Mal J Nutr 28(1): 119-148, 2022

Development of nutrition screening guideline content for use by healthcare staffs in older adults in health clinic setting: A scoping review

Siti Nur Amirah Sheikh Hishamuddin[1], Aliza Haslinda Hamirudin[1*], Sakinah Harith[2], Mohd Aznan Md Aris[3], Karimah Hanim Abd Aziz[4], Iman Nabihah Noor Azam[1] & Nurul Syaireen A Rashid[5]

[1]*Department of Nutrition Sciences, Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Kuantan, Pahang, Malaysia*; [2]*School of Nutrition and Dietetics, Faculty of Health Sciences, Universiti Sultan Zainal Abidin, Kuala Terengganu, Terengganu, Malaysia*; [3]*Department of Family Medicine, Kulliyyah of Medicine, International Islamic University Malaysia, Kuantan, Pahang, Malaysia*; [4]*Department of Community Medicine, Kulliyyah of Medicine, International Islamic University Malaysia, Kuantan, Pahang, Malaysia*; [5]*Primary Health Care Unit, Pahang Health State Department, Kuantan, Pahang, Malaysia*

ABSTRACT

Introduction: Malnutrition, specifically undernutrition, in community-dwelling older adults reduces their well-being and predisposes to diseases. Therefore, timely malnutrition identification through nutrition screening is needed to identify at risk and malnourished patients. This study aimed to develop the content of nutrition screening guideline to facilitate healthcare staffs in health clinics to administer a validated nutrition screening tool specifically for older adults. **Methods:** A scoping review was conducted electronically using SCOPUS, PubMed, ProQuest Health & Medical Complete, and Cochrane databases. The systematic search was performed up to 31st December 2021. Search terms were created for identification of eligible and related articles. Inclusion and exclusion criteria were determined for the systematic search. The search was limited to English and Malay languages, and full text articles with no limitation of years. All data were extracted and analysed, guided by the PRISMA extension for scoping reviews (PRISMA-ScR). **Results:** From 728 identified articles, 18 articles were included in the analysis. Identified information for the guideline content were: introduction, aims and objectives, definition of malnutrition, prevalence of malnutrition, implementation of nutrition screening, guidance on administering items in validated tools, and guidance on anthropometric measurements. Meanwhile, format and flow charts from established guidelines served as references for the guideline development process. **Conclusion:** Appropriate content to develop a nutrition screening guideline has been identified based on this review. Development of a guideline based on this content can facilitate healthcare staffs to perform timely nutrition screening in older adults.

Keywords: healthcare staffs, malnutrition, nutrition screening guideline, older adults, scoping review

---

*Corresponding author: Dr. Aliza Haslinda Hamirudin
Department of Nutrition Sciences, Kulliyyah of Allied Health Sciences,
International Islamic University Malaysia, Jalan Sultan Ahmad Shah,
25200 Kuantan, Pahang, Malaysia.
Tel: (6)(09)5716400 Ext. 3370; Fax: (6)(09)5716776; E-mail: aliza@iium.edu.my
doi: https://doi.org/10.31246/mjn-2020-0117

INTRODUCTION

Older adults are susceptible to malnutrition due to physiological changes, side effects of medication, chronic diseases, functional decline (Mathew & Funderburg, 2007; Volkert, 2002), socioeconomic factors (Donini *et al.*, 2013; Eldardery, Mo'awad & Fouad, 2018), loneliness, depression, and anxiety (Kennelly *et al.*, 2010). Malnutrition has been defined as "a subacute or chronic state of nutrition, in which a combination of varying degrees of under- or over-nutrition and inflammatory activity have led to a change in body composition and diminished function" (Soeters *et al.*, 2008, p. 708). In this review, malnutrition is referred as undernutrition.

Malnutrition has been described as a 'silent crisis' in older adults because it often remains undetected (Davidson & Getz, 2004). According to the World Health Organization (WHO), the prevalence of malnutrition in older people living in the community ranges between 1.3% and 47.8% (WHO, 2017). Previous studies have shown percentages of 27% to 38% of older adults at risk and malnourished in community setting (Kaiser *et al.*, 2010; Volkert *et al.*, 2019; Winter *et al.*, 2013). Meanwhile, in Malaysia's community setting, the prevalence of malnutrition is between 34.0% to 48.9% and 42.2% to 66.6% of male and female older adults, respectively, having risk of malnutrition (Muhamad *et al.*, 2019; Suzana *et al.*, 2013; Zainudin *et al.*, 2019). If malnutrition is left untreated, it will lead to undesirable health effects. Malnourished older adults have high risk of mortality (Söderström *et al.*, 2017), poorer function, low quality of life (Eldardery *et al.*, 2018), and delayed wound healing (Ahmed & Haboubi, 2010).

Timely malnutrition identification and management are needed for patients and healthcare benefit (Brotherton *et al.*, 2011). Identification of malnutrition risk can be performed through nutrition screening. Nutrition screening is the first step in identifying patients who are at risk of nutritional problems or who have undetected malnutrition (Elia *et al.*, 2011; Mathew & Funderburg, 2007). Therefore, nutrition screening is advocated for malnutrition identification. However, malnutrition identification in community living older adults through nutrition screening in health clinics in Malaysia is not systematically performed; although it is recommended to be conducted routinely across all healthcare settings (Elia, Zellipour & Stratton, 2005). Due to this, malnutrition is still under-recognised and under-treated due to the absence of formal screening procedures in health clinic setting (Elia *et al.*, 2005; Kennelly *et al.*, 2010). Thus, malnutrition identification through nutrition screening is required for provision of appropriate nutritional care among at-risk and malnourished patients (Brotherton *et al.*, 2011).

There are many available validated nutrition screening tools - Mini Nutritional Assessment Short-Form (MNA-SF), Nutritional Risk Screening (NRS 2002), Malnutrition Universal Screening Tool (MUST), Elderly Nutrition Screening (ENS), Malnutrition Screening Tool (MST), Seniors in the Community: Risk Evaluation for Eating and Nutrition questionnaire I (SCREEN) and others (Hamirudin, Charlton & Walton, 2016). However, from all of these validated nutrition screening tools mentioned, MNA-SF has been identified as the most appropriate tool for older adults in community, based on its specificity and sensitivity (Philips *et al.*, 2010). Most importantly, it has been validated in Malaysia (Suzana & Siti Saifa, 2007).

Previous studies have discussed regarding barriers and opportunities to perform nutrition screening. Lack

of education and knowledge has been identified as one of the barriers (Craven *et al.*, 2017; Endevelt *et al.*, 2009; Hamirudin *et al.*, 2013; Vandewoude *et al.*, 2011). Therefore, opportunities need to be identified to ensure that nutrition screening can be routinely performed. Opportunities like providing education and knowledge related to nutrition screening have been highlighted as one of the enablers (Craven *et al.*, 2017; Endevelt *et al.*, 2009; Vandewoude *et al.*, 2011).

Guideline is defined as "systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific clinical circumstances" (Lohr & Field, 1992, p.2). Current established guidelines in the Malaysian health clinic setting are related to flow, system and policy (BPPK, 2015; IHSR, 2018). Besides, other available guidelines are related to guidance on how to perform community screening programme in health clinic operating areas (BPPK, 2013). To date, there is no comprehensive guideline specifically for malnutrition risk identification in the Malaysian health clinic setting. Thus, the development of nutrition screening guideline is needed for healthcare staffs to provide knowledge on nutrition screening procedures in older adults. Hence, this scoping review aimed to develop the content of nutrition screening guideline to facilitate healthcare staffs in health clinics to administer validated nutrition screening tool specifically for older adults.

MATERIALS AND METHODS

Study design

A scoping review is defined as a synthesis of knowledge that follows a systematic approach aimed to map particular topic, main concepts, theories, sources, and knowledge gaps (Tricco *et al.*, 2018). The development of this scoping review was guided by the PRISMA extension for scoping reviews (PRISMA-ScR) (Tricco *et al.*, 2018).

The scoping review was conducted to answer the research question comprehensively (Munn *et al.*, 2018). Therefore, identifying research question was the early stage in conducting a scoping review (Arksey & O'Malley, 2005; Tricco *et al.*, 2018). Scoping reviews are useful in answering much broader questions (Tricco *et al.*, 2018). In this study, the research question was "What are the suitable content that can be included to develop a nutrition screening guideline?". Besides, Arksey & O'Malley (2005) have suggested to develop and maintain a broad approach of research question and refine it in a collaborative research team; which has been the construct of this scoping review. The aim was to generate a breadth of coverage. In scoping reviews, inclusion of grey literature is based on research question and objective, which should be reported if done (Tricco *et al.*, 2018). Thus, to answer the primary question, identifying relevant studies through different sources (electronic databases and manual search) was performed in this scoping review.

