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ASSESSMENT AND MANAGEMENT OF MALNUTRITION IN HOSPITALIZED ADULT PATIENTS: A SYSTEMATIC REVIEW OF THE ROLES OF RADIOLOGY, NURSING, CLINICAL NUTRITION, AND LABORATORY BIOMARKERS

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Abstract

Background: Malnutrition affects a substantial proportion of hospitalized adults and is associated with longer hospital stay, infections and higher mortality. Effective management requires coordinated work from multiple disciplines, including radiology, nursing, clinical nutrition and laboratory medicine. However, evidence is often reported within silos focusing on a single profession or assessment modality. Objectives: To synthesize evidence on the assessment and management of malnutrition in hospitalized adult patients, with specific attention to the complementary roles of radiology, nursing, clinical nutrition and laboratory biomarkers. Methods: A systematic search of major databases identified observational and interventional studies in hospitalized adults (≥18 years) addressing malnutrition assessment or management in at least one of the four domains. Ten original studies were included for the primary results and ten systematic reviews or meta-analyses informed the background and discussion. Data were synthesized narratively in line with PRISMA 2020 recommendations. Results: Nurse administered screening tools demonstrated good validity and reliability, while individualized dietitian led nutritional support reduced complications, readmissions and mortality. Computed tomography (CT)–derived body composition measures

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strengthened Global Leadership Initiative on Malnutrition (GLIM) phenotypic criteria, and laboratory biomarkers such as prealbumin and C reactive protein–to–albumin ratios provided additional prognostic information. Evidence supported a multidisciplinary model with early screening, targeted imaging and biomarker use, and structured nutritional interventions. Conclusion: Integrating radiology, nursing, clinical nutrition and laboratory biomarkers into standardized hospital pathways can improve identification and treatment of malnutrition in adults, but implementation and inter professional coordination remain major gaps.

Keywords: Hospital Malnutrition, GLIM, Radiology, Nursing, Clinical Nutrition, Biomarkers, Body Composition, Prealbumin.

INTRODUCTION

Disease related malnutrition affects an estimated 20–50% of hospital inpatients on admission and often worsens during the stay, leading to increased complications, longer length of stay and higher health care costs (Barker et al. 2011, Cass et al. 2022, Uhl et al. 2021). Despite clear recognition of its impact, malnutrition remains underdiagnosed and undertreated in many hospitals worldwide.

Systematic reviews of hospitalized adults show that nutritional support can improve outcomes when targeted to patients at nutritional risk, especially when high protein, individualized strategies are applied (Gomes et al. 2019, Uhl et al. 2022). At the same time, the literature on hospital acquired malnutrition highlights that nutritional deterioration during admission is common and often preventable, driven by organizational barriers, inadequate screening and insufficient clinical prioritization of nutrition (Cass et al. 2022).

Early identification relies heavily on screening tools implemented by nurses at admission and during the stay. Reviews of screening and assessment approaches in hospitalized older adults emphasize that multiple tools exist and differ in validity, feasibility and predictive performance (Dent et al. 2019, Cortés Aguilar et al. 2024). Evidence also suggests that nurses are central to detecting risk and initiating referrals, yet they frequently report insufficient training and competing workload demands (Jefferies et al. 2011).

Beyond bedside measurements, imaging and laboratory modalities have become increasingly important. Body composition analysis based on CT, ultrasound or functional measures adds objective information about muscle mass and quality and can be integrated into GLIM phenotypic criteria (Smith et al. 2022, Tolonen et al. 2021). Parallel advances in clinical chemistry have refined the role of visceral proteins and inflammation sensitive markers, while traditional reliance on albumin as a nutritional marker has been questioned, combinations of prealbumin, C reactive protein and composite ratios show promise as nutritional and prognostic indicators (Keller 2019, Devoto et al. 2006).

The Global Leadership Initiative on Malnutrition (GLIM) framework provides consensus criteria combining phenotypic (weight loss, low body mass index, reduced muscle mass) and etiologic (reduced intake, disease burden) domains to standardize malnutrition diagnosis in adults in settings (Barazzoni et al. 2020). However, the optimal way to operationalize GLIM in routine hospital care, how to integrate CT derived muscle

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measures, nurse led screening tools, dietitian delivered interventions and laboratory markers—is still evolving.

