Indonesian Journal of Global Health Research
Volume 7 Number 4, August 2025
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

EFFECTIVENESS OF THE MINI NUTRITIONAL ASSESSMENT (MNA) IN EVALUATING MALNUTRITION IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD): A SYSTEMATIC REVIEW

Erisca Carolina*, Agung Waluyo, Denissa Faradita
Department of Medical-Surgical Nursing, Faculty of Nursing, Universitas Indonesia, Jl. Prof. DR. Sudjono D. Pusponegoro, Pondok Cina, Beji, Depok, Jawa Barat 16424, Indonesia
*erisca.carolina@ui.ac.id

ABSTRACT
Patients with Chronic Obstructive Pulmonary Disease (COPD) are at high risk of weight loss. This weight loss can exacerbate malnutrition, which is closely associated with worsened lung function, increased hospitalization rates, decreased physical activity tolerance, reduced quality of life, and higher mortality. The Mini Nutritional Assessment (MNA) is a widely used questionnaire that provides clear information regarding nutritional status and helps assess malnutrition in patients. Objective to evaluate the effectiveness of the Mini Nutritional Assessment (MNA) in assessing nutritional status and predicting malnutrition in COPD patients. This article is written using a systematic review method, with a search strategy conducted across four databases, yielding a total of 871 articles. These articles were then screened based on inclusion and exclusion criteria, resulting in 7 articles from 2014-2024. The 7 selected articles were subjected to critical appraisal using the JBI Critical Appraisal Checklist. The review of the articles generally indicates that the MNA intervention is effective in assessing malnutrition in COPD patients. The MNA can be optimally used to predict malnutrition in COPD patients, particularly among the elderly.

Keywords: chronic obstructive pulmonary disease; malnutrition mini; nutritional assesment

How to cite (in APA style)
Carolina, E., Waluyo, A., & Faradita, D. (2025). Effectiveness of the Mini Nutritional Assessment (MNA) in Evaluating Malnutrition in Patients with Chronic Obstructive Pulmonary Disease (COPD): A Systematic Review. Indonesian Journal of Global Health Research, 7(4), 661-668. https://doi.org/10.37287/ijghr.v7i4.6397.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is defined as a heterogeneous lung disorder characterized by chronic respiratory symptoms (such as dyspnea, cough, and sputum production) resulting from airway abnormalities (e.g., bronchitis, bronchiolitis) and alveolar damage (e.g., emphysema), leading to persistent and often progressive airflow limitation (PPDI, 2020). COPD is projected to become a leading cause of death worldwide by 2030, affecting approximately 64 million people and contributing to global disability (Ruvuna & Sood, 2020).In Asia, the prevalence of COPD among adults aged 40 and older is estimated at around 8–10% (Momtazmanesh et al., 2023). According to Indonesia's 2013 National Health Survey, the prevalence of COPD was reported at 3.7% of the population, with higher rates among males (Kemenkes, 2021). This is strongly linked to the growing number of active smokers in the country; by 2022, there were 65 million smokers in Indonesia, making it the third-highest in the world (Kemenkes, 2022).

Weight loss is reported in approximately 50% of patients with severe COPD and in 10–15% of those with mild to moderate disease. Malnutrition in COPD may result from increased energy demands due to greater respiratory muscle workload, chronic hypoxemia, hypercapnia, and hypermetabolism. Malnutrition is closely associated with worsening pulmonary function, increased hospitalization rates, reduced physical activity tolerance, decreased quality of life, and higher mortality (Collins et al., 2021).One common consequence of malnutrition in COPD patients is sarcopenia—the loss of

