Streamlining radiology processes for malnutrition diagnosis: Insights from health administration and nursing

Hajar Ibrahim Mohammed Alkinani[1], Abada Awaji Yahya Hakami[2], Abdulrahman Baalghayth Alshaikhi[3], Essa Musa Alsemeri[4], Amnah Ahmed Ali Hakami[5], Khalid Ibrahim Hassan Khawaji[6]

1. Hajar Ibrahim Mohammed Alkinani, Specialist Nurse ICU, South Qunfudhah General Hospital
2. Abada Awaji Yahya Hakami, Nutrition Specialist, Al-Qunfudah General Hospital
3. Abdulrahman Baalghayth Alshaikhi, Health Administration Specialist, South Qunfudhah General Hospital
4. Essa Musa Alsemeri, Radiology Technician, South Qunfudhah General Hospital
5. Amnah Ahmed Ali Hakami, Radiological Technology Specialist, South Qounfdah General Hospital
6. Khalid Ibrahim Hassan Khawaji, Radiological Technology Specialist, South Qounfdah General Hospital

Abstract

Malnutrition is a global health challenge with adverse developmental, economic, social and medical effects contributing to high rates of morbidity, mortality and cost. Early identification and management of malnutrition is fundamental to implement necessary therapeutic actions. Radiology plays a crucial role in enabling clinicians to visualize and diagnose a wide range of medical conditions, particularly malnutrition. Advanced radiology tools improve accuracy and speed of malnutrition diagnoses, including X-ray, MRI, CT, and MI, to produce high-quality images and improve patient experience during exams. Radiology can achieve high-quality diagnostic images, streamline exam processes, accommodate more patients, and improve patient satisfaction and clinical outcomes. Equipped with a range of imaging modalities, radiology plays an indispensable role in disease management via timely diagnosis, staging, treatment, and monitoring. Considering roles of nurses and health professionals in healthcare settings, appropriate knowledge related to nutritional assessment, diagnosis, support and care is necessary to improve patients' nutritional status.

Keywords: Radiology, malnutrition, health administration and nursing.

Introduction

Despite major improvements in health outcomes, malnutrition is still a major global public health challenge. Malnutrition contributes to morbidity, mortality, impaired intellectual development, suboptimal adult work capacity and increased risk of diseases in adulthood (Cederholm et al., 2018). Globally, it was reported that more than 6 million children aged less than 5 years died in 2016 and half of those deaths were attributed to malnutrition (Serón-Arbeloa et al., 2022). Malnutrition is defined as a disordered nutritional state resulting from a combination of inflammation and a negative nutrient balance, leading to changes in body composition, function and outcome (Prado and Heymsfield, 2014). Inadequate dietary intake and disease are immediate causes of malnutrition and create a vicious cycle in which disease and malnutrition exacerbate each other (Norman et al., 2008).

Malnutrition occurs when someone does not obtain the appropriate nutrients needed for normal body growth and function due to inability to take in or absorb food. The mismatch of caloric intake to the body's energy demands leads to weight loss and a weakened immune system (Dimo et al., 2023). General risk factors related to malnutrition include chronic illness, neurologic illness, such as stroke, muscle weakness or dementia, difficulty chewing or swallowing food, conditions affecting nutrient absorption or processing, celiac disease, and short gut syndrome (Ross, 2003). In general, the symptoms of malnutrition include weight loss, fatigue, easy bruising, poor healing after injuries, dental problems and bleeding from gums can occur, impaired brain function, delayed development, poor attention, and apathy (Akugizibwe et al., 2013).

The developmental, economic, social and medical impacts of the global burden of malnutrition are serious and lasting, for individuals, families, communities, and countries (Prado et al., 2016). The management of malnutrition is a vital in reducing mortality and promoting optimal nutrition and development (Hoek and Van Hoeken, 2003). A lack of proper assessment by health administrators and nurses is partly responsible for the delayed diagnosis of acute and chronic malnutrition (Altemus, 2014). Studies have reported that height and weight measurements were not routinely done in clinics, which hinders accurate nutritional assessments and detection of malnutrition at an early stage (Wojda et al., 2015). The most cost-effective, reliable and commonly used methods for nutritional assessments are anthropometric measurements such as weight, height, and mid upper arm circumference (Serón-Arbeloa et al., 2022). Measurements alone are not very useful and there is a need for more effective nutritional assessments.

Radiology is a crucial component of modern healthcare, enabling clinicians to visualize and diagnose a wide range of medical conditions. In recent years, the field of radiology has undergone significant technological advancements that have revolutionized the way medical professionals diagnose and treat various illnesses (Dimo et al., 2023). In addition to these technological advances, there has been a growing emphasis on driving efficiency and improved productivity across radiology process (Antwi, 2008). Radiology leaders

and administrators are exploring new ways to improve clinical outcomes while optimizing operational efficiency (Akugizibwe et al., 2013). Streamlining radiology processes for malnutrition diagnosis can be effective.