Search strategy

Four electronic search engines; SCOPUS, PubMed, ProQuest Health & Medical Complete, and Cochrane were used to identify eligible articles. Manual search was also performed in identification of related articles. Systematic search was conducted up to 31st December 2021. The search was limited to English and Malay languages, full text articles with no limitation of years. Search terms in Box 1 were used in order to identify studies that had provided relevant content to the guideline. Keywords and Boolean operators were used in the search strategy for comprehensive search.

("Nutrition*" OR "Nutrition*risk*" OR "Malnutrition" OR "Undernutrition" OR "Malnourished" OR "Undernourished" OR "Nutrition* status") AND ("Elder*" OR "Geriatric*" OR "Ageing" OR "Aging" OR "Older adult*" OR "Older people" OR "Senior" OR "Senior citizen" OR "Veteran") AND ("Nutrition* screening" OR "Screen*" OR "Nutrition*risk screen*" OR "Screening tool*") AND ("Community" OR "General practice*" OR "Outpatient" OR "Clinic*" OR "Primary care") NOT ("Hospital" OR "Nursing home*" OR "Inpatient" OR "Ward") NOT ("Children" OR "Paediatric" OR "Pediatric" OR "Adult*" OR "Young adult*" OR "Adolescent*") NOT ("Maternal" OR "Pregnant")

Box 1. Search algorithm used in the review

Selection criteria

The inclusion criteria in this review were: (1) older adults aged 60 years and above, (2) studies in community, clinics, general practice, primary care, and outpatient settings, (3) studies using validated nutrition screening tools, (4) publication either in Malay or English languages, and (5) full text. Meanwhile, the exclusion criteria were (1) aged below 60 years old, (2) studies in hospital, nursing home, inpatient, and ward settings, (3) studies using assessment tools, (4) studies on relationship, association, assessment, and prevalence, (5) studies on nutrition risk, and (6) studies on nutrient or biomarker. Studies that did not provide any content to the development of nutrition screening guidelines were excluded.

Data extraction

Articles that were obtained in the identification step were then screened, where duplicate articles were discarded. Documents were screened based on title and abstract; and full text articles were examined to find relevant documents that answered the aim of this review. Data were extracted on purpose of the study, study design, sample characteristics, main outcome from results, and method of study. Sample characteristics included participants, sample size, and study setting.

Level of evidence and quality appraisal

Level of evidence and quality of the studies were identified and presented in Table 1. Level of evidence were assigned to the studies based on their methodological quality, validity, and applicability to patients (Ackley *et al.*, 2008). Level I was the highest ranking of evidence; whilst level VII was the lowest. Level I was evidence from a systematic review or meta-analysis from randomised controlled trials and clinical guidelines based on systematic review or meta-analysis; Level II represented evidence from one or more randomised controlled trials; Level III was evidence from controlled trials without randomisation; Level IV was evidence from case-control or cohort studies; Level V was evidence from systematic reviews of descriptive and qualitative studies; Level VI was evidence from a single descriptive or qualitative study; and finally, level VII represented evidence from expert opinions (Ackley *et al.*, 2008).

Meanwhile, quality of the studies was assessed by two researchers independently. The National Heart, Lung, and Blood Institute (NHLBI) assessment tool was used for quantitative studies (NHLBI, 2014), while the Critical Appraisal Skills Programme (CASP) was used for mixed-method and qualitative studies (CASP, 2013). The NHLBI tool consisted of 14 questions about study quality, while the CASP tool included ten items. Researchers then needed to rate the study as Good, Fair, and Poor based on the researchers' answers. For qualitative assessment, the ratings were based on overall qualitative judgement and not based on summary scores. Sampling methods, sample

characteristics, participation rate, and analysis method were the questions focused in both tools. Discrepancies of study quality rated by researchers were resolved through discussion. The quality rating of each study is presented in Table 1.

RESULTS

The identification step retrieved 728 documents by using the search engines mentioned and manual search as shown in Figure 1. Duplicate studies were removed and this resulted in 564 documents. Then, all documents were screened thoroughly based on title and abstract. This procedure resulted in 101 full text articles that were reviewed for eligibility for inclusion in the final review. Finally, 18 articles met the inclusion criteria, which are summarised and tabulated in Table 1. Table 1 presents the main outcome or method that have been discussed in articles and can be included in the content of the guideline.

Characteristics of included papers

18 journal articles (Table 1) were included in the review. Of these 18 journal articles, nine studies discussed regarding barriers, enablers, and facilitators to conduct nutrition screening among older adults (Avgerinou *et al.,* 2020; Craven *et al.*, 2017; Endevelt *et al.*,2009; Gaboreau *et al.*, 2013; Green *et al.*, 2014; Hamirudin *et al.*, 2013; Mays *et al.*, 2019; Vandewoude *et al.*, 2011; Winter *et al.*, 2013). Meanwhile, another eight studies mentioned about anthropometric measurements and guidance on administering validated screening tools (Butler *et al.*, 2017; Callen & Wells, 2005; Chatindiara *et al.*, 2019; Cuervo *et al.*, 2009; El-Desouky & Abed, 2017; Ghimire, Baral & Callahan, 2017; Rodriguez-Tadeo *et al.*, 2012; Villaverde-Gutiérrez *et al.*, 2015). One expert opinion was included in this review as the aim was to provide guidelines for undernutrition screening in primary care setting and suggest strategies to address undernutrition in older patients (Flanagan *et al.*, 2012). Most of the studies were cross-sectional studies. The year of these included studies were between 2005 to 2020.

Barriers and opportunities to conduct nutrition screening

Results in Table 1 showed the identified barriers and opportunities to conduct nutrition screening. Based on these articles retrieved, five studies discussed barriers to conduct nutrition screening (Avgerinou *et al.,* 2020; Craven *et al.*, 2017; Gaboreau *et al.*, 2013; Green *et al.*, 2014; Hamirudin *et al.*, 2013). Barriers to screening were common to both patients and healthcare staffs (Harris *et al.*, 2019). Time factor was one of the barriers to conduct nutrition screening as mentioned by five studies (Avgerinou *et al.,* 2020; Craven *et al.*, 2017; Gaboreau *et al.*, 2013; Green *et al.*, 2014; Hamirudin *et al.*, 2013). Lack of knowledge and training (Avgerinou *et al.,* 2020; Craven *et al.*, 2017; Gaboreau *et al.*, 2013; Hamirudin *et al.*, 2013), general practice limitations (Hamirudin *et al.*, 2013), funding and resources, as well as organisational factors (Avgerinou *et al.,* 2020; Craven *et al.*, 2017) were also identified as barriers to conduct nutrition screening.

On the other hand, nine studies regarding opportunities to perform nutrition screening have been identified (Avgerinou *et al.,* 2020; Craven *et al.*, 2017; Endevelt *et al.*, 2009; Flanagan *et al.*, 2012; Green *et al.*, 2014; Hamirudin *et al.*, 2013; Mays *et al.*, 2019; Vandewoude *et al.*, 2011; Winter *et al.*, 2013). Opportunities and enablers that are stated in Table 1 can be taken into consideration for the development of content. Based on the results,