This systematic review therefore aims to summarize original research on malnutrition assessment and management in hospitalized adults, focusing specifically on the roles of radiology, nursing, clinical nutrition interventions and laboratory biomarkers, and to contextualize these findings within the broader evidence base from systematic reviews and meta-analyses.

METHODS

This review followed the PRISMA 2020 reporting guideline. A comprehensive search of MEDLINE (via PubMed), Embase, CINAHL and Web of Science was undertaken to identify studies on malnutrition assessment or management in hospitalized adult patients (≥18 years). Search terms combined controlled vocabulary and free text related to: malnutrition, hospitalized adults, GLIM, nutrition screening, nursing, radiology, computed tomography, body composition, prealbumin, C reactive protein, biomarkers, nutritional support and randomized clinical trial. Reference lists of relevant systematic reviews were hand searched to identify additional primary studies.

Eligibility Criteria

Inclusion criteria for original studies were: hospitalized adult population (general medical, surgical, oncology, liver, or mixed wards), Explicit assessment or management of malnutrition or nutritional risk, Focus on at least one of the four domains: radiology (CT derived muscle or adiposity measures), nursing (screening tools or nursing led assessment), clinical nutrition (dietitian led or protocol driven nutritional interventions) or laboratory biomarkers (prealbumin, albumin, C reactive protein based indices), Observational cohort, cross sectional or randomized controlled trial design.

Inclusion criteria for reviews were systematic reviews or meta-analyses reporting explicit methods (search strategy, eligibility criteria) on prevalence, screening, assessment tools, interventions, imaging-based body composition, biomarkers or nursing roles in hospital malnutrition. We excluded paediatric studies, studies exclusively in outpatients or long-term care, case reports and narrative reviews without systematic methods.

Study Selection and Data Extraction

Two reviewers independently screen titles, abstracts for eligibility, followed by full text assessment, disagreements were resolved by discussion. For this synthesis, ten original studies ten systematic reviews, meta-analyses were purposively selected to provide balanced coverage of the four domains and to avoid over representation of any single tool or population.

A standardized extraction form captured study design, setting, sample size, population characteristics, malnutrition definition, assessment modality, intervention and main outcomes (nutritional status, complications, mortality, readmission, length of stay).

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Given the conceptual heterogeneity in domains, a narrative synthesis was undertaken without quantitative meta-analysis.

Quality Appraisal

Randomized controlled trials were appraised conceptually using domains similar to the Cochrane risk of bias tool (sequence generation, allocation concealment, blinding, incomplete outcome data and selective reporting). Observational studies were considered in terms of selection bias, confounding control and completeness of follow up. Systematic reviews were considered with respect to AMSTAR like criteria (breadth of search, dual screening, risk of bias assessment and synthesis methods). Because this article is a methodological and narrative synthesis, formal scoring is not reported, but the discussion emphasizes higher quality evidence (large RCTs and contemporary systematic reviews).

RESULTS

Overview of Included Studies

Ten original studies met the inclusion criteria and were grouped by primary domain: radiology (n=3), nursing led screening and assessment (n=3), clinical nutrition interventions (n=2) and laboratory biomarkers (n=2). Table 1 summarizes their main characteristics. These were interpreted alongside ten systematic reviews, meta-analyses covering prevalence, screening tools, interventions, imaging and biomarkers.

Radiology and Body Composition

Two original studies integrated CT derived muscle measures into GLIM based malnutrition diagnosis. In a cohort of hospitalized cancer inpatients, Sánchez Torralvo et al. used CT at the third lumbar vertebra to quantify skeletal muscle index and combined this with GLIM criteria (weight loss, low BMI, reduced intake) (Sánchez Torralvo et al. 2021). They showed that patients classified as malnourished by GLIM and simultaneously sarcopenic by CT had substantially higher 6-month mortality than those without sarcopenia, suggesting that radiology can refine risk stratification beyond clinical criteria alone.

Similarly, Jiang et al. applied GLIM criteria in hospitalized patients with liver cirrhosis and used CT derived L3 skeletal muscle index to operationalize reduced muscle mass (Jiang et al. 2024). They found a high prevalence of GLIM defined malnutrition and demonstrated that low muscle mass independently predicted mortality, even after adjustment for liver disease severity. Building on this, Fontane et al. evaluated the validity and applicability of GLIM criteria in patients hospitalized for acute medical conditions, showing that GLIM defined malnutrition was associated with higher in hospital mortality and readmission, and that incorporating objective measures of muscle mass improved predictive performance (Fontane et al. 2023).

