(DCP4 ID: RESPD06 and 07)
Cluster: Respiratory disorders

COPD emergency care

Authors: Pickersgill S, Watkins D, Kaur G, Ahmed S, Coates MM, Økland JM, Haaland ØA, Johansson KA

Date: February 5, 2020

Date updated: September 6, 2021

Interventions included for COPD emergency care are:

COPD emergency care

Emergency care of severe COPD (ventilator/BiPAP)

Description of condition and intervention

Chronic respiratory diseases are the chronic diseases of the airways of lungs. Chronic obstructive pulmonary disease or COPD term is an umbrella term of diseases describing chronic lung diseases that cause limitations in lung airflow. Symptoms include breathlessness, or a 'need for air', excessive sputum production and chronic cough (Holland 1993). Emphysema and chronic bronchitis are two types of COPD. Emphysema refers to destruction of tiny air sacs at the end of the airways in lungs. Chronic bronchitis refers to chronic cough resulting in inflammation of the airways (Alonso 2018). COPD develops over time, resulting from the combination of risk factors. These may include tobacco exposure (active smoking or passive smoking to second-hand smoking as well), occupational exposure (dusts, chemicals or fumes), indoor air pollution (biomass fuels), early life events (prematurity, poor in utero growth, frequent respiratory infections during childhood), asthma in childhood and a genetic condition namely alpha-1 antitrypsin deficiency causing COPD at young age. As COPD progress, people find their symptoms much worse and may require extra treatment or hospitalizations during emergency. Severe flare-ups can be life-threatening (Alonso 2018).

(DCP4 ID: RESPD06 and 07)
Cluster: Respiratory disorders

COPD is the 3rd leading cause of death worldwide, with 3.23 million deaths in 2019 (WHO 2018). About 80% of these deaths occurred in low- and middle-income countries (LMIC) (Alonso 2018). Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines aim to provide current evidence of assessment, diagnosis and treatment of patients with COPD. Pharmacologic therapy for COPD reduces symptoms, frequency of severity and improve exercise tolerance and health status. Commonly used medications are bronchodilators, beta2-agonists, antimuscarinic drugs, methylxanthines, combined bronchodilator therapy etc. (Gerald LB 2002). Those with acute exacerbations or severe COPD may require hospitalization at a referral hospital and ventilator support or BiPAP intervention.

International guidelines

Organization	Indications/recommendations
	Gold Initiative for COPD

Intervention attributes

Type of interventions

Curative

Delivery platform

This intervention may be delivered at first-level hospital and referral hospital (for emergency care ventilation/BiPAP intervention).

Equity

In addition to considerations like cost-effectiveness and health systems factors, dimensions of equity can be relevant for priority setting. The opportunity for a long and healthy life varies according to the severity of a health condition that individuals might have, so there are inequities in individuals' opportunities for long and healthy lives based on the health conditions they face. Metrics used to estimate the severity of illness at an individual level can be used to

help prioritize those with less opportunity for lifetime health. FairChoices: DCP Analytics Tool uses Health adjusted age of death (HAAD), which is a metric that estimates the number of years lived from birth to death, discounting years lived with disability. A high HAAD thus represents a disease less severe in terms of lifetime health loss, while a low HAAD represents a disease that is severe on average, causing early death or a long period of severe disability. It is also possible to estimate the distribution of HAAD across individuals with a health condition. FairChoices shows for each intervention an average HAAD value of the conditions that are affected by respective interventions that have health effects. Additionally, a plot shows HAAD values for around 290 conditions (Johansson KA et al 2020).

Model assumptions

Table 2: Summary of model parameters and values used in FairChoices – DCP Analytical Tool

Category	Model parameter	Notes
Intervention	COPD emergency care Emergency care of severe COPD (ventilator/BiPAP)	
Cost parameters		
Treated population	Incidence of COPD	Global Burden of Disease Study 2019
Gender	Both male & female	
Age	0-99 years 15 to 95+ years for ventilation intervention	NCD Countdown appendix
Treated fraction COPD emergency care	0.0855	NCD Countdown appendix
Emergency care of severe COPD (ventilator/BiPAP)	0.0095	NCD Countdown appendix
Effect parameters		
Affected population	Those with condition	
Affected gender	Both male & female	
Affected fraction age	0 to 99 years	

	15 to 95+ years for ventilation intervention	
Affected fraction for mortality outcome COPD emergency care	0.0855	
Emergency care of severe COPD (ventilator/BiPAP)	0.0095	
Comparison	No intervention	
Mortality Reduction (RRR) COPD emergency care	0.6014	NCD Countdown Appendix
Emergency care of severe COPD (ventilator/BiPAP) or Exacerbation treatment with oxygen	0.00318	NCD Countdown Appendix