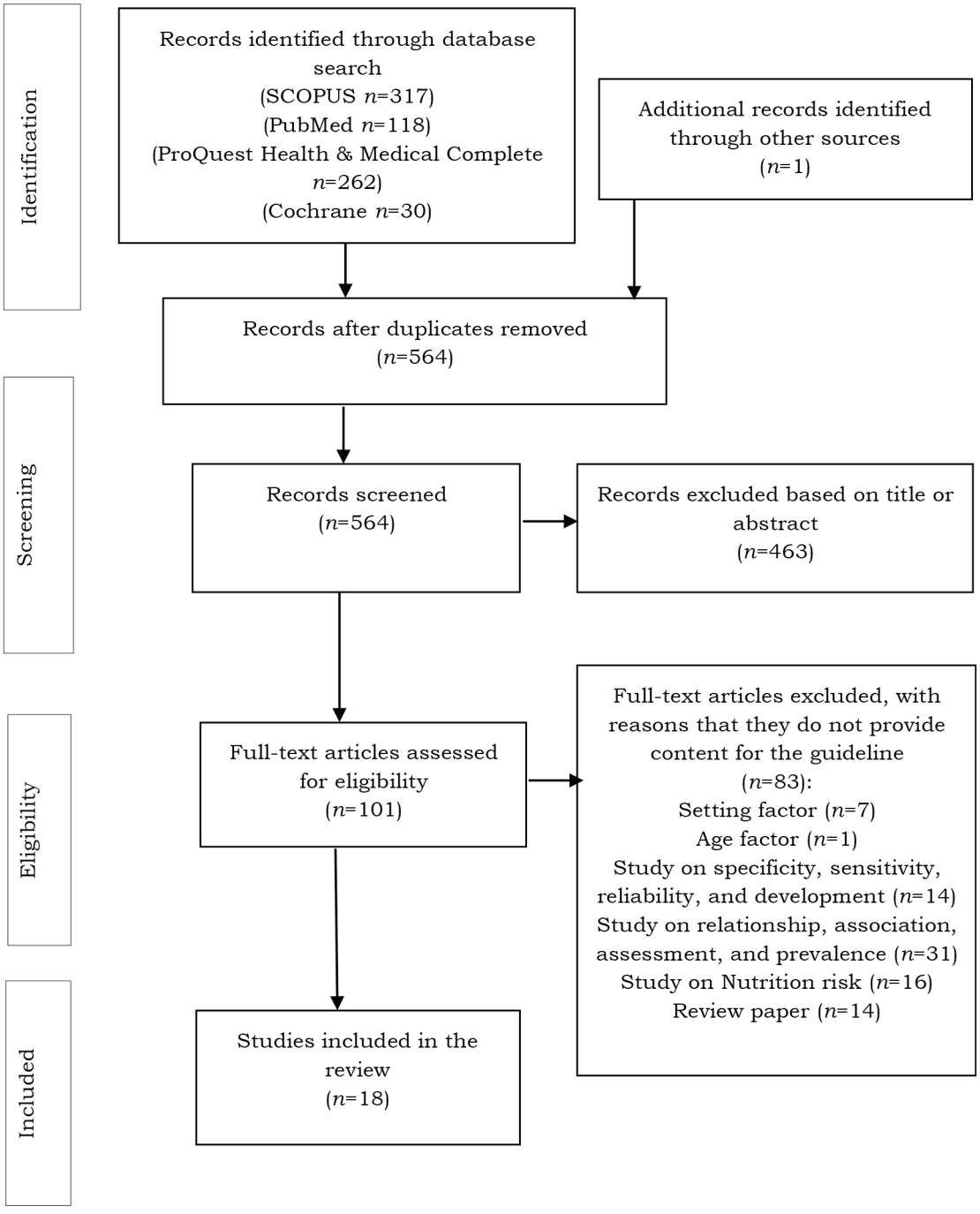

Figure 1. Flow chart illustrating the selection process of documents to be included in this review guided by PRISMA extension scoping reviews (PRISMA-ScR)

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
1	Craven *et al.*, (2017) Australia	Barriers and enablers to malnutrition screening of community-living older adults: A content analysis of survey data by Australian dietitians Purpose: To identify barriers and enablers to malnutrition screening of CLOAs from the perspective of dietitians	Mixed-method	• Setting: Community • Participants: Dietitians working for government, not-for-profit and private organisations in Australia (working with community living older adults ≥65 years old) • Total participants: (*n*=92) • Dietetic experience range: 1-42 years (median: 8 years) • Years working with CLOAs: 1-35 years (median: 5 years)	Barriers to malnutrition screening: 1. Organisational factors - Time - Funding and resources - Policy and procedure - Training and education 2. Staff factors - Knowledge - Screening burden - Management support 3. Older adult factors - Knowledge and communication Enabler to malnutrition screening: 1. Organisational factors - Policy and procedure - Training and education - Funding and resources 2. Staff factors - Knowledge - Communication - Management support 3. Screening factors - Screening tools - Screening outcome	1. Training and education 2. Organisation: Policy and procedure of nutrition screening 3. Staff involved 4. Screening tools: Validated nutrition screening tool 5. Screening outcome (pathway for intervention)	Level VI	Good

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
2	Endevelt *et al.* (2009) Israel	Nurses' knowledge and attitudes regarding nutrition in the elderly Purpose: To assess nurses' knowledge and attitudes regarding nutritional care for the elderly, and the impact of their attitude on the quality of assessment-care they provide to this growing population in need of nutritional-care	Cross sectional	• Setting: Healthcare service • Participants: Nurses at Healthcare services • Total participants: (n=159) Mean age (years±SD): 36.7±13.6	1. Participants' attitudes, knowledge and practice - 60% agreed or strongly agreed that it is difficult to change nutritional behaviours among the older adults - 85% agreed or strongly agreed that a dying older adults patient should receive nutritional care 2. Knowledge about nutrition - 89% agreed with the statement that it is a difficult task to change nutritional habits in the older adults population 3. Attitudes concerning the contribution of nutrition to various conditions - The majority (79%-95%) agreed or strongly agreed that nutrition influences outcomes in cases of obesity, diabetes, and high blood pressure 4. Treat of nutritional issues in the older adults - 32% of the nurses strongly agreed that it should be physicians and 63% thought that dietitians should provide nutritional care - 38% strongly agreed that nurses themselves should provide nutritional care. 11% of the nurses strongly agreed that their knowledge of nutrition could help influence the nutritional habits and behaviours of their older adults patients	1. Training and education by provision of knowledge related to nutrition screening for nutritional problems in older adults 2. Effects and consequences of nutritional problem 3. Role of healthcare professional in treating of nutritional issues in older adults population	Level VI	Poor

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
3	Vandewoude *et al.* (2011) European countries	Variability of nutritional practice by Geriatricians across Europe Purpose: To learn more about the knowledge and attitudes of geriatricians across Europe towards nutrition and their interest in receiving training	Quali-tative	• Setting: Community setting (Geriatric care) • Participants: Geriatricians from European Union Geriatric Medicine Society (EUGMS) • Total participants: (n=208), ratio male/female: 1:3	• Respondents with longer medical practice were less likely to identify training needs in nutrition (p=0.038) or to express interest in attending educational courses (p=0.041) • 20.3% of respondents had formal nutrition training, although nearly all indicated that they routinely considered nutrition when promoting healthy ageing • E-learning was the preferred education format (48.4%), followed by symposia for 38.5% • Less likely to identify training needs in nutrition or to express interest in attending educational courses • Majority recognised that a weight loss of 5-10% over the previous 6 months as indicative of malnutrition risk, and 19% use body mass index cut-off value of 18.5 kg/m2 to initiate nutritional intervention • 55% considered a cut-off value of 20kg/m2 as indicative of malnutrition MNA and MUST were the most frequently used nutritional screening tools	1. Training and education 2. Guidance for validated nutrition screening tools 3. Screening tool: Validated nutrition screening tool that suits with the older adults population	Level VI	Fair

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
4	Gaboreau *et al.* (2013) France	What are key factors influencing malnutrition screening in community dwelling elderly populations by General Practitioners? A large cross-sectional survey in two areas in France Purpose: To determine knowledge, attitude and practice on malnutrition screening implementation in community-dwelling elderly populations by French GPs	Cross sectional	• Setting: Primary care • Participants: General practitioners in primary care • Total participants: (n=493)	• 72.2% felt that malnutrition screening was useful. • Only 26.6% implemented each year and 11.9% implement every 2-5 years Barriers: 1.Forgetting to screen 2. Lack of knowledge 3. Time 4. Unsuitable working conditions 5. Insufficient motivation 6. Technical support Promote of screening practices as part of GP functions	Promote screening as routine practice	Level VI	Fair
5	Hamirudin *et al.* (2013) Australia	'We are all time poor' Is routine nutrition screening of older patients feasible Purpose: To identify perceived barriers and opportunities to implementing nutrition screening in General Practice	Qualitative	• Setting: General Practice • Participants: Healthcare staff in General Practices • Total participants: (n=25) Gender: Male (n=9), Female (*n*=16)	Barriers: 1. Lack of time 2. Patient's attitude towards nutrition 3. General practice limitation 4. Lack of nutrition screening knowledge 5. Low priority for nutrition 6. Lack of resources 7.Outcomes of nutrition screening Opportunities: 1. Current practice 2. Patient's condition 3. Staff initiative	1. Based on current practice in clinics 2. Patient's condition 3. Staff	Level VI	Good

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
6	Green *et al.* (2014) United Kingdom	Barriers and facilitators to screening for malnutrition by community nurses: a qualitative study Purpose: To understand community nurses' perceptions of barriers and facilitators to undertaking nutritional screening	Qualitative	• Setting: Primary care services • Participants: Community nurses in organisation • Total participants: (n=20)	Barriers: 1. Professional judgement as good as screening 2. Time and resource to screen and intervene Facilitators and barriers: 1. Supportive (or unsupportive) organisational culture 2. Need for (or lack of) training and sharing good practice 3. Ease and acceptability of the screening tool Suggested ways: 1. Better communication between care setting	1. Training and education 2. Organisational 3. Screening tool: Validated nutrition screening tool	Level VI	Good
7	Cuervo *et al.* (2009) Spain	Impact of global and subjective Mini Nutritional Assessment (MNA) questions on the evaluation of the nutritional status: The role of gender and age Purpose: To study the independent value of the global and the subjective MNA questions to predict undernutrition according to the full MNA score, and to analyse the influence of gender and age on such items	Cross sectional	• Setting: Community • Participants: Community dwelling older adults in Spain (75±6.8) years (65-100 years old) • Total participants: (n=22,007) 8014 men (36.4%) and 13,993 women (63.6%) 75.2±6.8 years with a range from 65 to 100	Data collection method: • Height and weight self-reported. Measurement was performed if doubt Mobility (3 levels): 1. When participants were not able to get out of bed or chair 2. When the participants were able to get out of bed or chair but did not get out home 3. When he/she was able to go out home - Psychological stress or acute diseases was answered with information reported by the participant or by relative if it was needed - Neuropsychological problems (dementia or depression) was based on subjective impression of the interviewer	1. Guidance on asking the questions from validated nutrition screening tool 2. Guidance on anthropometric measurement	Level VI	Fair

