

Nursing assessment and management of nutrition in older people with cancer: An integrative review

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**Nursing Assessment and Management of Nutrition in Older People with Cancer: An Integrative
Review**

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Abstract

Background: There is a risk of malnutrition when older people are diagnosed with cancer, highlighting the need for nutritional assessments and appropriate management to be undertaken by healthcare professionals including nurses. The absence of a standardised assessment method and management of nutrition in older people creates a gap in clinical practice and warrants further research.

Aim: The aim of this review was to explore the current nutritional assessment methods and evidence-based interventions for improving nutritional outcomes in older people with cancer.

Methods: An integrative literature review was conducted using electronic databases. Papers were limited to those published in English between 2009 and 2021. Search terms included older adult, elder, geriatric, senior, cancer, nutrition, malnutrition, hospital, and inpatient across four databases: Embase, CINAHL, MEDLINE, and Scopus. Using the inclusion and exclusion criteria, 303 articles were screened. A Mixed Methods Appraisal Tool (MMAT) (2018) was used for quality appraisal. Concept analysis explored themes across the included articles.

Findings: The themes from the analysis of ten primary research articles, which included 5,327 participants were, (1) types of nutritional assessment; and (2) management of older people with cancer. The main nutritional assessment scales used were the Mini Nutrition Assessment and Patient-Generated Subjective Global Assessment.

Conclusion: The completion of a comprehensive nutritional assessment by health professionals, including nurses, could facilitate early dietary intervention in older persons with cancer. This would enable supportive dietary advice and supplementation to improve health outcomes.

Keywords: nutritional assessment; malnutrition management; elderly; cancer nursing; nutritional risk status; literature review.

Nursing Assessment and Management of Nutrition in Older People with Cancer: An Integrative Review

The incidence of cancer is increasing, primarily due to the ageing population. The estimated number of new cases in people aged 65 and older is expected to increase from 9.95 million in 2020 to 18.6 million in 2040 (Botero et al., 2019; World Health Organization, 2021). People with cancer aged 65 and older are predisposed to a range of comorbidities, including hypertension, heart disease, dyslipidemia and diabetes (Australian Institute of Health and Welfare, 2021; Davis et al., 2011). Malnutrition is known to be one of the most serious comorbidities that influence the trajectory of cancer-related symptoms (Botero et al., 2019). Malnutrition or undernutrition is defined as “a state resulting from lack of intake or uptake of nutrition that leads to altered body composition and body cell mass leading to diminished physical and mental function and impaired clinical outcomes from disease” (European Society for Clinical Nutrition and Metabolism, 2021, p. 51). Further, malnutrition rates in older people with cancer are between 30-80% (Mostame et al., 2019) with this reported as a prognostic indicator for poorer health outcomes in people with cancer. These health outcomes include, declining survival rates, quality of life, and increased risk of treatment toxicities (Botero et al., 2019). Evidence suggests nutritional assessments, such as validated nutritional assessment tools, are essential in identifying poor nutrition in older people with cancer (Arends et al., 2017). Various nutritional assessment tools are used for identification of malnutrition including the Mini Nutritional Assessment (MNA) and the Body Mass Index (BMI). The MNA assesses the patient’s weight loss, food consumption, age, BMI, and disease severity; while the BMI is used to provide a baseline for nutritional level measures in kg/m^2 (European Society for Clinical Nutrition and Metabolism, 2021; Zhang et al., 2018). However, there is no currently formalised clinical standard for measuring nutrition and the severity of poor nutrition in older people with cancer.

Malnutrition has a strong connection to other illnesses often developing due to the activation of systemic inflammation by diseases, including cancer (Arends et al., 2017). For older people with cancer, malnutrition is common, producing negative health impacts. These include increased infection rates, falls, mortality rates, morbidity rates, and hospitalisations leading to increased healthcare costs

(Zhang et al., 2018). Early identification of malnutrition and providing nutritional information tailored to the individual enables better health outcomes, including optimum nutritional intake and improved quality of life related to the ability to engage in social behaviors. Therefore, developing a targeted assessment and management approach that identifies malnutrition in older people with cancer before extreme nutritional deficit occurs, could lead to better health outcomes, including potentially reducing inflammation and improving quality of life.