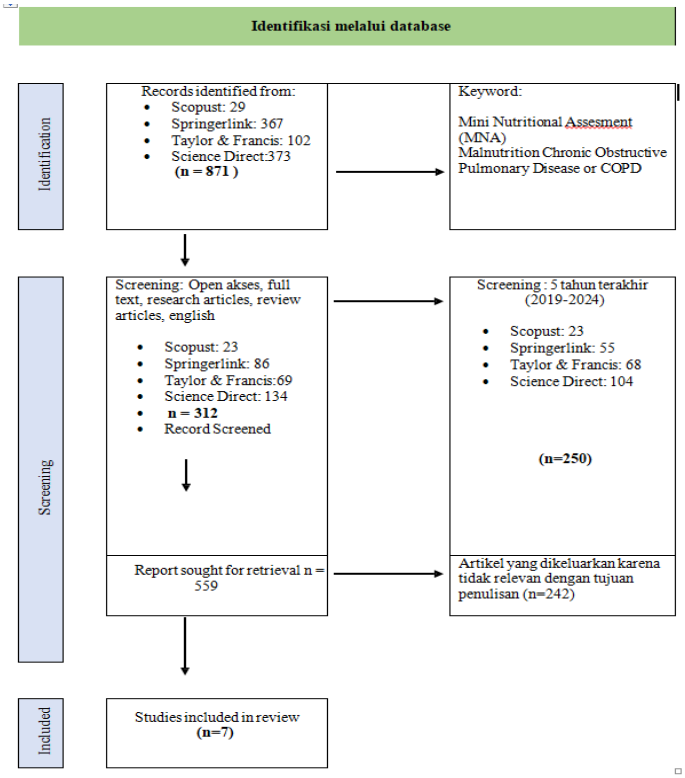
skeletal muscle mass and strength—with a reported prevalence of 21.6% overall, and variability between 8% and 63%. This condition is often underdiagnosed in patients with high body mass index (BMI), as excess body weight may mask muscle loss (Panel, 2023).

Numerous screening tools have been developed to assess nutritional status in patients; however, no gold standard currently exists for screening and assessing malnutrition specifically in COPD patients. The Mini Nutritional Assessment (MNA) is a widely used questionnaire that provides a comprehensive overview of a patient's nutritional status. Recent studies have demonstrated a significant correlation between nutritional status assessed using the MNA and disease progression, prognosis, and perceived dyspnea in COPD patients. Evidence suggests that malnutrition—as detected by MNA scores—is associated with various health outcomes, including morbidity and mortality (Raimondo et al., 2024).The MNA has been shown to be an effective tool for assessing nutritional status in populations such as patients undergoing hemodialysis (Nasir et al., 2022) and those with cancer (Torbahn et al., 2020). The Mini Nutritional Assessment–Full Form (MNA-FF) consists of 18 questions covering BMI (height and weight), weight loss, mid-upper arm and calf circumference, general assessment (e.g., lifestyle, medication history, mobility, and signs of depression or dementia), a short dietary assessment (food and fluid intake), and subjective health and nutrition perception (Griffin et al., 2021).The Mini Nutritional Assessment–Short Form (MNA-SF) is a brief version comprising six questions that evaluate food intake, weight loss, mobility, presence of acute illness, psychological stress, and BMI (Serón-Arbeloa et al., 2022). The MNA has demonstrated good validity for assessing nutritional status and identifying malnutrition (Nozawa et al., 2023). Therefore, the aim of this systematic review is to evaluate the effectiveness of the Mini Nutritional Assessment (MNA) in detecting malnutrition among patients with Chronic Obstructive Pulmonary Disease (COPD)

METHOD

This study employs a systematic review approach, guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. After relevant articles were identified, the researcher conducted a critical appraisal of each selected article to assess its quality using the Joanna Briggs Institute (JBI) tool. The aim of this process is to evaluate the effectiveness of the Mini Nutritional Assessment (MNA) in assessing malnutrition in patients with Chronic Obstructive Pulmonary Disease (COPD). Literature search was conducted in October 2024 through online databases, including SpringerLink, ScienceDirect, and Taylor & Francis. The search strategy was developed based on the PICO formulation. Literature search was carried out using the keywords "Mini Nutritional Assessment AND Chronic Obstructive Pulmonary Disease AND Malnutrition." The process of literature search is illustrated in the figure.