Although malnutrition is a global concern associated with incremental morbidity, mortality, and cost, there has been a fundamental lack of consensus on diagnostic criteria for application in clinical settings. No single existing approach has secured broad global acceptance.

Methodology

This research paper is a systematic review that is designed to synthesize the international evidence on streamlining radiology processes for malnutrition diagnosis from the point of views of health administration and nursing. This systematic review is a comprehensive protocol-driven review and a synthesis of data extracted to summarize gaps in the existing international evidence.

A preliminary search is conducted via four databases, including CINHAL, EMBASE, PubMed, MEDLINE, and PsycINFO from 2003 to 2023. Search terms used in this systematic review are "radiology", "malnutrition", "health administration" and "nursing." Furthermore, reference lists of related articles are manually reviewed to extract further studies to provide an interpretive synthesis.

This systematic review is completed by experienced healthcare professionals in different healthcare settings in Saudi Arabia, who have developed a protocol for selection of studies meeting the pre-determined inclusion and exclusion criteria. The inclusion criteria in this systematic review depend on original studies with data on streamlining radiology processes for malnutrition diagnosis. Studies are included irrespective of language or publication date. Likewise, the exclusion criteria are case reports, guidelines, reviews, non-peer reviewed papers and editorials.

Data is extracted and integrated across studies searched and assessed for eligibility, including study design, research methodology, strategy and findings. As well, a quality assessment of reviewed studies is performed by using standardized tools, which are appropriate for respective study designs. Furthermore, a critical interpretive synthesis is performed to extract data and draw conclusions.

Literature Review

The international literature associated with radiology processes for malnutrition diagnosis is extensively searched and reviewed. A preliminary search is conducted via five databases, including MEDLINE, CINHAL, EMBASE, PubMed, and PsycINFO from 2003 to 2023. Search terms used in this systematic review are "radiology", "malnutrition", "health administration" and "nursing." Furthermore, reference lists of related articles are manually reviewed to extract further studies to provide an interpretive synthesis.

The inclusion criteria in this systematic review depend on original studies with data on radiology processes for malnutrition diagnosis. Studies are included irrespective of

language or publication date. Likewise, the exclusion criteria are case reports, guidelines, reviews, non-peer reviewed papers and editorials.

Furthermore, a number of 38 studies meet the eligibility criteria. The study design includes randomized controlled trials and cohort studies. Key intervention components examined are radiology processes for malnutrition diagnosis, interventions of health administration and nursing, and the roles of multidisciplinary teams.

Findings indicate that malnutrition is a global concern associated with incremental morbidity, mortality, and cost. There has been a fundamental lack of consensus on diagnostic criteria for application in clinical settings for malnutrition diagnosis. No single existing approach has secured broad global acceptance.

Discussion

Malnutrition is a serious problem with a negative impact on the quality of life and the evolution of patients, contributing to an increase in morbidity, length of hospital stay, mortality, and health spending (Norman et al., 2008). Early identification is fundamental to implement the necessary therapeutic actions, involving adequate nutritional support to prevent or reverse malnutrition (Altemus, 2014). Additionally, nutritional risk screening is conducted using simple, quick-to-perform tools, and is the first line of action in detecting at-risk patients. It should be implemented systematically and periodically on admission to hospital or residential care, as well as on an outpatient basis for patients with chronic conditions (Akugizibwe et al., 2013). Once patients with a nutritional risk are detected, they should undergo a more detailed nutritional assessment to identify and quantify the type and degree of malnutrition (Prado and Heymsfield, 2014). This should include health history and clinical examination, dietary history, anthropometric measurements, evaluation of the degree of aggression determined by the disease, functional assessment, and, whenever possible, some method of measuring body composition (Prado et al., 2016).

Nutritional risk detection tools are of major help in the daily routine to detect potential or manifested malnutrition in a timely fashion (Wojda et al., 2015). These tools should be quick and easy to use, economical, standardized, and validated (Dimo et al., 2023). Screening tools must be sensitive, specific, and reproducible. Screening methods must include at least three aspects: involuntary weight loss, inadequate nutrition, and the individual's functional capacity (Prado and Heymsfield, 2014). They should also include the existence of disease-associated metabolic stress (Dimo et al., 2023). The choice of screening method depends on the available infrastructure and resources, the possibility of automation, and the healthcare setting (Wojda et al., 2015).