The negative impact of malnutrition within the older cancer population further highlights the need for early tailored assessment and management guidelines (Magnuson et al., 2018). Oncology nurses are in a key position to complete early assessments and begin nutritional management (ten Cate et al., 2020). Interventions to manage malnutrition in older people with cancer include nutritional referrals to healthcare experts, assessment of oral hygiene, dental health, provision of meals and nutritional supplements (Magnuson et al., 2018). In addition, early nutritional assessment in older people with cancer is important as it allows for tailored treatment and support, leading to improved health outcomes (Mostame et al., 2019).

Despite the prevalence of cancer in older people and the risk of comorbid malnutrition, there is a paucity of evidence-based research to guide the appropriate assessment and management of malnutrition within this population (Arends et al., 2017). This integrative review examines the available evidence regarding nutritional assessment and management for older people with cancer.

Method

An integrative review framework was used to conduct a comprehensive examination of nutritional assessment and malnutrition management in older people with cancer (Whittemore & Knafl, 2005). An integrative review was chosen as it follows a comprehensive and systematic approach when searching both quantitative and qualitative literature. The five stages of an integrative review were completed: (i) problem identification, (ii) literature search, (iii) data evaluation, (iv) data analysis, and (v) presentation of findings (Whittemore & Knafl, 2005). The literature review protocol was published in PROSPERO CRD42019119177. The research question explored was: What are the

current nutritional assessment methods and evidence-based interventions that reduce poorer nutritional outcomes in older people with cancer?

Review Strategy

The main author [DN] conducted a systematic literature search in consultation with a health librarian in December 2021 using CINAHL, EMBASE, Scopus, Medline, and Google Scholar. Search terms were developed from the research question using PICO (population, intervention, comparison, outcome). The European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines developed in 2009 provide general guidelines for the management of malnutrition thus provides a starting point to understand current evidence-based practice (European Society for Clinical Nutrition and Metabolism, 2021). The search was conducted from January 2009 to December 2021 to review clinical practice over time concerning assessing and managing malnutrition in older people with cancer. Key terms and MESH terms included ‘cancer’ AND ‘elder*’ OR ‘older’ OR ‘geriatric’ OR ‘senior’ AND ‘nutrition’ OR ‘malnutrition’ AND ‘hospital’ OR ‘inpatient’.

Data Extraction

All included studies were directly downloaded from the databases into an online EndNote Library© X9. Duplicates were removed using Endnote function. The titles and abstracts were systematically searched using Endnote against the inclusion criteria by one reviewer () and the Griffith University health librarian (see table 1). The next stage was a full-text review by four independent reviewers [DN, CR, ML, EC] to identify the final articles to be included. Extracted data included author, year, design, sample, aims, instruments, findings, limitations, and themes. The data extraction followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement (Page et al., 2021).

Table 1 here

Quality Assessment

The Mixed Methods Appraisal Tool (MMAT) was used to undertake a quality assessment of the final selected studies (Hong et al., 2018). Following data extraction, the MMAT (2018) was used to appraise the methodological quality of published quantitative, qualitative and mixed methods

articles based on empirical data (Hong et al., 2018). The MMAT was used to assess and grade heterogeneous studies along with various research designs. Following the data analysis process of the MMAT the studies were critiqued relative to design, methods and study details, including aims, ethical considerations, sample population and size, interventions and outcome measures (Pluye & Hong, 2014). The MMAT results are presented as indications of the research quality. Research has supported the validity, reliability, and efficiency of the MMAT tool (Pace et al., 2012; Pluye & Hong, 2014). Four reviewers [DN, CR, ML, EC] independently appraised the studies, then results were compared for differences, and disagreements were resolved through consensus of the team.

Data Analysis

A concept analysis was completed by three reviewers [DN, CR, EC] to develop themes. This type of analysis aims to analyse the basic elements of a concept by exploring existing knowledge (Delves-Yates et al., 2018). This included taking concepts from one article and recognising the same concepts in another article, even though they may not be expressed using identical words. This process includes identifying different use of the concept, attributes, a model case, a borderline, similarities, differences, antecedents, and consequences. A fourth author (ML) mediated any discrepancy in opinion (Walker & Avant, 2005).