Prisma Diagram
Figure 1



Article Selection Criteria

The article selection in this study was based on the PIO method, which is defined as follows: (1) Population: Patients with Chronic Obstructive Pulmonary Disease (COPD), (2) Intervention: MNA assessment, (3) Outcome: Malnutrition assessment. The inclusion criteria for this study are as follows: (1) Articles published in international journals within the last 10 years (2014–2024), (2) Articles written in English, and (3) Articles using research designs such as cross-sectional and cohort studies.

Data Extraction and Quality Assessment

The selected articles were then further reviewed using the JBI Critical Appraisal Checklist for Cross-Sectional Studies for articles with a cross-sectional design and the JBI Critical Appraisal Checklist for Cohort Studies for articles with a cohort study design.

RESULT

Based on the article search from four databases, namely ScienceDirect, SpringerLink, Scopus, and Taylor & Francis, a total of 871 articles were obtained. These articles were then limited according to the inclusion and exclusion criteria, resulting in 7 final articles. The research designs used were as follows: 4 articles used a cross-sectional design, 2 articles used a prospective observational design, and 1 article used a retrospective study design. The studies were conducted in Japan, Australia, Taiwan, Korea, Italy, and Poland. The age range of the samples in the articles was between 55 and 90 years.To assess the methodological quality of the selected articles, the researchers used the JBI Critical Appraisal Checklist for Cross-Sectional Studies for articles with a cross-sectional design, and the JBI Critical Appraisal Checklist for Cohort Studies (JBI-Cohort Studies) for articles with prospective and retrospective designs.

This assessment aimed to identify potential biases in each study and was used to evaluate the reliability of the study results. After analyzing the 7 critically appraised articles, no articles showed a high risk of bias (>49%), and none showed moderate bias. All 7 articles showed a

low risk of bias (>70%). This indicates that the majority of the articles reviewed demonstrated a strong methodological foundation and can be relied upon to provide evidence regarding the effectiveness of the Mini Nutritional Assessment in assessing malnutrition in patients with COPD.Of the seven articles that were analyzed and reviewed using the JBI criteria, most met the criteria for addressing the research questions and objectives set forth. Although some articles did not explicitly mention blinding in their studies and did not provide detailed strategies to control confounding factors, multivariate analysis was still conducted for the related variables. Overall, the research findings are consistent with the systematic objective of this review, which is to evaluate the effectiveness of the Mini Nutritional Assessment in assessing malnutrition in patients with COPD, showing positive results in the use of MNA for evaluating nutritional status in COPD patients.

Table 1.
Results of Search and Literature Review

Authors	Country	Study Design	N	Age Range	Screening Tools	Results
Szymanowska et al., 2022	Poland	Cross Sectional	124	60-86 years	MNA-SF, MUST, NRS-2002	- MNA-SF had good predictive value with sensitivity (58.3%). MUST and NRS-2002 showed poor sensitivity (47.9%). - MUST sensitivity was higher in subjects with severe and very severe obstruction (58.6%). MUST had the highest specificity (100%), followed by MNA-SF (92.1%) and NRS-2002 (poor). - Accuracy: MNA-SF (AUC 0.84), MUST (AUC 0.74), NRS-2002 (AUC 0.41).
Hsu et al., 2014	Taiwan	Cross Sectional	83	55-83 years	MNA-T1 & MNA-T2 (Taiwan versions of MNA)	- MNA-T1 and MNA-T2 are suitable for assessing nutritional status in COPD patients. Nutritional scores from both versions correlated well with most anthropometric indicators and pulmonary function related to nutrition. - High acceptance rate (kappa = 0.949) in predicting nutritional risk. Both versions predicted FFMI well (0.804 for MNA-T1, $p < 0.001$; 0.813 for MNA-T2, $p < 0.001$).
Raimondo et al., 2024	Italy	Prospective observational study	120	67-79 years	MNA-SF	- MNA score can be used as an indicator for assessing nutritional status in COPD patients and as a predictor for disease severity and quality of life. - MNA provides prognostic value; subjects at risk of malnutrition or with malnutrition had higher risks of moderate to severe acute exacerbation.
Chung et al., 2024	South Korea	Cross Sectional	194	59-69 years	MNA-SF	- MNA-SF can effectively assess nutritional status in patients with NTM-PD and serve as an important clinical indicator where treatment time is determined by clinical assessment.
Takahiro et al., 2023	Japan	Cross Sectional	81	64-79 years	MNA-SF	- MNA-SF is a valid and sensitive quick screening tool correlated well with BMI, FFMI, or Alb to assess malnutrition. - MNA-SF reveals the relationship between physical activity, skeletal muscle mass, and strength according to nutritional status, making it a sensitive tool to detect malnutrition or risk of malnutrition.
Yukio et al., 2023	Japan	Prospective cohort study	37	65-77 years	MNA-SF	- COPD patients at risk of malnutrition had significantly higher osteoporosis rates and higher ucOC levels compared to well-nourished patients ($p = 0.007$, p