Intervention cost

The cost for managing acute COPD exacerbations using systemic steroids, inhaled beta-agonists, and, if indicated, oral antibiotics and oxygen therapy is estimated at 195 USD per episode in 2005 in Vietnam (Hoang Anh PT, et al.). The cost was calculated as a weighted average of hospital and out-patient unit costs. The cost of managing acute ventilatory failure due to acute exacerbations of asthma is estimated to be 272.5892857 pounds per episode in the United Kingdom in 2003. Based on Plant P.K. et al 2003, the cost was calculated based on the costs of non-invasive ventilator (£40.393), the cost of replacement masks (£11.75), the additional nursing cost (£4.4464), and the cost of 2 bed days (£216.)

References

Holland 1993: Holland WW. Chronic respiratory diseases. [Internet]. Vol. 47, Journal of epidemiology and community health. 1993 [cited 2021 Sep 6]. p. 4–5. Available from: https://www.who.int/health-topics/chronic-respiratory-diseases#tab=tab_2

Alonso 2018: Alonso JLI, Paredes CM. Chronic obstructive pulmonary disease (COPD). Med [Internet]. 2018 [cited 2021 Sep 6];12(63):3699–709. Available from:

https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-(copd)

WHO 2018: World Health Organization. WHO - The top 10 causes of death [Internet]. 24 Maggio. 2018 [cited 2021 Sep 6]. p. 1–7. Available from: https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death

Gerald LB, Bailey WC. Global initiative for chronic obstructive lung disease [Internet]. Vol. 22, Journal of Cardiopulmonary Rehabilitation. 2002 [cited 2021 Sep 6]. p. 234–44. Available from: https://goldcopd.org/

Johansson KA, Coates MM, Økland JM, Tsuchiya A, Bukhman G, Norheim OF, Haaland Ø. Health by disease categories. Distributional Cost-Effectiveness Analysis: Quantifying Health Equity Impacts and Trade-Offs. 2020 Sep 30:105.

Quon BS, Gan WQ, Sin DD. Contemporary Management of Acute Exacerbations of COPD. Chest 2008; 133: 756–66

McFadden ER. Acute Severe Asthma. Am J Respir Crit Care Med 2003; 168: 740–59.

Han MK, Quibrera PM, Carretta EE, et al. Frequency of exacerbations in patients with chronic obstructive pulmonary disease: an analysis of the SPIROMICS cohort. Lancet Respir Med 2017; 5: 619–26.

Tomii K, Seo R, Tachikawa R, et al. Impact of noninvasive ventilation (NIV) trial for various types of acute respiratory failure in the emergency department; decreased mortality and use of the ICU. Respir Med 2009; 103: 67–73.

Lightowler JV, Wedzicha JA, Elliott MW, Ram FS. Non-invasive positive pressure ventilation to treat respiratory failure resulting from exacerbations of chronic obstructive pulmonary disease: Cochrane systematic review and meta-analysis. BMJ. 2003 Jan 25;326(7382):185. doi: 10.1136/bmj.326.7382.185. PMID: 12543832; PMCID: PMC140272.

Ram FSF, Picot J, Lightowler J, Wedzicha JA. Non-invasive positive pressure ventilation for treatment of respiratory failure due to exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev 2004; : CD004104

Hoang et al 2016: Hoang Anh PT, Thu le T, Ross H, Quynh Anh N, Linh BN, Minh NT. Direct and indirect costs of smoking in Vietnam. Tob Control. 2016 Jan;25(1):96-100. doi: 10.1136/tobaccocontrol-2014-051821. Epub 2014 Dec 15. PMID: 25512430; PMCID: PMC4717360.

Plant et al 2003: Plant PK, Owen JL, Parrott S, Elliott MW. Cost effectiveness of ward based non-invasive ventilation for acute exacerbations of chronic obstructive pulmonary disease: economic analysis of randomised controlled trial. BMJ. 2003 May 3;326(7396):956. doi: 10.1136/bmj.326.7396.956. PMID: 12727767; PMCID: PMC153850.

Appendix

Literature Review for effectiveness & safety

This literature search is an example of Level 1 search for intervention inputs taken from DCP3 or generated in an ad hoc manner (e.g., quick google search found one study of cervical cancer screening cost-effectiveness that was used to create an effectiveness parameter for that intervention).

Level of evidence of efficacy studies:

1. low (expert opinions, case series, reports, low-quality case control studies)
2. moderate (high quality case control studies, low quality cohort studies)
3. high (high quality cohort studies, individual RCTs)
4. very high (multiple RCTs, metaanalysis, systematic review, clinical practice guidelines).