These findings align with systematic reviews indicating that CT based body composition analysis provides robust prognostic information in hospitalized and oncology populations

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and can be used opportunistically from routine scans (Smith et al. 2022, Tolonen et al. 2021). Collectively, this evidence supports radiology as a key partner in malnutrition assessment when cross sectional imaging is already available for diagnostic purposes.

Nursing Led Screening and Assessment

Three original studies highlighted the central role of nurses in early detection of malnutrition. Lim et al. validated the 3 Minute Nutrition Screening (3 MinNS) tool when administered by ward nurses in a Singapore tertiary hospital (Lim et al. 2013). In this cross-sectional study, 121 adults were screened within 24 hours of admission.

Using Subjective Global Assessment (SGA) by dietitians as the reference, a 3 MinNS cut off score of ≥3 yielded high sensitivity and specificity for identifying patients at risk of malnutrition, and inter-rater agreement between nurses was substantial. This demonstrates that brief, nurse administered tools can accurately flag at risk patients early in the admission.

Expanding on practical implementation, Diep Pham et al. audited malnutrition screening in a New Zealand hospital using the Malnutrition Screening Tool (MST) (Diep Pham et al. 2023).

They reported variable completion rates and documented that, when performed, nurse completed MST screening reliably identified adults at risk, but adherence to institutional screening policies was suboptimal. Barriers included competing workload and incomplete documentation, highlighting the need for organizational support and feedback to sustain high screening coverage.

Gbareen et al. compared a subjective assessment (Mini Nutritional Assessment, MNA) with an objective scoring system (Standardized Appetite and Nutrition Screening, SANS) of chronically ill adults, exploring nurses' workload and cultural differences between Arab and Jewish Israeli patients (Gbareen et al. 2021).

They found good agreement between tools and showed that patient self-assessment could reduce nursing workload, though cultural background influenced responses and interpretation. This underscores that nutritional assessment is not merely a technical task but is shaped by communication, culture and patient engagement.

Systematic reviews of screening tools in hospitalized adults confirm that many instruments (MST, MUST, NRS 2002, MNA SF, 3 MinNS) have acceptable predictive validity but differ in feasibility, populations and cut offs (Dent et al. 2019, Cortés Aguilar et al. 2024).

Nursing reviews emphasize that nurses are pivotal in initiating screening and monitoring intake but often lack training and institutional support to fully assume this role (Jefferies et al. 2011).

Clinical Nutrition Interventions

large randomized controlled trials provided high quality evidence on hospital nutritional management.

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In the EFFORT trial, Schuetz et al. enrolled medical inpatients at nutritional risk, as determined by validated screening tools, and randomized them to individualized, goal directed nutritional support versus usual care (Schuetz et al. 2019). Dietitians tailored energy and protein prescriptions, monitoring intake daily.

The intervention reduced a composite endpoint of adverse clinical outcomes and lowered 30-day mortality compared with usual care, demonstrating that systematic, protocol driven nutrition support improves hard outcomes.

Deutz et al. conducted the NOURISH trial in malnourished older hospitalized adults, randomizing participants to receive a specialized high protein oral nutritional supplement or a placebo like control during hospitalization and after discharge (Deutz et al. 2016). The supplemented group had lower rates of readmission and mortality, supporting the benefit of targeted oral nutritional supplementation in high-risk older patients.

These RCTs are consistent with meta-analyses showing that individualized nutritional support in malnourished or at-risk inpatients reduces mortality and complications (Gomes et al. 2019, Uhl et al. 2022). They also illustrate the central role of clinical nutrition teams in translating screening results into concrete interventions.

Laboratory Biomarkers

Two included original studies focused on laboratory markers as tools for nutritional assessment and prognosis. Devoto et al. evaluated prealbumin concentrations in hospitalized adults and concluded that prealbumin was a feasible and reliable marker of malnutrition, especially in settings where a full nutritional assessment is difficult (Devoto et al. 2006).

They observed that lower prealbumin levels were associated with worse clinical status and adverse outcomes, although inflammation and acute illness could influence levels.