Authors	Country	Study Design	N	Age Range	Screening Tools	Results
						= 0.030). - MNA-SF is effectively linked to osteoporosis and bone metabolism markers in COPD patients.
Stephenson et al., 2022	Australia	Retrospective study	86	54-90 years	MNA® (Full Form), BMI & FFMI	- MNA® is more effective than BMI or FFMI in detecting malnutrition or nutritional risk in outpatient COPD patients. - MNA® provides additional, more comprehensive nutritional information, especially for patients with normal BMI or FFMI but who are at risk for malnutrition.

DISCUSSION

The Mini Nutritional Assessment (MNA) has been proven effective in assessing the risk of malnutrition in patients with Chronic Obstructive Pulmonary Disease (COPD) (Chung et al., 2024; Di Raimondo et al., 2024; Fujita et al., 2023; Hsu et al., 2014; Kaluźniak-Szymanowska et al., 2022; Kawai et al., 2023; Stephenson et al., 2022). Studies indicate that MNA plays a crucial role in evaluating the nutritional condition of patients, particularly among the elderly. With the use of the Full Form, Short Form, or culturally adapted versions of the MNA, healthcare providers can quickly and accurately identify the risk of malnutrition in patients.The MNA evaluates various dimensions of nutritional status, including anthropometric measurements, general health, eating habits, and self-perception of nutrition, providing a holistic view of an individual's nutritional health. The tool is an easy-to-use, efficient solution for overcoming barriers in assessing the nutritional status of patients who are difficult to identify at an early stage (Montesanto et al., 2019; Nasir et al., 2022).

In comparison with other tools, the MNA-SF demonstrated good predictive value for assessing the nutritional status of COPD patients, with sensitivity (58.3%). In contrast, the MUST and NRS-2002 questionnaires showed poor sensitivity (47.9% for both) but had better specificity (92.1%), and accuracy was best for MNA-SF (AUC 0.84) (Kaluźniak-Szymanowska et al., 2022). Other studies also demonstrated MNA's effectiveness in assessing the nutritional status of elderly and young adult populations with other chronic diseases, such as Parkinson's disease. MNA was able to distinguish patients' nutritional status based on BMI, with good reliability (Cronbach’s alpha value of 0.70), indicating that MNA is a consistent and applicable tool for identifying malnutrition (Ghazi et al., 2015).The effectiveness of MNA in assessing the nutritional status of COPD patients has been confirmed, particularly through the strong correlation between MNA scores and various anthropometric indicators and pulmonary function related to nutritional status (Hsu et al., 2014). Nutritional assessment using MNA is more effective than BMI and FFMI in detecting patients at risk of malnutrition, especially for those with normal BMI or FFMI. MNA® provides additional, comprehensive nutritional information, which is crucial for patients who might have normal BMI or FFMI but are still at risk of malnutrition (Stephenson et al., 2022). This is because BMI and FFMI only measure specific aspects of nutritional status, such as weight relative to height (BMI) or fat-free mass (FFMI), without considering other factors like diet quality, muscle mass, and body function, all of which are directly related to nutritional status. Additionally, MNA includes factors such as functional status, psychological condition, and self-perception of health, which are often undetected by other screening methods, thus providing a more complete and accurate picture of malnutrition risk, particularly in elderly populations more vulnerable to malnutrition (Jaglarz-Biały et al., 2024).