Results

The initial online literature search yielded 303 results; ten studies were included in the final review (see Figure 1). The included studies were all quantitative and published between 2009 and 2021 (see Table 2). Final studies described data obtained from over 4888 people in six countries, including Brazil (Martucci et al., 2017), China (Zhang et al., 2013; Zhang et al., 2012; Zhang et al., 2021), Egypt (Abd Allah et al., 2020), France (Bourdel-Marchasson et al., 2014; Lacau St Guily et al., 2018), Japan (Yanagi et al., 2017), Spain (Sobrini et al., 2021), and the United States of America (Yanagi et al., 2017). The largest study sample was from France (N = 2197) (Bourdel-Marchasson et al., 2014), the smallest from Spain (N = 40) (Sobrini et al., 2021). The studies included one Randomised Controlled Trial (RCT) (Bourdel-Marchasson et al., 2014) and nine observational

studies, including four cohort studies (Barao et al., 2017; Martucci et al., 2017; Sobrini et al., 2021; Zhang et al., 2021), one cross-sectional study (Lacau St Guily et al., 2018), and four descriptive quantitative studies (Abd Allah et al., 2020; Yanagi et al., 2017; Zhang et al., 2013; Zhang et al., 2012).

The demographics for the sample across all the studies identified a mean age of 72 years ranging from 65 to 85 years, the sample sizes ranged from 40 to 2197 with a mean sample size of 488 participants. The studies covered general cancer (Abd Allah et al., 2020; Bourdel-Marchasson et al., 2014; Lacau St Guily et al., 2018; Martucci et al., 2017; Sobrini et al., 2021; Zhang et al., 2021) or specific types of cancer, including colorectal cancer (Barao et al., 2017), lung cancer (Zhang et al., 2013; Zhang et al., 2012), and head and neck tumours (Yanagi et al., 2017).

Insert Figure 1 here

Insert Table 2 here

Quality Assessment

The quality assessment of articles within this paper was completed using the 2018 version of the MMAT (Hong et al., 2018) and the methodologies identified were quantitative and varied. (See Table 2 for summary). Bourdel-Marchasson et al. (2014) provided clear description of randomisation and sample allocation ensuring transparency of the study. Bourdel-Marchasson et al. (2014); Martucci et al. (2017); Zhang et al. (2012) had a small sample size and examined a limited number of cases reducing their ability to be generalised. All studies were included after comparing their designs and the significance of their results (Hong et al., 2018).

Themes

From the ten studies, two themes were identified, types of nutritional assessment and nutritional management in older people with cancer.

Types of Nutritional Assessment

The final included studies revealed no consistent process to diagnose and measure malnutrition in older people with cancer. All the studies undertook assessment and management interventions at different points of care (ambulatory and inpatients) using different healthcare

professionals including dietitians, and nurses (Barao et al., 2017; Bourdel-Marchasson et al., 2014; Martucci et al., 2017; Yanagi et al., 2017; Zhang et al., 2013). The measurement of malnutrition was not consistent across all the studies. Weight loss and BMI were the main measures of nutritional assessment (See Table 2) (Barao et al., 2017; Lacau St Guily et al., 2018). The studies highlighted the need to enable a clear understanding of nutritional status, particularly using more than one measurement other than BMI (Martucci et al., 2017). Zhang et al. (2013) outlined that the MNA tool is a valid and reliable tool for elderly people. It was noted that when the Mini Nutritional Assessment (MNA) tool, or its short form (MNA-SF) were used, there was a better chance of implementing nutritional management earlier in this population (Yanagi et al., 2017). Barao et al. (2017) emphasised the necessity of conducting routine assessments to monitor changes in nutritional status over time. One comprehensive nutritional assessment tool, the Patient-Generated Subjective Global Assessment (PG-SGA), provided a preliminary evaluation of the survival rate of older people with cancer (Barao et al., 2017). The MNA assessed nutritional risk by identifying appetite, weight loss, BMI, age, disease complexity, and the client's fragility (Zhang et al., 2012). However, it was found to be limited when a person has poor cognitive status, depression or low health literacy and when they cannot respond to questions accurately (Zhang et al., 2013). Whereas, early assessment, identification of risk factors, and tailored nutritional advice completed by nurses, instead of only conducting a BMI assessment, was found to improve patients' health outcomes including survival rates and quality of life (Martucci et al., 2017).