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
8	Ghimire, Baral & Callahan (2017) India	Nutritional assessment of community-dwelling older adults in rural Nepal Purpose: 1. To validate a Nepalese version of the MNA tool 2. To use the MNA to estimate the prevalence of malnutrition among elderly people in the Okharpauwa Village Development Committee (VDC) in the Nuwakot District of Nepal	Cross sectional	• Setting: Community • Participants: Older adults people in Okharpauwa, Nepal • Total Participants: (*n*=242) Gender: Male (*n*=111) (45.9%) Female (*n*=131) (54.1%)	Data collection method: - Used four anthropometric assessments (participants wore light clothing and barefoot) 1. Height (using a mechanical stadiometer) 2. Weight (using a digital weighing scale) 3. Calf-circumference was measured on seated participants with an inextensible tape at several locations to find the maximal bare calf circumference 4. Mid-arm circumference - The participant's forearm was held in horizontal position to locate and mark the mid-distance between the acromial surface of the scapula and the olecranon process of the elbow. Arm need to hanging freely at the side, circumference at that marked arm mid-point was measured - BMI was calculated as weight in kg/ (height in m)^2	1. Guidance on anthropometric measurement a) Height b) Weight c) Calf-circumference (CC) d) BMI	Level VI	Good

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
9	Rodriguez-Tadeo *et al.* (2012) Mexico	Malnutrition risk factors among the elderly form US-Mexico border: The "One Thousand" Study Purpose: To examine nutritional, functional, and cognitive impairments, as well as depression, in non-institutionalized elderly Mexicans along Mexico's northern border	Observational, descriptive and cross-sectional	• Setting: Community • Participants: Older adults inChihuahua, Mexico (60-79 years old) • Total participants: (n=760) Gender: n=570 were women (75%), and n=190 were men (25%), with a mean age of 71.0±7.7 and 73.7±7.9 years, respectively	Anthropometric measurements: - Collected after standardisation for human error - Weight measurement need to be performed (little clothing as possible), without shoes, on a SECA 804 digital scale and recorded on the sheet of anthropometry (in kg). BMI will be calculated Physical limitations: - Used gender-specific formulas developed by Chumlea: 1. Height- estimated by knee height (use gender specific equations) 2. Arm and calf circumference in cm (using flexible fiberglass tape) 3. Waist circumference in the abdominal region 4. Skin folds were measured with a Lange skin fold calliper	1. Guidance on anthropometric measurement - Weight and Height -BMI -Measurement for individuals with physical limitations: 1. Calf circumference 2. Knee height 2. Weight measurement needs to be performed with as little clothing as possible, and without shoes, in kilogram (kg) 3. Provide gender-specific formula by Chumlea 4. List of tools for nutrition screening	Level VI	Fair

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
10	Chatindiara *et al.*, (2018) New Zealand	Associations between nutrition risk status, body composition and physical performance among community-dwelling older adults Purpose: To investigate the associations between nutrition risk status, body composition and physical performance among community-dwelling older New Zealanders	Cross sectional	• Setting: Community • Participants: Community-dwelling older adults aged 65 years and older • Total Participants: (n=257) Gender: Male (*n*=120) (46.7%), Female (*n*=137) (53.7%)	Data collection method: - All assessments were performed according to the MNA-SF user guide - Weight and height measured using portable stadiometer (SECA 213) - BMI was calculated (kg/m^2)	1. Guidance on anthropometric measurement -Weight and height - BMI 2. List of tools	Level VI	Good

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
11	Winter *et al.* (2013) Australia	Nutrition screening of older people in a community general practice using the MNA-SF Purpose: To determine the prevalence of malnutrition risk in a population of older people (aged 75 years and over) attending a community general practice and identify characteristics of those classified as malnourished or at risk of malnutrition	Cross sectional	• Setting: Community General Practice • Participants: Older adults75 years and over at general medical practices • Total participants: (n=225) Gender: Male 48% (n=108) female 52% (n=117)	Data collection: - Six nurses conducted the 75+ health assessments across medical practice - All nurses were instructed in administering the MNA-SF by one of the investigators (DF) and were provided with instructions on interventions based on the MNA-SF score - Nurses measured weight and height all patients - The MNA-SF was added to the regular assessment to screen for risk of malnutrition. - If subjects were identified as being at risk of malnutrition or malnourished, nurses were instructed to explain the importance of good nutrition and provide some simple and dietary advice or offer services (such as home delivered meals or some help) as required	1.Staff involved 2. Provide education 3. Pathway for intervention of after nutrition screening 3. Guidance on anthropometric measurement	Level VI	Fair

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
12	Mays *et al.*, (2019) United States	Identifying geriatric patients at risk for malnutrition: A quality improvement project Purpose: Implementation of Mini Nutritional Assessment Short-Form (MNA-SF) in the preoperative clinic of a large academic health center to identify patients at-risk for malnutrition prior to elective surgery	Before-after pre post studies with no control group	• Setting: Clinic setting • Participants: Patients aged 65 years and older at preoperative clinic • Total Participants: (n=280) Gender: Male 135 (48.2%), female 139(49.6%), 6 (2.1%) refused to disclose their gender Age range: 65-92 years old	Data collection method: - MNA-SF was incorporated in the current system and got permission from Nestle Nutrition Institute and in compliance with copyright and trademark rules - Educational session and explanation on: 1. Project objectives 2. Intervention of tool - Via the Nestle MNA-SF user guide and 11-minutes instructional video. - The nursing staff were given two weeks to complete the instructional materials and a 30 minute in service was provided to address questions regarding screening process - Screening was conducted during the nurse-patient interview as part of the routine nursing intake process and the MNA-SF score was documented in the EHR. - Measurement of weight, height and body mass index (BMI) - Additional questions asked by the nursing staff based on MNA-SF questions	1. Incorporation within the current system (provide flow chart based on clinic system) 2. Training and education 3. Objectives 4. Pathway for intervention of validated nutrition screening tool 5. Guidance on anthropometric measurement	Level IV	Fair

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
13	Butler *et al.* (2017) East of England, United Kingdom	BMI calculation in older people: The effect of using direct and surrogate measures of height in a community-based setting Purpose: To assess how the use of direct and surrogate measures of height impacts on BMI calculation in people aged 75 years	Cross sectional	• Setting: Community • Participants: Free-living older people aged ≥75 years • Total Participants: (n=64) Age range in years/mean age in years: 85.0±5.7	- All other anthropometric measures were carried out by three trained researchers who used the same protocol and underwent the same training to minimise inter-variability - Current height (HC) was measured using a Leicester height measure portable stadiometer (SECA, Birmingham, UK) to the nearest 0.5 cm and weight measured to the nearest 0.1 kg using compact digital floor scales (SECA model 888, Birmingham, UK) - Shoe heel height was measured with a flexible tape if footwear of participant cannot be removed. Ulna length was measured. By using a flexible tape measure (WM02 Body Tape, Chasmors Ltd) and knee height was measured using a sliding caliper (Knee Height Caliper, Chasmors Ltd) - Calculations of predicted maximum height using surrogate height measures from ulna (HU) and knee height (HK) were performed using published values BMI [weight (kg)/height (m^2)] was calculated using current measured height (BMIC) and predicted using reported maximum adult height (BMIR), ulna length (BMIU) and knee height (BMIK)	1. Guidance on anthropometric measurement Including if individuals have physical limitations 2. List of tools	Level VI	Fair

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
14	El-Desouky & Abed (2017) Egypt	Screening of malnutrition and its correlates among a sample of rural elderly in Qalyobeya Governorate, Egypt Purpose: To screen the elderly persons for malnutrition and to detect the underlying factors of this problem	Cross sectional	• Setting: Community • Participants: Older adults, 60 years and above at selected village in Qalyobeya Governorate, Egypt • Total participants: (n=320) mean 70.1±7.1 (61-89) male (n=167) (52.2%) female (n=153) (47.8%)	- Weighing weight by electronic digital scale to the nearest 0.1 kg, in light indoor clothes without shoes - Height was measured in the standing position to the nearest 0.1 cm. -BMI was calculated as weight (kg)/ height (m^2) - Calf circumference was measured to the nearest 0.1 cm and obtained at the most prominent point of the calf - BMI in older adults was classified according to Mini-Nutritional Assessment-Short Form (MNA-SF) into four categories: – less than 19 (severe malnutrition) – 19 to less than 21 (moderate malnutrition) – 21 to less than 23 (mild malnutrition) – At least 23 (no malnutrition) - It is a functional classification where higher BMI in the older adults is associated with better functional status even in BMIs (≥30 kg/m^2)	1. Guidance on anthropometric measurement -Weight -Height -BMI	Level VI	Good