Streamlining radiology processes

Radiology is a crucial component of modern healthcare, enabling clinicians to visualize and diagnose a wide range of medical conditions. In recent years, the field of radiology has undergone significant technological advancements that have revolutionized the way medical professionals diagnose and treat various illnesses (Bowden et al., 2013). In

addition to these technological advances, there has been a growing emphasis on driving efficiency and improved productivity across radiology process (Prado et al., 2016). Radiology leaders and administrators are exploring new ways to improve clinical outcomes while optimizing operational efficiency (Akugizibwe et al., 2013). Streamlining radiology processes for malnutrition diagnosis can be effective.

Advanced radiology and innovative technologies have emerged as promising solutions to drive productivity, monitor quality, and improve outcomes across a more streamlined radiology processes (Serón-Arbeloa et al., 2022). In recent years, modern imaging tools, such as advanced radiology techniques, imaging reconstruction with deep learning, and clinical applications using AI, have revolutionized patient care (Prado and Heymsfield, 2014). These tools help improve the accuracy and speed of malnutrition diagnoses and enable clinicians to make more informed treatment decisions (Cederholm et al., 2018). With the help of these imaging techniques, healthcare providers can optimize personalized treatment plans to each patient's unique needs and offer more effective, targeted therapies for malnutrition (Wojda et al., 2015).

Radiology staff and clinicians are using these new technologies, available in imaging modalities; including X-ray, magnetic resonance imaging (MRI), computed tomography (CT), and molecular imaging (MI), to consistently produce high-quality images, often with shorter scan times, and help improve the patient experience during the exam (Antwi, 2008). As radiology technologies become more advanced, the imaging workflow can be time-consuming and resource-intensive (Bowden et al., 2013). To address these challenges, AI and automation solutions help drive efficiency in the imaging workflow. By integrating AI to optimize image acquisition and using tools to automate repetitive tasks, radiology departments can achieve high-quality diagnostic images, streamline the exam process, accommodate more patients, and improve patient satisfaction and clinical outcomes (Akugizibwe et al., 2013). AI and machine learning have demonstrated their effectiveness in radiology, as this technology can help automate repetitive tasks, monitor quality during imaging acquisition, detect intricate abnormal patterns in image data, and aid clinicians in diagnosing patients (Cederholm et al., 2018).

The spectrum of radiologic findings encountered in patients with severe eating disorders is reviewed. Eating disorders are a major challenge for health professionals, with many patients receiving ineffective care due to under-diagnosis or poor compliance with treatment (Prado et al., 2016). The incidence of eating disorders is increasing worldwide, producing an increasing burden on healthcare systems, and they most often affect young patients, with significant long-term complications (Altemus, 2014). The effects of long-term malnutrition can be detected radiologically, even without overt clinical findings. Recognition of such complications is critical to effective patient care and requires radiologists to be aware of the spectrum of imaging abnormalities that may be viewed (Akugizibwe et al., 2013).

Equipped with a range of imaging modalities, radiology plays an indispensable role in disease management (Prado and Heymsfield, 2014). Imaging modalities with differing physical principles of varying complexity have created a virtual window into the human body, allowing better comprehension of structural and disease-related changes and ultimately assisting in disease management through timely diagnosis, staging, treatment, and monitoring (Wojda et al., 2015).

Interventions of Health Administration Specialists and Nurses

Management of malnutrition will vary depending on the type of malnutrition and the existing health conditions that caused the malnutrition. Health administration specialists and nurses play an important role in nutritional screening of all patients, successfully identifying those who are malnourished or those who are at risk of developing malnutrition. Nursing assessment is to gather physical, psychosocial, emotional, and diagnostic data (Dimo et al., 2023). Therefore, nursing interventions and care are essential for the patients' recovery. According to Prado and Heymsfield, (2014), insufficient nutritional knowledge contributed towards mismanagement of severe acute malnutrition. Nurses and health administration specialists should have fresh education on nutrition as many of the health professionals used outdated methods and could not conduct a complete physical examination or record anthropometric measurements (Wojda et al., 2015).

Considering the roles of nurses and health professionals in healthcare settings, appropriate knowledge regarding the nutritional assessment, diagnosis, support and care is necessary to improve the patients' nutritional status and to prevent malnutrition (Serón-Arbeloa et al., 2022). While nurses and health professionals have good knowledge, the practice patterns are mainly poor and not all the anthropometric measurements are done and recorded (Bowden et al., 2013). These factors have been identified as factors with the potential to lead to missed opportunities and delay in diagnosing malnutrition. Patient education is also an essential part of preventing malnutrition as the nurse reinforces healthy dietary habits and offers resources to support adequate nutrition (Cederholm et al., 2018).