More recently, García Moreno et al. examined C reactive protein to prealbumin and C reactive protein to albumin ratios as integrated nutritional and prognostic markers in hospitalized patients (García Moreno et al. 2024).

In this observational cohort, higher ratios were associated with poorer nutritional status and increased mortality, suggesting that combining negative acute phase proteins with CRP may better reflect the interplay between inflammation and malnutrition than single markers alone.

A broader review on nutritional laboratory markers emphasizes that no single biomarker is sufficient to diagnose malnutrition, but albumin, prealbumin and related indices retain value as prognostic markers and as complements to clinical and anthropometric assessment (Keller 2019).

This aligns with GLIM guidance that laboratory data can support—but should not replace—clinical identification of reduced intake, weight loss and low muscle mass (Barazzoni et al. 2020).

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Table 1: Characteristics of the 10 included original studies

Domain	Citation	Country	Design and population	intervention	Key findings
Radiology, GLIM	Sánchez Torralvo 2021	Spain, oncology inpatients	Prospective cohort, adult cancer in patients undergoing CT	GLIM criteria plus CT derived L3 skeletal muscle index for sarcopenia	GLIM defined malnutrition combined with CT sarcopenia identified a subgroup with markedly higher 6-month mortality, improving prognostic stratification.
Radiology, GLIM	Jiang 2024	China, hospitalized cirrhotic patients	Cohort study, adults with liver cirrhosis	GLIM criteria with CT measured L3 muscle index	High prevalence of GLIM malnutrition, low muscle mass independently predicted mortality beyond liver disease scores.
Radiology, GLIM	Fontane 2023	Spain, acute medical wards	Prospective validation study, adults hospitalized for acute medical conditions	GLIM criteria operationalized with clinical and body composition data	GLIM defined malnutrition was associated with increased in hospital mortality and readmissions, performance improved when muscle mass measures were incorporated.
Nursing screening	Lim 2013	Singapore, tertiary hospital	Cross sectional, adults screened within 24 h of admission	3 Minute Nutrition Screening (3 MinNS) administered by nurse's vs SGA by dietitians	3 MinNS score ≥3 showed high sensitivity and specificity for malnutrition risk, inter rater agreement between nurses was substantial, supporting nurse led screening.
Nursing screening	Diep Pham 2023	New Zealand, general hospital	Audit and reliability study, adult inpatients	Nurse completed Malnutrition Screening Tool (MST) on admission	Screening completion rates were suboptimal, but when performed, MST reliably identified at risk patients, highlighted implementation barriers such as workload and documentation.
Nursing assessment	Gbareen 2021	Israel, chronic illness clinics, hospital	Cross sectional, Arab and Jewish adults with chronic disease	Comparison of subjective (MNA) and objective (SANS) tools, with emphasis on nurses' role	Good agreement between tools, patient self-assessment could reduce nurses' workload, but cultural background influenced responses and interpretation.
Clinical nutrition	Schuetz 2019	Multicentre Europe, medical wards	RCT, medical inpatients at nutritional risk	Individualized, goal directed nutritional support by dietitian's vs usual care	Intervention reduced adverse outcomes and 30-day mortality, demonstrating benefit of structured nutritional support in at risk inpatients.
Clinical nutrition	Deutz 2016	Multicentre, older hospitalized adults	RCT, malnourished older inpatients	Specialized high protein oral nutritional supplement vs control	Supplement group had lower readmission and mortality rates, supporting targeted supplementation in older malnourished patients.
Biomarkers	Devoto 2006	Italy, hospitalized adults	Observational, mixed wards	Serum prealbumin as a tool for nutritional assessment	Prealbumin was feasible and correlated with malnutrition severity and adverse outcomes, especially where detailed assessment was not feasible.
Biomarkers	García Moreno 2024	Spain, hospitalized adults	Observational cohort	C reactive protein to prealbumin and C reactive protein to albumin ratios	Higher ratios were associated with poorer nutritional status and higher mortality, suggesting these indices integrate inflammation and malnutrition risk.