Nutritional Management of Older People with Cancer

For older people with cancer, the management of malnutrition in this population falls into two major categories a) nutritional counselling (face-to face-interviewing, dietary advice, and family involvement) and b) nutritional supplementation, enteral or parenteral feeding see table 3) (Lacau St Guily et al., 2018; Yanagi et al., 2017). In relation to nutritional counselling, it was found early assessment enabled tailored nutritional advice which improved health outcomes and reduced the risk of complications such as infection (Bourdel-Marchasson et al., 2014; Zhang et al., 2012).

However, when recommending nutritional supplementation, enteral or parenteral feeding, physicians often underestimated the impact of malnutrition on the older person's health outcomes, thus in most cases clinicians only offered oral supplementation (Lacau St Guily et al., 2018). A RCT conducted by Bourdel-Marchasson et al. in 2014 found the health outcomes were the same when providing enteral feeding to people with the same cancer type. These outcomes included infection rates, changes in weight, nutritional prescriptions, and other hospitalisations. Bourdel-Marchasson et al. (2014) found nutritional advice given by a dietician in a cancer treatment setting, explaining the nutritional value of food and improving nutritional intake, was more beneficial than oral nutritional supplements, in terms of controlling cancer treatment outcomes. Martucci et al. (2017) reported the need for integrating a nutritional care plan for best practice geriatric care and included identifying any comorbidities such as diabetes and cancer.

Insert Table 3 here

Discussion

This review identified the high risk of malnutrition for older people with cancer and the lack of a consistent approach to assessment and management to improve nutritional status. Research by Abd Allah et al. (2020) in an oncology hospital setting, reported health risks (including comorbidities) were related to malnutrition in older people. Also older people with cancer were found to report weight loss, however, were unlikely to realise their risk of malnutrition (Yanagi et al., 2017). Moreover, it was indicated that the risk of malnutrition was related to poor health literacy or poor nutritional knowledge and personal values, resulting in older people not realising their risk of becoming malnourished (Abd Allah et al., 2020). Malnutrition risk was also exacerbated in older people with cancer, especially for those who were undertaking cancer treatment/s. This is due to many factors including loss of appetite and loss of taste (Arends et al., 2017), leading to an increase in the inability of this population to tolerate chemotherapy treatment. Additionally, a deterioration in health status due to malnutrition, results in a higher risk of mortality (Barao et al., 2017). These factors contribute to the complexities associated with treating older people with cancer.

This integrative review found four main assessment tools are used, MNA, MNA-SF, PG-SGA, and GLIM. Management strategies to improve nutrition included nutritional supplements, counselling, multidisciplinary support. Although not specific to the elderly population with cancer, the Clinical Oncology Society of Australia (COSA) position statement addresses the general cancer population and supports the findings of this review (Clinical Oncological Society of Australia, 2022). The COSA statement identifies that a standardised assessment tool would enable nurses to assess and tailor supportive care, as well as link patients to a diverse range of allied health professionals to help manage malnutrition in the older population (Bourdel-Marchasson et al., 2014; Lacau St Guily et al., 2018; Martucci et al., 2017). The MNA was valid and reliable for nurses to use for measuring nutritional status (ten Cate et al., 2020) and is also useful for alerting nurses to the need for supportive and tailored dietician referral interventions (Mislant et al., 2018). The MNA tool has a high sensitivity and moderate specificity in assessing the risk of malnutrition in the elderly by 80% Sobrini et al. (2021). The Global Leadership Initiative on Malnutrition (GLIM) Assessment, compared to the MNA-SF, was only able to identify 57.5% of the sample within the study as at risk of malnutrition (Sobrini et al., 2021). Zhang et al. (2021) found that the GLIM assessment tool is the most effective tool for identifying malnutrition in elderly patients with gastrointestinal tumors only. The MNA continues to be more effective than GLIM for older people with cancer.