Another advantage of MNA as a nutrition screening tool is its ability to be used effectively as an indicator of nutritional status in COPD patients, as well as a predictor related to disease severity and quality of life. Patients with low MNA scores are at greater risk for muscle mass

and lean body mass decline. MNA scores are also strongly correlated with disease severity, with low scores being closely related to worsening clinical conditions based on radiological findings (Chung et al., 2024). For subjects at risk or with existing malnutrition, MNA can predict the risk of moderate to severe acute exacerbations of COPD (Di Raimondo et al., 2024). MNA can also be used to assess the risk of osteoporosis in COPD patients, where patients at risk of malnutrition are more likely to experience osteoporosis. COPD patients at risk of malnutrition exhibited significantly higher osteoporosis levels and higher ucOC values compared to well-nourished patients ($p = 0.007$, $p = 0.030$) (Fujita et al., 2023). Previous studies have also highlighted the superiority of MNA in detecting malnutrition in COPD patients compared to other methods like the Subjective Global Assessment (SGA). MNA can identify more patients at risk of malnutrition (up to 65%) and has higher sensitivity in detecting early nutritional declines, allowing for faster and more accurate nutritional interventions, particularly for elderly patients with COPD (Yuceege et al., 2014).

In the seven studies reviewed, the sample age ranged from 55-90 years, categorizing them as elderly. The prevalence of malnutrition in elderly COPD patients was found to be 20%, with 47.5% at risk of malnutrition (Di Raimondo et al., 2024). MNA is a sensitive screening tool for the elderly population, who are at higher risk of malnutrition due to physical, psychological, and medical changes associated with aging. Elderly individuals often face reduced appetite, digestive problems, and physical limitations that affect their nutritional intake. Additionally, cognitive and psychosocial factors, such as dementia or loneliness, can also impact eating habits (Meneses et al., 2023). MNA provides questions covering these aspects concisely, making it easier for healthcare providers to conduct efficient nutritional assessments, especially in elderly populations with COPD.

CONCLUSION

The Mini Nutritional Assessment (MNA) has proven to be effective in detecting the risk of malnutrition in COPD patients, with a significant correlation between MNA scores and disease prognosis, as well as other health outcomes. MNA can be used in both the full version (MNA) and the short version (MNA-SF), both of which have high sensitivity in detecting malnutrition in COPD patients. Research shows that MNA-SF has the ability to identify the risk of malnutrition and correlates with the severity of the patient's condition, including the risk of exacerbations and other complications. Additionally, MNA-SF also shows potential in detecting other health issues related to malnutrition, such as osteoporosis in COPD patients, which is often undetected in standard examinations.This tool has also proven to be more sensitive compared to other screening tools, especially in the elderly population, who often face unique challenges related to appetite, physical decline, and chronic illnesses. MNA is a user-friendly tool with a short completion time, making it easier for nurses to assess the nutritional status of COPD patients and identify the risk of malnutrition, which could potentially worsen the patient's health condition.