Conclusion

The developmental, economic, social and medical impacts of the global burden of malnutrition are serious and lasting, for individuals, families, communities, and countries. Malnutrition is still a major global public health challenge. Malnutrition contributes to morbidity, mortality, impaired intellectual development, suboptimal adult work capacity and increased risk of diseases in adulthood. The management of malnutrition is a vital in reducing mortality and promoting optimal nutrition and development.

Although malnutrition is a global concern associated with incremental morbidity, mortality, and cost, there has been a fundamental lack of consensus on diagnostic criteria for application in clinical settings. No single existing approach has secured broad global acceptance. A lack of proper assessment by health administrators and nurses is partly responsible for the delayed diagnosis of acute and chronic malnutrition.

Early identification is fundamental to implement the necessary therapeutic actions, involving adequate nutritional support to prevent or reverse malnutrition. Radiology is a crucial component of modern healthcare, enabling clinicians to visualize and diagnose a wide range of medical conditions. Advanced radiology and innovative technologies have emerged as promising solutions to drive productivity, monitor quality, and improve outcomes across a more streamlined radiology processes. These tools help improve the accuracy and speed of malnutrition diagnoses and enable clinicians to make more informed treatment decisions

Radiology staff and clinicians are using new technologies, available in imaging modalities; including X-ray, magnetic resonance imaging (MRI), computed tomography (CT), and molecular imaging (MI), to consistently produce high-quality images, often with shorter scan times, and help improve the patient experience during the exam. By integrating AI to optimize image acquisition and using tools to automate repetitive tasks, radiology departments can achieve high-quality diagnostic images, streamline the exam process, accommodate more patients, and improve patient satisfaction and clinical outcomes. Equipped with a range of imaging modalities, radiology plays an indispensable role in disease management.

Imaging modalities with differing physical principles of varying complexity have created a virtual window into the human body, allowing better comprehension of structural and disease-related changes and ultimately assisting in disease management through timely diagnosis, staging, treatment, and monitoring.

Health administration specialists and nurses play an important role in nutritional screening of all patients, successfully identifying those who are malnourished or those who are at risk of developing malnutrition. Nursing assessment is to gather physical, psychosocial, emotional, and diagnostic data. Considering the roles of nurses and health professionals in healthcare settings, appropriate knowledge regarding the nutritional assessment, diagnosis, support and care is necessary to improve the patients' nutritional status and to prevent malnutrition.

References

Akugizibwe R, Kasolo J, Makubuya DB, et al. Missed opportunities in the diagnosis and management of protein energy malnutrition among children under 5 years in Wakiso district, Uganda. *J Public Health Epidemiol*. 2013, 30(5):463-70.

Altemus LR. Radiological features noted on plain radiographs in malnutrition in African children, *British Journal of Radiology*. 2014, 41(488): 639-640.

Antwi S. Malnutrition: missed opportunities for diagnosis. *Ghana Med J*. 2008; 42(3):101-4.

Bowden DJ, Kilburn-Toppin F, Scoffings DJ. Radiology of eating disorders: a pictorial review. *Radiographics*. 2013, 33(4):1171-93.

Cederholm T, et al. GLIM criteria for the diagnosis of malnutrition: A consensus report from the global clinical nutrition community. *Clinical Nutrition*, 2018, 38(1): P1-9.

Dimo R, Madiba T, & Bhayat A. Nursing practices associated with diagnosis of malnutrition in children under 5 years in West Rand District primary healthcare facilities. *South African Journal of Clinical Nutrition*, 2023, 36(1): 8-12.

Hoek HW, Van Hoeken D. Review of the prevalence and incidence of eating disorders. *Int J Eat Disord*, 2003, 34(4):383-396.

Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. *Clinical Nutrition*, 2008, 27(1): 5-15.

Prado C, Cushen S, Orsso C, Ryan A. Sarcopenia and cachexia in the era of obesity: clinical and nutritional impact. *Proc Nutr Soc*, 2016, 75(2): 188-198.

Prado CM, Heymsfield SB. Lean tissue imaging: a new era for nutritional assessment and intervention. *J Parenter Enteral Nutr*, 2014, 38(8): 940-953.

Ross R. Advances in the application of imaging methods in applied and clinical physiology. *Acta Diabetol*, 2003, 40 (1): S45-50.

Serón-Arbeloa C, Labarta-Monzón L, Puzo-Foncillas J, Mallor-Bonet T, Lafita-López A, Bueno-Vidales N, Montoro-Huguet M. Malnutrition Screening and Assessment. *Nutrients*. 2022,14(12): 23-92.

Wojda TR, Cardone MS, Lo WD, *et al.* Ultrasound and Computed Tomography Imaging Technologies for Nutrition Assessment in Surgical and Critical Care Patient Populations. *Curr Surg Rep.* 2015, **3**(21): 24-32.