The MNA was found to be an effective tool for nurses in identifying malnutrition in older people with cancer. However, it was also found that providing nutritional care for patients with low health literacy, depression, or cognitive issues, was challenging for nurses due to the lack of evidence-based information for this population (Ten Cate et al., 2020; Zhang et al., 2013). The MNA is the most commonly used nutritional assessment tool, however, for the older population, where psychosocial [depression and social isolation] and physical factors [functional and movement] are concerns, the tool did not enable an accurate identification of malnutrition (Zhang et al., 2013). This demonstrates the need for a more comprehensive tool that considers psychological status, health literacy, pre-existing nutritional knowledge and personal values concerning nutrition (Arends et al., 2017; Mislant et al., 2018).

Once the nutritional assessment is complete, early intervention for the management of malnutrition is vital (Bourdel-Marchasson et al., 2014). An RCT conducted by Bourdel-Marchasson et al. (2014) found that nutritional counselling provided by healthcare professionals regarding appropriate intake was beneficial in improving nutritional status for older people with cancer. The assessment of nutrition in this population should also be supported with nutritional management including oral supplements, enteral nutrition, or parenteral nutrition (Lacau St Guily et al., 2018). These have been used in the general population but are not commonly used for older people with cancer (Lacau St Guily et al., 2018). The literature lacked clarity about a standardised nutritional management intervention for older people with cancer, that can guide decision-making for starting nutritional supplements for health professionals, including dietitians and nurses. Whilst nutritional counselling was effective in increasing intake for older people with cancer, there was little correlation found between improving intake and overall treatment outcomes such as survival rates (Bourdel-Marchasson et al., 2014).

The inconsistent nutritional management in this population could also be related to the underestimation by physicians and clinicians alike of the impact of malnutrition on quality of life, such as, the ability to self-care (Arends et al., 2017; Lacau St Guily et al., 2018; Martucci et al., 2017). Optimal nutritional management involves healthcare professionals including nurses and dietitians within cancer treatment centres to consider the individual and their psychological or neuropsychological situation (Zhang et al., 2013).

Strengths and Limitations

The strength of this integrative review is that a broad range of current literature was critically analysed to identify the nutritional assessment and management of malnutrition in older people with cancer by healthcare professionals within cancer treatment centres. A limitation identified in this review was the lack of consistency for best nutritional assessments for the older cancer population. There was a lack of high-level research, RCTs hence, caution should be taken when generalising the results of this review, due to the limited availability of quality evidence, in this area of research.

Recommendations

This review demonstrated that there is a lack of evidence for nutritional assessment and management for older people with cancer. This indicates there is an urgent need for more robust research involving randomised controlled trials in this high-risk population. Future research should aim to develop a clear definition of malnutrition and validated nutritional assessment tools that better inform healthcare professionals, including nurses, of the appropriate nutritional assessment and management needs for older people with cancer. In addition, the future development of comprehensive and individualised nutritional assessment tools should consider the psychological status and health literacy of older people with cancer. A recommendation from this review is for nurses to conduct a nutritional assessment using the current Mini Nutritional Assessment combined with health assessment and begin the process of tailoring nutritional management for older persons with cancer.

Conclusion

Malnutrition is prevalent in older people with cancer, especially for those who are undertaking cancer treatment/s. This review identified that nutrition assessment was not routinely completed in older people and highlighted the need for nutritional management plans to improve health outcomes for older people with cancer. The MNA is the most utilised nutritional assessment tool, however, for the older population, where psychosocial and physical factors are concerns, the tool did not enable an accurate identification of malnutrition. The assessment of nutrition in this population should also be supported with nutritional management including oral supplements, enteral nutrition, or parenteral nutrition. These have been used in the general population but are not usually used for older people with cancer. Whilst an individualised and comprehensive nutritional plan may not reduce the mortality rate from cancer, it was found to enhance the quality of life for this population. More robust RCTs are urgently needed to confirm the best nutritional assessment and management for older people with cancer.

Disclosure of Interest

The authors report no conflict of interest, and no funding was received for this research project. There is no data set involved in this project.