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title Purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
15	Callen & Wells (2005) United States	Screening for nutritional risk in community-dwelling old-old Purpose: To identify the leading risk factors associated with non-invasive measures of poor nutritional status among elders aged 80 or older still living independently in the community	Cross sectional descriptive mixed-method	• Setting: community • Total participants: (*n*=68) • Participants: Age 80 or older of community living older adults Mean age±SD 85.7±4.4 (range 80-102)	Anthropometric measurements: 1. For measurement of height, subjects stood without shoes against a wall. Height was measured using a non-stretchable measuring tape 2. Weight was obtained with subjects in stocking feet using the same calibrated portable electronic scale designed for home health use 3. Amount of weight change in the 6 months prior to the interview was assessed with the question: - Have you lost or gained weight unintentionally in the last 6 months? If so, how much? - Weight loss, particularly an involuntary weight loss is perhaps the most important finding indicating the presence of malnutrition in the older adults and is associated with increased morbidity and mortality	1.Guidance on anthropometric measurement - Weight - Height - BMI 2. Guidance on asking the questions from validated nutrition screening tool	Level VI	Fair

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title & purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
16	Villaverde-Gutiérrez *et al.*, (2014) Spain	Should arm span or height be used in calculating the BMI for the older people? Preliminary results Purpose: To consider using arm span rather than height for calculating the body mass index, as a parameter that offers greater long-term stability, for the nutritional assessment of persons aged over 65 years	Cross sectional & observational	• Setting: community • Total Participants: • (n=76) • Participants: 65 years and older community living older adults Mean age±SD 80.2±6.8 (range 65- 89) Male (33.33%) female (66.7%)	- The anthropometric measures considered were weight, height and arm span, to calculate conventional BMI (weight/ height) and BMI.1 (weight/ arm span); in the latter, height was replaced by arm span (maximum extension of the arms, forming an angle of 90 degrees with respect to the trunk)	Guidance on anthropometric measurement	Level VI	Fair

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title Purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/ method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
17	Flanagan *et al.*, (2012) Australia	Managing undernutrition in the elderly Prevention is better than cure Purpose: Provides guidelines for screening for undernutrition in general practice, and suggests strategies to address undernutrition in older patients	N/A Expert opinion	N/A	1. Definitions - Malnutrition: "A deficiency or excess (or imbalance) of energy, protein and other nutrients, which causes measurable adverse effects on tissue/body form (shape, size, composition), function and clinical outcome. Can encompass both over nutrition and undernutrition, but often used to refer to undernutrition only" - Undernutrition: "A clinical syndrome characterised by weight loss associated with significant depletion of fat stores and muscle mass. Also known as protein energy undernutrition" 2. Identifying undernutrition in the older adults by nutrition screening 3. Incorporating screening into general practice - Screening for undernutrition among older adults patients should be incorporated into routine practice to improve focus time and intervention for older adults who are at greater risk - A systematic approach is identifying older adults who are at risk by measuring weight every visit or twice to see any weight loss 4. Validated nutrition screening tools in identification of undernutrition 5. Identifying and addressing contributing factors 6. Management strategies	From this expert opinion paper. Key points can be included in the guidelines are 1. Nutrition screening is needed for early identification of malnutrition 2. Nutrition screening can be incorporated into routine practice 3. Systematic approach is needed to monitor weight 4. Validated nutrition screening tool is required 5. Involvement of all healthcare professional will beneficial towards this issue	Level VII	N/A

Table 1. Summary of suggested topics to be included in nutrition screening guideline (from articles) (continued)

No.	*Author, (Year), Country*	*Title Purpose of the study*	*Study design*	*Sample description*	*Main outcome (From results/method)*	*Suggested topics to be included*	*Level of evidence*	*Quality of study*
18	Avgerinou *et al.*, (2020) United Kingdom	Supporting nutrition in frail older people: a qualitative study exploring views of primary care and community health professionals Purpose: To explore primary care and other community health professionals' views on how to support nutrition in frail older people, in order to inform future community-based interventions for this population	Qualitative study	• Setting: General practices and community setting • Participants: general practices: at each practice, all GPs, practice nurses, and healthcare assistants; • Health professionals from frailty MDTs; and • • Dietitians working with community - dwelling older people.	Four themes were identified: 1. Understanding and identifying malnutrition 2. Management of unintentional weight loss in the community 3. Challenges to addressing malnutrition 4. Potential solutions	1. Training and education by provision of knowledge 2. Role of healthcare staff 3. Organisation: Policy and procedure of nutrition screening 4. Validated nutrition screening tool	Level VI	Fair

opportunities and enablers of nutrition screening can be categorised into several categories: organisational, staff, and screening factors. Organisational factors involved system, policy and procedure in the clinics (Avgerinou *et al.,* 2020; Craven *et al.*, 2017; Flanagan *et al.*, 2012; Hamirudin *et al.*, 2013; Mays *et al.*, 2019), training and education (Avgerinou *et al.,* 2020; Craven *et al.*, 2013; Green *et al.*, 2014; Mays *et al.*, 2019; Vandewoude *et al.*, 2011; Winter *et al.*, 2013), as well as funding and resources in the clinics (Avgerinou *et al.,* 2020; Craven *et al.*, 2017). Staff factors included knowledge (Avgerinou *et al.,* 2020; Craven *et al.*, 2017; Endevelt *et al.*, 2009), communication and management support (Craven *et al.*, 2017; Green *et al.*, 2014), and role of staff in nutrition screening (Avgerinou *et al.,* 2020; Endevelt *et al.*, 2009; Hamirudin *et al.*, 2013; Winter *et al.*, 2013). Meanwhile, screening factors were related to the use of screening tool (Flanagan *et al.*, 2012; Vandewoude *et al.*, 2011), outcome and intervention pathway of the screening (Craven *et al.*, 2017; Flanagan *et al.*, 2012; Mays *et al.*, 2019; Winter *et al.*, 2013), and acceptability and ease of nutrition screening (Craven *et al.*, 2017; Green *et al.*, 2014). Provision of knowledge and education (Endevelt *et al.*, 2009; Vandewoude *et al.*, 2011; Winter *et al.*, 2013), and enhancement of practices related to nutrition screening (Gaboreau *et al.*, 2013) were also significant enablers that have been identified. Therefore, these factors may facilitate healthcare staffs in performing nutrition screening. The incorporation of nutrition screening into routine screening is needed to help focus time and intervention resources for individuals who are identified as at greatest risk (Flanagan *et al.*, 2012). Consequently, nutrition screening can be routinely performed as part of health clinic practice (Gaboreau *et al.*, 2013).

Guidance on administering validated nutrition screening tools

There are many available validated nutrition screening tools. However, MNA-SF is recognised as the most suitable tool that can be used in community living older adults population (Philips, 2010). Six studies (Callen & Wells, 2005; Chatindiara *et al.*, 2018; Cuervo *et al.*, 2009; El-Desouky & Abed, 2017; Mays *et al.*, 2019; Winter *et al.*, 2013) have discussed administering the items of validated nutrition screening tool. Besides, two studies have used MNA-SF user guide as guidance to administer the items of MNA-SF (Chatindiara *et al.*, 2018; Mays *et al.*, 2019). Pathway after nutrition screening is recommended to be included in the intervention component (Mays *et al.*, 2019; Winter *et al.*, 2013). Hence, guidance on administering items of validated nutrition screening tools is essential as the total score will determine the nutritional status of patients.

Guidance on anthropometric measurements

Generally, nutrition screening tools are available in questionnaire format with or without anthropometric data (Power *et al.*, 2018). Therefore, guidance on anthropometric measurements is needed to facilitate the administering of nutrition screening. Based on the results in Table 1, ten studies have mentioned about anthropometric measurements and the tools required in the method part (Butler *et al.*, 2012; Callen & Wells, 2005; Chatindiara *et al.*, 2018; Cuervo *et al.*, 2009; El-Desouky & Abed, 2012; Ghimire *et al.*, 2017; Mays *et al.*, 2019; Rodriguez-Tadeo *et al.*, 2012; Winter *et al.*, 2013; Villaverde-Gutiérrez *et al.*, 2014). Weight, height, and body mass index (BMI) were the most common data needed during nutrition screening. Furthermore, steps on how to measure weight and height with the required tools

were explained in five studies (Callen & Wells, 2005; Chatindiara *et al.*, 2018; El-desouky & Abed, 2017; Ghimire *et al.*, 2017; Rodriguez-Tadeo *et al.*, 2012). Besides, measuring height and weight for older adults with limitation are also presented in Table 1. Based on the studies, measuring arm and mid-arm circumference (MAC) (Ghimire *et al.*, 2017; Rodriguez-Tadeo *et al.*, 2012), calf circumference (CC) (El-Desouky & Abed, 2012; Ghimire *et al.*, 2017; Rodriguez-Tadeo *et al.*, 2012), knee height (Butler *et al.*, 7017; Rodriguez-Tadeo *et al.*, 2102) were other alternatives to estimate weight and height for older adults with limitation. To summarise, guidance on anthropometric measurements needs to be included in the guideline.

