protein needs using a predictive equation; macronutrient intake only.
Yoneda T, Yoshikawa M, et al. Plasma levels of amino acids and hypermetabolism in patients with chronic obstructive pulmonary disease. *Nutrition*. 2001;17(2):95-9. PMID: 11240335.	No comparison between measured and estimated energy or protein needs using a predictive equation. Secondary criteria: published prior to 2005.
Yquel RJ, Tessonneau F, et al. Peak anaerobic power in patients with COPD: gender related differences. *Eur J Appl Physiol.* 2006;97(3):307-15. PMID: 16770466 doi:10.1007/s00421-006-0181-1.	No comparison between measured and estimated energy or protein needs using a predictive equation; Energy needs were derived from questionnaire.

[1]**Abbreviations:** AH=ActiHeart; BEE=basal energy expenditure; BMR=basal metabolic rate; DLW=doubly labeled water; DW=Digiwalker (pedometer); EE=energy expenditure; ERS=European Respiratory Society; ESPEN=European Society for Clinical Nutrition and Metabolism; FFM=fat-free mass; HBE=Harris-Benedict Equation; IC=IC; PAM(s)=physical activity monitor(s); PW=Power Walker; REE=resting energy expenditure; TEE=total energy expenditure; SAB=SenseWear armband; SWA=SenseWear armband.