References

- Abd Allah, E. S., Gad, H. M. M., & Abdel-Aziz, H. R. (2020). Nutritional status and its contributing factors among older adults with cancer receiving chemotherapy. *Clinical Nursing Research*, 29(8), 650-658. <https://doi.org/10.1177/1054773820947953>
- Arends, J., Baracos, V., Bertz, H., Bozzetti, F., Calder, P., Deutz, N., . . . Lobo, D. (2017). ESPEN expert group recommendations for action against cancer-related malnutrition. *Clinical Nutrition*, 36(5), 1187-1196. <https://doi.org/10.1016/j.clnu.2017.06.017>
- Australian Institute of Health and Welfare. (2021). *Cancer in Australia 2019*. <https://www.aihw.gov.au/reports/cancer/cancer-in-australia-2019/data>
- Barao, K., Abe Vicente Cavagnari, M., Silva Fucuta, P., & Manoukian Forones, N. (2017). Association between nutrition status and survival in elderly patients with colorectal cancer. *Nutrition in Clinical Practice*, 32(5), 658-663. <https://doi.org/10.1177/0884533617706894>
- Botero, L., Agarwal, E., Berry, R., Gillespie, K., Isenring, E., & McCarthy, A. L. (2019). Nutrition risk and mortality in older oncology patients: An exploratory study. *Nutrition & Dietetics*. <https://doi.org/10.1111/1747-0080.12547>
- Bourdel-Marchasson, I., Bourdel-Marchasson, I., Blanc-Bisson, C., Blanc-Bisson, C., Doussau, A., Doussau, A., . . . Fonck, M. (2014). Nutritional advice in older patients at risk of malnutrition during treatment for chemotherapy: a two-year randomized controlled trial. *PLoS One*, 9(9), e108687. <https://doi.org/10.1371/journal.pone.0108687>
- Clinical Oncological Society of Australia. (2022). *Evidence-based practice guidelines for the nutritional management of adult patients with head and neck cancer*. https://wiki.cancer.org.au/australia/COSA:Head_and_neck_cancer_nutrition_guidelines
- Davis, J. W., Chung, R., & Juarez, D. T. (2011). Prevalence of comorbid conditions with aging among patients with diabetes and cardiovascular disease. *Hawai'i Medical Journal*, 70(10), 209-213. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3215980/>
- Delves-Yates, C., Stockl, A., & Moore, J. (2018). Making sense of concept analysis. *Nurse Research*, 25(4), 43-46. <https://doi.org/10.7748/nr.2018.e1503>
- European Society for Clinical Nutrition and Metabolism. (2021). *ESPEN Guidelines*. <https://www.espen.org/guidelines-home/espen-guidelines>
- Hong, Q. N., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., . . . Pluye, P. (2018). The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. *Education for Information*, 34, 285-291. <https://doi.org/10.3233/EFI-180221>
- Lacau St Guily, J., Bouvard, É., Raynard, B., Goldwasser, F., Maget, B., Prevost, A., . . . Hebuterne, X. (2018). NutriCancer: A French observational multicentre cross-sectional study of malnutrition in elderly patients with cancer. *Journal of Geriatric Oncology*, 9(1), 74-80. <https://doi.org/10.1016/j.jgo.2017.08.003>
- Magnuson, A., Lemelman, T., Pandya, C., Goodman, M., Noel, M., Tejani, M., . . . Mohile, S. (2018). Geriatric assessment with management intervention in older adults with cancer: a randomized pilot study. *Supportive Care in Cancer*, 26(2), 605-613. <https://doi.org/10.1007/s00520-017-3874-6>
- Martucci, R. B., Barbosa, M. V., D'Almeida, C., Rodrigues, V. D., Bergmann, A., De Pinho, N. B., & Thuler, L. C. S. (2017). Undernutrition as independent predictor of early mortality in elderly cancer patients. *Journal of Parenteral and Enteral Nutrition*, 41(2), 278. <https://doi.org/10.1177/0148607116686023>
- Mislang, A. R., Di Donato, S., Hubbard, J., Krishna, L., Mottino, G., Bozzetti, F., & Biganzoli, L. (2018). Nutritional management of older adults with gastrointestinal cancers: An