Quality appraisal of studies

Quality of studies were appraised and included in Table 1. Two types of assessment tools were used to assess the quality of studies. Based on the results, studies were categorised as quantitative or qualitative based on study design.

Five qualitative studies have been rated good and fair (Avgerinou *et al.,* 2020; Craven *et al.*, 2017; Green *et al.*, 2014; Hamirudin *et al.*, 2013; Vandewoude *et al.*, 2011). Out of these five studies, only two studies were rated as fair (Avgerinou *et al.,* 2020; Vandewoude *et al.*, 2011). Qualitative studies were assessed by using the CASP checklist. In general, this checklist was used to assess methodology of the study including data collection, ethical issues, and data analysis.

Meanwhile, a total of 12 quantitative studies have been presented in Table 1. Three studies have been rated as good quality (Chatindiara *et al.*, 2018; El-desouky & Abed, 2017; Ghimire *et al.*, 2017), eight studies rated as fair quality (Butler *et al.*, 2017; Callen & Wells, 2005; Cuervo *et al.*, 2009; Endevelt *et al.*, 2009; Gaboreau *et al.*, 2013; Villaverde-Gutiérrez *et al.*, 2016; Winter *et al.*, 2013), and one study as poor (Rodriguez-Tadeo *et al.*, 2012). Quantitative studies were assessed by using the NHLBI tool. The assessment included aim of the study, participants' characteristics, methodology of study, and data analysis. An expert opinion paper (Flanagan *et al.*, 2012) was not rated for quality appraisal as there was no suitable tool.

DISCUSSION

This study has reviewed the content that can be included in a guideline for use by healthcare staffs to administer a validated nutrition screening tool in older adults in health clinic setting. A total of 18 articles were retrieved regarding barriers and opportunities to perform nutrition screening, format, flow and topics that can be included in the guideline, guidance on administering validated nutrition screening tools, and guidance on how to perform anthropometric measurements. Therefore, this review was a key step to establishing the content of a guideline for health clinics.

Based on the results, suitable content for the guideline consisted of introduction, aims and objectives, definition of malnutrition, prevalence of malnutrition, implementation of nutrition screening, and guidance on administering items in validated nutrition screening tools. In general, the purpose of the nutrition screening guideline is to facilitate healthcare staffs in health clinics in implementing nutrition screening among older adults.

Barriers and opportunities to conduct nutrition screening

Barriers and opportunities of nutrition screening need to be identified. The identification of barriers may lead to the development of tailored nutrition

screening implementation guidelines. Besides, identified opportunities may also help in content development of the nutrition screening guidelines. A total of nine studies have discussed regarding barriers and opportunities of nutrition screening (Avgerinou *et al.,* 2020; Craven *et al.*, 2017; Endevelt *et al.*, 2009; Gaboreau *et al.*, 2013; Green *et al.*, 2014; Hamirudin *et al.*, 2013; Mays *et al.*, 2019; Vandewoude *et al.*, 2011; Winter *et al.*, 2013). Out of these nine studies, two studies discussed specifically regarding knowledge, attitude and practice towards nutrition among older adults (Endevelt *et al.*, 2009; Vandewoude *et al.*, 2011).

Provision of knowledge and education can enhance the enforcement of nutrition screening (Endevelt *et al.*, 2009; Mays *et al.*, 2019; Vandewoude *et al.*, 2011; Winter *et al.*, 2013). Nutrition care and screening outcomes among older adults will be improved due to sustained screening through the provision of education among healthcare professionals (Kennelly *et al.*, 2011). Besides, enforcement of policy and procedure (Avgerinou *et al.,* 2020; Craven *et al.*, 2017), as well as nutrition screening as a screening practice based on clinics' condition were identified as other enablers in implementing nutrition screening (Gaboreau *et al.*, 2013; Hamirudin *et al.*, 2013). Incorporation of nutrition screening into the current system and routine practice of the clinic is the best way to implement nutrition screening (Flanagan *et al.*, 2012). From the findings, three studies highlighted this point (Hamirudin *et al.*, 2013; Mays *et al.*, 2019; Winter *et al.*, 2013). Therefore, these identified opportunities from other studies can be incorporated into the content development of the nutrition screening guidelines for healthcare staffs.

Format and flow of the nutrition screening guidelines

During the development process, format and flow of the guidelines are important criteria that need to be included for clarity in presenting information. The established guidelines developed by the Ministry of Health (MOH) could be used as guidance and references. From the six guidelines that have been identified, four guidelines from the Ministry of Health (MOH), Malaysia were in A4 size (GEM, 2004; BPKK, 2013, BPKK, 2015; IHSR, 2018). In addition, two guidelines presented information on policy and system in health clinics (BPKK, 2015; IHSR, 2018). This information may help in understanding the clinics' condition to facilitate nutrition screening in this setting. Flow charts in the established guidelines could become references in terms of formatting (BPKK, 2015). Nevertheless, the content will be based on health clinics. Besides, most of the guidelines have outlined the following information, namely: introduction, aims and purpose, implementation including guidance on how to complete nutrition screening, flow chart, appendices, and references. The outline will serve as a useful guidance in providing the required information comprehensively.

Guidance on administering validated nutrition screening tools

Based on the results, information related to guidance on administering validated nutrition screening tools need to be included in the guidelines. From previous studies, validated nutrition screening tool has been administered by referring to the user guide of the tool (Chatindiara *et al.*, 2018; Mays *et al.*, 2019). Validated nutrition screening tools need to be administered in a proper way in order to obtain correct scores. For example, a study has shown that item related to weight changes in a validated

tool can be asked as such: "Have you lost or gained weight unintentionally in the last six months? If so, how much?" (Callen & Wells, 2005). This is particularly important as the total score in a screening tool is an indicator of malnutrition risk (Reber *et al.*, 2019; Rosa *et al.*, 2017).

Meanwhile, two established guidelines provided guidance on how to administer items in validated tools (NNI, 2011; Sakinah *et al.*, 2017). However, out of these two established guidelines, only one provided a pathway after nutrition screening (NNI, 2011). The intended development of this guideline will be in the Malay language for use by staffs in the Malaysian health clinics.

Guidance on anthropometric measurements

Based on the results, guidance on anthropometric measurements needs to be included in the guidelines. Few studies have emphasised on anthropometric measurements in the method part, which indicated its importance. Based on the studies reviewed, important measurements that must be included are weight and height (Callen & Wells, 2005; Chatindiara *et al.*, 2018; Cuervo *et al.*, 2009; El-desouky & Abed, 2018; Ghimire *et al.*, 2018; Rodriguez-Tadeo *et al.*, 2012; Winter *et al.*, 2013). The way of measuring weight and height have also been explained in these studies; for instance, minimal clothing, barefooted, and subject must stand against a wall during height measurement (El-Desouky & Abed, 2017; Ghimire *et al.*, 2017; Rodriguez-Tadeo *et al.*, 2012). Weight and height need to be measured in a proper way to avoid measurement errors. Based on the included studies, the tools required for this measurement are mechanical stadiometer and digital weighing scale, and reading must be reported in cm and kg, respectively (Chatindiara *et al.*, 2018; El-desouky & Abed, 2018; Ghimire *et al.*, 2017; Rodriguez-Tadeo *et al.*, 2012). BMI can then be obtained as it is one of the required items in most validated nutrition screening tools. It can be defined as a measure of weight adjusted for height, calculated as weight in kilograms divided by the square of height in meters (kg/m^2) (Centers for Disease Control and Prevention, 2009).

BMI is one of the indicators of nutritional status. Values of BMI were obtained in previous studies by using the afore-mentioned BMI formula as a risk of malnutrition (Chatindiara *et al.*, 2018; El- desouky & Abed, 2017; Ghimire *et al.*, 2017; Mays *et al.*, 2019; Rodriguez-Tadeo *et al.*, 2012). Meanwhile, the recent Global Leadership Initiative on Malnutrition (GLIM) has identified five criteria for malnutrition identification, which are phenotypic criteria (weight loss, low body mass index, and reduced muscle mass) and etiologic criteria (reduced food intake or assimilation and inflammation or disease burden) (Cederholm *et al.,* 2019). Hence, to diagnose a patient with malnutrition, one of the phenotypic criteria and etiologic criteria should be present (Cederholm *et al.,* 2019). Thus, information related to both criteria should be included in the guideline development to identify malnutrition risk.