REFERENCES

Chung, E., Park, Y., Lee, H. J., & Kang, Y. A. (2024). Usefulness of the mini nutritional assessment short-form for evaluating nutritional status in patients with nontuberculous mycobacterial pulmonary disease: a prospective cross-sectional study. BMC Infectious Diseases, 24(1), 1–10. https://doi.org/10.1186/s12879-024-09499-3

Collins, P. F., Nathan, A., Roberts, S., & Wilkinson, T. (2021). Effective nutrition support for patients with chronic obstructive pulmonary disease: Managing malnutrition in primary care. British Journal of General Practice, 71(710), 427–428. https://doi.org/10.3399/bjgp21X717053

Di Raimondo, D., Pirera, E., Pintus, C., De Rosa, R., Profita, M., Musiari, G., Siscaro, G., & Tuttolomondo, A. (2024). The Impact of Malnutrition on Chronic Obstructive Pulmonary Disease (COPD) Outcomes: The Predictive Value of the Mini Nutritional Assessment (MNA) versus Acute Exacerbations in Patients with Highly Complex COPD and Its Clinical and Prognostic Implications. Nutrients, 16(14), 1–13. https://doi.org/10.3390/nu16142303

Fujita, Y., Yoshikawa, M., Yamauchi, M., Yamamoto, Y., Osa, T., Sakaguchi, K., Fujioka, N., Ibaraki, T., & Muro, S. (2023). Mini Nutritional Assessment Short-Form as screening tool for osteoporosis in patients with chronic obstructive pulmonary disease. Asia Pacific Journal of Clinical Nutrition, 32(1), 13–18. https://doi.org/10.6133/apjcn.202303_32(1).0003

Griffin, A., McGarry, S., Moloney, C., & Galvin, R. (2021). Diagnostic accuracy of the Mini Nutritional Assessment – Short Form to identify malnutrition among older adults: protocol for a systematic review and meta-analysis. HRB Open Research, 4(July), 83. https://doi.org/10.12688/hrbopenres.13358.1

Hsu, M. F., Ho, S. C., Kuo, H. P., Wang, J. Y., & Tsai, A. C. (2014). Mini-nutritional assessment (MNA) is useful for assessing the nutritional status of patients with chronic obstructive pulmonary disease: A cross-sectional study. COPD: Journal of Chronic Obstructive Pulmonary Disease, 11(3), 325–332. https://doi.org/10.3109/15412555.2013.863274

Jaglarz-Biały, K., Stanisław, K., & Konturek, A. (2024). Screening of nutritional status – characteristics of Nutritional Screening Tools in everyday medical practice. Index Coperincus International. https://doi.org/10.5604/01.3001.0054.8164

Kaluźniak-Szymanowska, A., Krzymińska-Siemaszko, R., Deskur-śmielecka, E., & Wieczorowska-Tobis, K. (2022). Optimal Assessment of Nutritional Status in Older Subjects with the Chronic Obstructive Pulmonary Disease—A Comparison of Three Screening Tools Used in the GLIM Diagnostic Algorithm. International Journal of Environmental Research and Public Health, 19(3). https://doi.org/10.3390/ijerph19031025

Kawai, T., Asai, K., Miyamoto, A., Yamada, K., Furukawa, Y., Toyokura, E., Nishimura, M., Sato, K., Watanabe, T., & Kawaguchi, T. (2023). Distinct contributions of muscle mass and strength stratified by nutritional status to physical activity in patients with chronic obstructive pulmonary disease. Respiratory Investigation, 61(4), 389–397. https://doi.org/10.1016/j.resinv.2023.03.001

Kemenkes. (2022, Agustus 31). Deteksi Dini Penyakit Paru Obstruktif Kronis. Retrieved September 30, 2024, from https://p2ptm.kemkes.go.id/kegiatan-p2ptm/dki-jakarta/workshop-deteksi-dini-penyakit-paru-obstruktif-kronik-4-regional-dilaksanakan-30-agustus-sd-2-september-2022-ikutilah-jangan terlewat#:~:text=Saat%20ini%2C%20lebih%20dari%2065%20juta%20penduduk%20Indon

Kemenkes. (2021, November 23). Merokok, Penyebab Utama Penyakit Paru Obstruktif Kronik. Retrieved September 30, 2024, from Penyakit Paru Obstruktif Kronik: https://kemkes.go.id/id/rilis-kesehatan/merokok-penyebab-utama-penyakit-paru-obstruktif-kronis