- International Society of Geriatric Oncology (SIOG) review paper. *Journal of Geriatric Oncology*, 9(4), 382-392. <https://doi.org/10.1016/j.jgo.2018.01.003>
- Mostame, P., Moharramipour, A., Hossein-Zadeh, G. A., & Babajani-Feremi, A. (2019). Statistical significance assessment of phase synchrony in the presence of background couplings: An ECoG study. *Brain Topography*, 32(5), 882-896. <https://doi.org/10.1007/s10548-019-00718-8>
- Pace, R., Pluye, P., Bartlett, G., Macaulay, A. C., Salsberg, J., Jagosh, J., & Seller, R. (2012). Testing the reliability and efficiency of the pilot Mixed Methods Appraisal Tool (MMAT) for systematic mixed studies review. *International Journal of Nursing Studies*, 49(1), 47-53. <https://doi.org/10.1016/j.ijnurstu.2011.07.002>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., . . . Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, 372, 71. <https://doi.org/10.1136/bmj.n71>
- Pluye, P., & Hong, Q. N. (2014). Combining the power of stories and the power of numbers: mixed methods research and mixed studies reviews. *Annual Review of Public Health*, 35, 29-45. <https://doi.org/10.1146/annurev-publhealth-032013-182440>
- Sobrini, P., Sánchez-Castellano, C., & Cruz-Jentoft, A. J. (2021). MNA-SF as a screening tool for malnutrition diagnosed with the glim criteria in older persons with cancer [Article]. *European Geriatric Medicine*, 12(3), 653-656. <https://doi.org/10.1007/s41999-020-00442-8>
- Ten Cate, D., Ettema, R. G. A., Huisman-de Waal, G., Bell, J. J., Verbrugge, R., Schoonhoven, L., & Schuurmans, M. J. (2020). Interventions to prevent and treat malnutrition in older adults to be carried out by nurses: A systematic review. *Journal of Clinical Nursing*, 29(11-12), 1883-1902. <https://doi.org/10.1111/jocn.15153>
- Walker, L. O., & Avant, K. C. (2005). *Strategies for theory construction in nursing* (Vol. 4). Pearson/Prentice Hall Upper Saddle River, NJ.
- Whittemore, R., & Knafl, K. (2005). The integrative review: updated methodology. *Journal of advanced nursing*, 52(5), 546-553. <https://doi.org/10.1111/j.1365-2648.2005.03621.x>
- World Health Organization. (2021). *Cancer tomorrow*. https://gco.iarc.fr/tomorrow/en/dataviz/isotype?age_start=13&single_unit=500000
- Yanagi, A., Murase, M., Sumita, Y. I., & Taniguchi, H. (2017). Investigation of nutritional status using the Mini Nutritional Assessment-Short Form and analysis of the relevant factors in patients with head and neck tumour. *Gerodontology*, 34(2), 227-231. <https://doi.org/10.1111/ger.12253>
- Zhang, L., Su, Y., Wang, C., Sha, Y., Zhu, H., Xie, S., . . . Lin, Y. (2013). Assessing the nutritional status of elderly Chinese lung cancer patients using the Mini-Nutritional Assessment (MNA®) tool. *Clinical Interventions in Aging*, 8, 287-291. <https://doi.org/10.2147/cia.s41941>
- Zhang, L., Wang, C., Sha, S. Y., Kwauk, S., Miller, A. R., Xie, M. S., . . . Wang, L. C. (2012). Mini-nutrition assessment, malnutrition, and postoperative complications in elderly Chinese patients with lung cancer. *Journal of Balkan Union of Oncology*, 17(2), 323-326. <http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L365200534>
- Zhang, X., Sun, M., McKoy, J. M., Bhulani, N. N. A., Valero, V., Barcenas, C. H., . . . Edwards, B. J. (2018). Malnutrition in older patients with cancer: Appraisal of the Mini Nutritional Assessment, weight loss, and body mass index. *Journal of Geriatric Oncology*, 9(1), 81-83. <https://doi.org/10.1016/j.jgo.2017.07.012>
- Zhang, X., Tang, M., Zhang, Q., Zhang, K.-P., Guo, Z.-Q., Xu, H.-X., . . . Cederholm, T. (2021). The GLIM criteria as an effective tool for nutrition assessment and survival prediction in older adult cancer patients. *Clinical Nutrition*, 40(3), 1224-1232. <https://doi.org/10.1016/j.clnu.2020.08.004>