Previous studies have also emphasised on alternative ways to measure weight and height. For example, calf circumference, mid-arm circumference, girth of arm, and arm span (Goswami *et al.*, 2018) can become alternative measurements (Ghimire *et al.*, 2017; Rodriguez-Tadeo *et al.*, 2012; Villaverde-Gutiérrez *et al.*, 2015). Other ways to measure height that have been highlighted are measurements of half arm span (Siqueira *et al.*, 2012) and knee height (Chumlea, Roche & Steinbaugh, 1985). In MNA-SF, measuring calf circumference is an alternative to body

mass index. A value of <30.1cm (man) and <27.3cm (woman) will classify an older adult as malnourished (Harith, Shahar & Adznam, 2016). These cut-off points can be used by health professionals in Malaysia to screen for older adults who are at risk of malnutrition.

Quality appraisal of studies

All included studies were rated as good, fair or poor quality. From the findings, 35% of the studies were rated as good quality, 59% rated as fair quality, and the remaining 6% rated as poor quality studies.

Limitation and strength

Limitation of this review was the exclusion of non-English and non-Malay journal articles. However, this review was able to provide essential content to be included in the nutrition screening guideline in health clinics by following a systematic approach using PRISMA extension for scoping reviews (Tricco *et al.*, 2018). Further studies can be done in the future to measure the outcomes of using this newly developed nutrition screening guideline. Therefore, feasibility of the newly developed guideline can be measured.

CONCLUSION

Development of a guideline based on the identified content can facilitate healthcare staffs to perform nutrition screening among older adults in the health clinic setting. The comprehensive details in the guideline can become a main reference for nutrition screening procedures, particularly in Malaysian health clinics. Subsequently, appropriate nutrition intervention by nutrition experts can be implemented to improve patients' nutritional status. Hence, timely malnutrition identification using the nutrition screening guideline could improve older adults' nutritional status and decrease the number of at-risk and malnourished patients.

Acknowledgement

This study was funded by the Fundamental Research Grant Scheme (FRGS), Ministry of Education Malaysia (FRGS/1/2018/SKK06/UIAM/02/5).

Authors' contributions

SNASH, conducted the study, data analysis and interpretation, prepared the draft of the manuscript and reviewed the manuscript; AHH, principal investigator, conceptualised and designed the study, contributed expertise in data analysis and interpretation, and reviewed the manuscript; SH, contributed expertise and reviewed the manuscript; MAMA, contributed expertise and reviewed the manuscript; KHAA, contributed expertise and reviewed the manuscript; INNA, contributed to data analysis and interpretation; NSAR, contributed expertise and reviewed the manuscript.

Conflict of interest

Authors declare no conflict of interest.

References

Ackley BJ, Swan BA, Ladwig G & Tucker S (2008). *Evidence-based nursing care guidelines: Medical-surgical interventions* (p. 7). Mosby Elsevier, St. Louis, MO.

Arksey, H & O'Malley L (2005). Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 8(1): 19-32. https://doi.org/10.1080/1364557032000119616

Ahmed T & Haboubi N (2010). Assessment and management of nutrition in older people and its importance to health. *Clin Interv Aging* 5:207–216.

Avgerinou C, Bhanu C, Walters K, Croker H, Tuijt R, Rea J & Kharicha K (2020). Supporting nutrition in frail older people: a qualitative study exploring views of primary care and community health professionals. *Br J Gen Pract*, 70(691), e138-e145.

BPKK (2013). Garis Panduan Program Saringan Komuniti Dalam Kawasan Operasi Klinik Kesihatan. Bahagian Pembangunan Kesihatan Keluarga (BPKK) Cawangan Kesihatan Primer. From http://fh.moh.gov.my/v3/index.php/component/jdownloads/send/37-sektor-penjagaan-perubatan-kesihatan-primer/161-garis-panduan-saringan-komuniti-dalam-kawasan-operasi-klinik-kesihatan?Itemid=0 [Retrieved December 10 2019].

BPKK (2015). Polisi Operasi Klinik Kesihatan. Bahagian Pembangunan Kesihatan Keluarga (BPKK) Cawangan Kesihatan Primer. From http://fh.moh.gov.my/v3/index.php/component/jdownloads/send/40-sektor-polisi/288-operasi-kk?Itemid=0 [Retrieved December 10 2019].

Brotherton A, Simmonds N, Bowling T & Stroud M (2011). Malnutrition is dangerous : The importance of effective nutritional screening and nutritional care. *Clin Risk* 17(4):137–142.

Butler R, McClinchy J, Morreale-Parker C, Marsh W & Rennie KL (2017). BMI calculation in older people: The effect of using direct and surrogate measures of height in a community-based setting. *Clin Nutr ESPEN 22*:112–115.

Callen BL & Wells TJ (2005). Screening for nutritional risk in community-dwelling old-old. *Public Health Nurs* 22(2):138–146.

CASP U (2013). *CASP qualitative checklist.* From http://media.wix.com/ugd/ dded87_29c5b002d99342f788c6ac670e49f274.pdf [Retrieved September 10 2020].

Cederholm T, Jensen GL, Correia MITD, Gonzalez MC, Fukushima R, Higashiguchi T, Baptista G, Barazzoni R, Blaauw R, Coats AJS, Crivelli AN, Evans DC, Gramlich L, Fuchs-Tarlovsky V, Keller H, Llido L, Malone A, Mogensen KM, Morley JE & Compher C (2019). GLIM criteria for the diagnosis of malnutrition – A consensus report from the global clinical nutrition community. *Journal of Cachexia, Sarcopenia and Muscle* 10(1):207–217. https://doi.org/10.1002/jcsm.12383

Centers for Disease Control and Prevention (2009). Adult BMI. From http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html [Retrived May 6 2020].

Chatindiara I, Williams V, Sycamore E, Richter M, Allen J & Wham C (2019). Associations between nutrition risk status, body composition and physical performance among community-dwelling older adults. *Aust N Z J Public Health* 43(1):56-62.

Chumlea WC, Roche AF & Steinbaugh ML (1985). Estimating stature from knee height for persons 60 to 90 years of age. *J Am Geriatr Soc* 33(2):116-120.

Craven DL, Pelly FE, Isenring E & Lovell GP (2017). Barriers and enablers to malnutrition screening of community-living older adults: a content analysis of survey data by Australian dietitians. *Aust J Prim Health* 23(2):196–201.

Cuervo M, Ansorena D, Martínez-González MA, García A, Astiasarán I & Martínez JA (2009). Impact of global and subjective mini nutritional assessment (MNA) questions on the evaluation of the nutritional status: The role of gender and age. *Arch Gerontol Geriatr* 49(1):69–73.

Davidson J & Getz M (2004). Nutritional risk and body composition in free-living elderly participating in congregate meal-site programs. *J Nutr Elder* 24(1):53-68.

Donini LM, Scardella P, Piombo L, Neri B, Asprino R, Proietti AR & Di Bella G (2013). Malnutrition in elderly: social and economic determinants. *J Nutr Health Aging* 17(1):9-15.

Eldardery NESAE, Mo'awad E & Fouad N (2018). Risk factors of malnutrition among elderly in geriatric homes, *IOSR J Nurs Health Sci* 7(5):62-74.

El-Desouky R & Abed H (2017). Screening of malnutrition and its correlates among a sample of rural elderly in Qalyobeya Governorate, Egypt. *J Egypt Public Health Assoc* 92(3):156–166.

Elia M, Zellipour L & Stratton RJ (2005). To screen or not to screen for adult malnutrition? *Clin Nutr 24*(6):867–884.

Elia M, Russell C, Stratton R, Todorovic V, Evans L & Farrer K (2011). The MUST explanatory booklet. *A guide to the Malnutrition Universal Screening Tool (MUST) for adults.* BAPEN, London.

Endevelt R, Werner P, Goldman D & Karpati T (2009). Nurses' knowledge and attitudes regarding nutrition in the elderly. *J Nutr Health Aging* 13(6):485–489.

Flanagan D, Fisher T, Murray M, Visvanathan R, Charlton K, Thesing C, Quigley G & Walther K (2012). Managing undernutrition in the elderly: Prevention is better than cure. *Aust Fam Physician* 41(9):695–699.

Gaboreau Y, Imbert P, Jacquet JP, Marchand O, Couturier P & Gavazzi G (2013). What are key factors influencing malnutrition screening in community-dwelling elderly populations by general practitioners? A large cross-sectional survey in two areas of France. *Eur J of Clin Nutr* 67(11):1193–1199.

GEM (2014). *Modul 3 Penuaan Sihat, Aktif dan Produktif.* Persatuan Gerontologi Malaysia, Ministry of Health Malaysia, Putrajaya.

Ghimire S, Baral BK & Callahan K (2017). Nutritional assessment of community-dwelling older adults in rural Nepal. *Plos One* 12(2):e0172052.