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DISCUSSION

This review synthesizes evidence in four professional domains that contribute to hospital malnutrition care. The ten original studies, interpreted in the context of ten systematic reviews and meta-analyses, illustrate how radiology, nursing, clinical nutrition and laboratory biomarkers provide complementary insights. Radiology based body composition analysis strengthens phenotypic components of malnutrition diagnosis. CT derived skeletal muscle indices, when integrated with GLIM criteria, consistently identified patients at higher mortality risk of cancer inpatients and individuals with cirrhosis (Sánchez Torralvo et al. 2021, Jiang et al. 2024). Fontane et al. extended this concept to acute medical populations, demonstrating the prognostic validity of GLIM in general wards (Fontane et al. 2023). Systematic reviews on CT based body composition support these findings, emphasizing the prognostic value of low muscle mass and quality and advocating opportunistic use of existing scans rather than additional imaging solely for nutritional assessment (Smith et al. 2022, Tolonen et al. 2021).

Nursing led screening emerges as the frontline mechanism for identifying at risk patients. Lim et al. showed that nurses can administer 3 MinNS with high validity and reliability compared with dietitian performed SGA (Lim et al. 2013). Diep Pham et al. highlighted that even when robust tools such as MST are available, implementation barriers limit coverage, echoing review findings that organizational culture, training and feedback are crucial determinants of screening success (Dent et al. 2019, Cortés Aguilar et al. 2024, Jefferies et al. 2011). Gbareen et al. further illustrate the importance of cultural competence and patient engagement, suggesting that shared assessment approaches may reduce workload while respecting cultural differences (Gbareen et al. 2021).

Clinical nutrition interventions provide some of the strongest outcome data. The EFFORT and NOURISH trials demonstrate that individualized support and high protein oral supplementation can reduce complications, readmissions and mortality in nutritionally at-risk inpatients (Schuetz et al. 2019, Deutz et al. 2016). These results are consistent with meta-analyses showing that hospital nutrition support is most effective when targeted using validated screening tools, delivered by trained dietitians and maintained for sufficient duration (Gomes et al. 2019, Uhl et al. 2022). However, Uhl's AHRQ review also notes substantial heterogeneity in interventions, populations and definitions of malnutrition, complicating comparisons and guideline development (Uhl et al. 2021).

Laboratory biomarkers remain controversial for diagnosing malnutrition but are valuable for prognosis. Devoto et al. and García Moreno et al. show that prealbumin and CRP based ratios correlate with malnutrition severity and mortality (Devoto et al. 2006, García Moreno et al. 2024). Keller's review emphasizes that these biomarkers are strongly influenced by inflammation and should be interpreted alongside clinical and body composition data rather than used as standalone diagnostic criteria (Keller 2019). This perspective is reflected in the GLIM framework, which prioritizes phenotypic and etiologic criteria but allows laboratory markers to support assessment (Barazzoni et al. 2020).

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Implications for Practice

Taken together, the evidence suggests a practical pathway: nurse led screening at admission using a validated tool, followed by dietitian assessment and individualized nutritional care for at risk patients, opportunistic use of CT based muscle measures when scans are available to refine GLIM classification and prognosis, and selective use of biomarkers such as prealbumin and CRP based ratios to integrate inflammatory and nutritional risk. Interprofessional communication and clear referral triggers are essential to avoid fragmentation.

Limitations of the Evidence and this Review

The original studies included here are heterogeneous in populations (oncology, cirrhosis, older adults, chronic illness), settings and malnutrition definitions, limiting generalizability. Many are single centre cohorts with moderate sample sizes. Radiology focused studies rely on CT, which is not always available or indicated. Biomarker studies are observational and susceptible to confounding by inflammation and comorbidities. This review itself is narrative, includes a focused subset of available studies, and did not perform a formal risk of bias scoring or meta-analysis. Nonetheless, the cross disciplinary synthesis provides a clinically useful framework for integrating different modalities into hospital malnutrition pathways.

CONCLUSION

Hospital malnutrition in adults is common, harmful and frequently preventable. Evidence from randomized trials, observational cohorts and systematic reviews shows that early nurse led screening, dietitian delivered individualized nutritional support, CT based body composition assessment and targeted use of laboratory biomarkers each contribute important and complementary information. Applying GLIM criteria within this multidisciplinary framework can standardize diagnosis while allowing local adaptation. Future work should focus on implementing integrated hospital pathways that link screening, imaging, biomarker interpretation and nutrition therapy, and on evaluating their impact on patient centred outcomes, costs and staff workload in diverse clinical settings.

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