Meneses, A., Silva, C., Pinho-Reis, C., & Guerra, R. S. (2023). Mini nutritional assessment-short form test: criterion and predictive validity in older adults from a long-term care unity. Nutricion Hospitalaria, 40(4), 763–770. https://doi.org/10.20960/nh.04356

Momtazmanesh, S., Moghaddam, S. S., Ghamari, S. H., Rad, E. M., Rezaei, N., Shobeiri, P., Aali, A., Abbasi-Kangevari, M., Abbasi-Kangevari, Z., Abdelmasseh, M., Abdoun, M., Abdulah, D. M., Md Abdullah, A. Y., Abedi, A., Abolhassani, H., Abrehdari-Tafreshi, Z., Achappa, B., Adane, D. E. A., Adane, T. D., … Farzadfar, F. (2023). Global burden of chronic respiratory diseases and risk factors, 1990–2019: an update from the Global Burden of Disease Study 2019. EClinicalMedicine, 59(10). https://doi.org/10.1016/j.eclinm.2023.101936

Montesanto, A., D'Aquila, P., Rossano, V., Passarino, G., & Bellizzi, D. (2019). Mini Nutritional Assessment Scores Indicate Higher Risk for Prospective Mortality and Contrasting Correlation With Age-Related Epigenetic Biomarkers. Frontiers in Endocrinology, 10(October), 1–7. https://doi.org/10.3389/fendo.2019.00672

Nasir, K., Sultan, S., Qureshi, R., Dhrolia, M., & Ahmad, A. (2022). Mini Nutritional Assessment (MNA) as a Reliable Tool for Nutritional Assessment of Hemodialysis Patients: A Single-Center Observation. Cureus, 14(1), 4–11. https://doi.org/10.7759/cureus.21024

Nozawa, Y., Nishitani-Yokoyama, M., Shimada, K., Kasuya, H., Kunimoto, M., Fujiwara, K., Doi, M., Sato, Y., Nishimura, J., Xu, J., Abulimiti, A., Tabata, M., & Minamino, T. (2023). Nutritional Status in Patients Undergoing Phase II Cardiac Rehabilitation by Mini Nutritional Assessment. Cardiology Research, 14(2), 133–141. https://doi.org/10.14740/cr1479

Panel, multi-professional consensus. (2023). 3rd EDITION Managing Malnutrition in COPD. 2016(June 2016), 1–12. www.bapen.org.uk/pdfs/must/must_full.pdf

Ruvuna, L., & Sood, A. (2020). Epidemiology of Chronic Obstructive Pulmonary Disease. Clinics in Chest Medicine, 41(3), 315–327. https://doi.org/10.1016/j.ccm.2020.05.002

Serón-Arbeloa, C., Labarta-Monzón, L., Puzo-Foncillas, J., Mallor-Bonet, T., Lafita-López, A., Bueno-Vidales, N., & Montoro-Huguet, M. (2022). Malnutrition Screening and Assessment. Nutrients, 14(12), 1–30. https://doi.org/10.3390/nu14122392

Stephenson, H., Roberts, M., Klimkeit, E., & Smith, T. (2022). Uncovering undernutrition in chronic obstructive pulmonary disease: Beyond body mass index. Respiratory Medicine, 205(July), 107026. https://doi.org/10.1016/j.rmed.2022.107026

Torbahn, G., Strauss, T., Sieber, C. C., Kiesswetter, E., & Volkert, D. (2020). Nutritional status according to the mini nutritional assessment (MNA)® as potential prognostic factor for health and treatment outcomes in patients with cancer - a systematic review. BMC Cancer, 20(1), 594. https://doi.org/10.1186/s12885-020-07052-4

Yuceege, M., SO Salman, Duru, S., YM Saygıdeğer, Sonmez, Z., & Ardıç, S. (2014). 【Pubmed非掲載？】The Evaluation of Nutrition in Male COPD Patients Using Subjective Global Assessment and Mini Nutritional Assesment. International Journal of Internal M Edicine, 1, 1–5. https://doi.org/10.5923/j.ijim.20130201.01