Goswami AK, Kalaivani M, Gupta SK, Nongkynrih B & Pandav CS (2018). Relationship between height and arm span of elderly persons in an urban colony of New Delhi. *Indian J Public Health* 62(2):159-162.

Green SM, James EP, Latter S, Sutcliffe M & Fader MJ (2014). Barriers and facilitators to screening for malnutrition by community nurses : a qualitative study. *J Hum Nutr Diet* 27(1):88-95.

Hamirudin AH, Charlton K & Walton K (2016). Outcomes related to nutrition screening in community living older adults: A systematic literature review. *Arch Gerontol Geriatr* 62: 9–25.

Hamirudin AH, Charlton K, Walton K, Bonney A, Albert G, Hodgkins A, Potter J, Milosavljevic M & Dalley A (2013). "We are all time poor": Is routine nutrition screening of older patients feasible? *Aust Fam Physician* 42(5):321–326.

Harith S, Shahar S & Adznam SN (2016). Determination of calf circumference cut-off values for malaysian elderly and its predictive value in assessing risk of malnutrition. *Malays J Nutr* 22(3):375–387.

Harris PS, Payne L, Morrison L, Green SM, Ghio D, Hallett C, Parsons EL, Aveyard P, Roberts HC, Sutcliffe M, Robinson S, Slodkowska-Barabasz J, Little PS, Stroud MA & Yardley L (2019). Barriers and facilitators to screening and treating malnutrition in older adults living in the community: a mixed-methods synthesis. *BMC Fam Prac* 20(1):100.

IHSR (2018). *Primary Care Clinics: The Lean Experiences.* Institute for Health Systems Research, Ministry of Health Malaysia, Putrajaya.

Kaiser MJ, Bauer JM, Rämsch C, Uter W, Guigoz Y, Cederholm T, Thomas DR, Anthony PS, Charlton KE, Maggio M & Tsai AC, Vellas B & Sieber CC (2010). Frequency of malnutrition in older adults : A multinational perspective using the mini nutritional assessment *J Am Geriatr Soc* 58(9):1734–1738.

Kennelly S, Kennedy NP, Rughoobur GF, Slattery CG & Sugrue S (2010). An evaluation of a community dietetics intervention on the management of malnutrition for healthcare professionals. *J Hum Nutr Diet* 23(6):567–574.

Kennelly S, Kennedy NP, Corish CA, Flanagan-Rughoobur G, Glennon-Slattery C & Sugrue S (2011). Sustained benefits of a community dietetics intervention designed to improve oral nutritional supplement prescribing practices. *J Hum Nutr Diet* 24(5):496-504.

Lohr KN & Field MJ (eds) (1992). *Guidelines for clinical practice: from development to use.* National Academies Press, Washington DC.

Mathew MK & Funderburg K (2007). Malnutrition and Feeding Problems. In Ham RJ (eds). *PRIMARY CARE GERIATRICS: A Case-Based Approach* (Fifth Edit). Mosby Inc., St. Louis, MO.

Mays LC, Drummonds JW, Powers S, Buys DR & Watts PI (2019). Identifying Geriatric Patients at Risk for Malnutrition: A Quality Improvement Project. *J Nutr Gerontol Geriatr* 38(2):15-129.

Muhamad AR, Hamirudin AH, Zainudin N, Sidek S & Rahman NAA (2019). Nutritional risk according to Mini Nutritional Assessment© "short form among community dwelling elderly in Kuantan, Pahang: A pilot study. *Int J Allied Heal Sci* 3(2):658-667.

Munn Z, Peters MD, Stern C, Tufanaru C, McArthur A & Aromataris E (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Med Res Methodol* 18(1):143.

NHLBI (2014). Quality assessment tool for observational cohort and cross-sectional studies. *Bethesda: National Institutes of Health, Department of Health and Human Services.* From https://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascularrisk-reduction/tools/cohort. [Retrieved August 26 2020].

NNI (2011). Nutrition screening – a guide to completing the mini nutritional assessment. Nestle Nutrition Institute. From https://www.mna-elderly.com/forms/mna_guide_english.pdf [Retrieved March 8 2019].

Phillips MB, Foley AL, Barnard R, Isenring EA & Miller MD (2010). Nutritional screening in community-dwelling older adults: a systematic literature review. *Asia Pac J Clin Nutr* 19(3):440-449.

Power L, Mullally D, Gibney ER, Clarke M, Visser M, Volkert D, Bardon L, de van der Schueren MA, Corish CA & MaNuEL Consortium (2018). A review of the validity of malnutrition screening tools used in older adults in community and healthcare settings–A MaNuEL study. *Clin Nutr ESPEN* 24:1-13.

Reber E, Gomes F, Vasiloglou MF, Schuetz P & Stanga Z (2019). Nutritional risk screening and assessment. *J Clin Med* 8(7):1065.

Rodriguez-Tadeo A, Wall-Medrano A, Gaytan-Vidaña ME, Campos A, Ornelas-Contreras M & Novelo-Huerta HI (2012). Malnutrition risk factors among the elderly from the US-Mexico border: the "one thousand" study. *J Nutr Health Aging* 16(5):426-431.

Rosa CB, Garces SBB, Hansen D, Brunelli AV, Bianchi PDA, Coser J, Krug MDR & Schwanke CHA (2017). Malnutrition risk and hospitalization in elderly assisted in Primary Care. *Cien Saude Colet* 22:575-582.

Sakinah H, Suzana S, Noor Aini MY, Philip Poi JH & Kamaruzzaman SB (2017). *Garis Panduan Alat Penyaringan Risiko Malpemakanan-Hospital Untuk Warga Emas.* School of Nutrition and Dietetics, Faculty of Health Science, Universiti Sultan Zainal Abidin.

Siqueira VDO, Costa BVDL, Lopes ACS, Santos LCD, Lima-Costa MF & Caiaffa WT (2012). Different equations for determining height among the elderly: the Bambuí cohort study of aging. *Cad Saude Publica* 28(1):125-134.

Söderström L, Rosenblad A, Adolfsson ET & Bergkvist L (2017). Malnutrition is associated with increased mortality in older adults regardless of the cause of death. *Br J Nutrition* 117(4):532–540.

Soeters PB, Reijven PL, van Bokhorst-de van der Schueren MA, Schols JM, Halfens RJ, Meijers JM & van Gemert WG (2008). A rational approach to nutritional assessment. *Clin Nutri* 27(5):706-716

Suzana S, Boon PC, Chan PP & Normah CD (2013). Malnutrition risk and its association with appetite, functional and psychosocial status among elderly malays in an agricultural settlement. *Malays J Nutr* 19(1):65–75.

Suzana S & Siti Saifa H (2007). Validation of nutritional screening tools against anthropometric and functional assessments among elderly people in Selangor. *Malays J Nutr 13*(1):29–44.

Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MD, Horsley T, Weeks L, Hempel S, Akl EA, Chang C, McGowan J, Stewart L, Lewin S, Godfrey CM, Macdonald MT, Langlois EV, Soares-Weiser K, Moriarty J, Clifford T, Tuncalp O & Straus SE (2018). PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 169(7):467-473.

Vandewoude M, Michel JP, Knight P, Anthony P, Glencorse C & Engfer M (2011). Variability of nutritional practice by geriatricians across Europe. *Eur Geriatr Med* 2(2):67–70.

Villaverde-Gutiérrez C, Sánchez-López MJ, Ramirez-Rodrigo J & Ocaña-Peinado FM (2015). Should arm span or height be used in calculating the BMI for the older people? Preliminary results. *J Clin Nurs* 24(5–6):817–823.

Volkert D (2002). Malnutrition in the elderly—prevalence, causes and corrective strategies. *Clin Nutr* 21:110-112.

Volkert D, Beck AM, Cederholm T, Cereda E, Cruz-Jentoft A, Goisser S, de Groot L, Großhauser F, Kiesswetter E, Norman K, Pourhassan M, Reinders I, Roberts HC, Rolland Y, Schneider SM, Sieber CC, Thiem U, Visser M, Wijnhoven HAH & Wirth R. (2019). Management of malnutrition in older patients—current approaches, evidence and open questions. *J Clin Med* 8(7):974.

WHO (2017). Integrated care for older people (ICOPE). Guidelines on community-level interventions to manage declines in intrinsic capacity. World Health Organization. From https://apps.who.int/iris/bitstream/handle/10665/258981/9789241550109-eng.pdf?sequence=1&isAllowed=y [Retrived March 18 2019].

Winter J, Flanagan D, McNaughton SA & Nowson C (2013). Nutrition screening of older people in a community general practice, using the MNA-SF. *J Nutr Health Aging* 17(4):322-325.

Zainudin N, Hamirudin AH, Nor NA & Sidek S (2019). Malnutrition risk and perception on dietary practices among elderly living in agricultural settlements: A mixed-methods research. *Nutr Food Sci* 49(4):617–627.