

# 老年共病衰弱相关免疫特征与护理管理进展

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## 摘 要

老年共病患者衰弱的发生发展与免疫衰老、炎性衰老密切相关, 随着年龄增长, 免疫系统会发生改变, 如免疫调节改变、应答能力变化以及慢性低度炎症被激活。这些免疫变化会与多种共病相互作用, 加速机体功能衰退。上述机制往往会使得疾病负担相近的老年人群, 在疾病进展和健康结局上存在差异, 衰弱相关免疫特征可为理解其功能下降及健康结局的异质性提供补充生物学视角。本文围绕老年共病患者衰弱相关免疫特征、潜在机制及护理管理进展进行综述, 并结合现有衰弱护理及老年共病护理管理相关证据分析其临床应用价值与边界。免疫炎症指标可作为评估衰弱及功能状态的辅助信息, 其临床界值及独立决策价值尚不明确。护理管理应整合衰弱、功能、营养、多重用药及已有免疫炎症资料, 通过运动、营养支持、用药管理、连续照护及动态复评实施个体化干预。衰弱相关免疫特征可为风险识别和个体化护理提供参考, 为解释共病患者结局异质性提供新角度, 尚不能替代标准化综合评估, 也不宜作为独立的护理分层依据。

## 关键词

老年共病, 衰弱, 免疫衰老, 炎性衰老, 护理管理

# Advances in Frailty-Related Immune Features and Nursing Management in Older Adults with Multimorbidity

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## Abstract

The development and progression of frailty in older adults with multimorbidity are closely associated

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with immunosenescence and inflammaging. With increasing age, the immune system undergoes alterations, examples include modified immune regulation, altered response capacity, and the activation of chronic low-grade inflammation. These immune shifts can interact with multimorbidity, accelerating functional decline. These mechanisms tend to result in disparities in disease progression and health outcomes among older adults with similar disease burdens. Frailty-related immune characteristics can provide a complementary biological perspective for understanding functional decline and the heterogeneity of health outcomes in older adults with multimorbidity. In clinical practice, clinicians and nurses must account for individual patient care needs when interpreting and applying immune-related features. Older adults living with multimorbidity often present with coexisting frailty, nutritional deficits, and polypharmacy-related risks, which may influence each other during disease progression. For this reason, the interpretation of immune-inflammatory information requires integration with clinical characteristics and patient-centered assessments. Even so, existing studies have confirmed associations between immunosenescence, inflammaging and frailty as well as multimorbidity, discrepancies in measurement methods and biomarker selection limit the direct translation of these findings into clinical nursing practice. Further investigations can establish valid assessment strategies and elaborate practical pathways to embed immune-inflammatory data within nursing assessment and intervention workflows. This review examines frailty-related immune characteristics, potential mechanisms, and advances in nursing management among older adults with multimorbidity. Combined with available evidence on comprehensive frailty nursing assessment and nursing management for older adults with multimorbidity, it analyzes the clinical application value and boundaries of these contents. Current findings suggest that immunosenescence and inflammaging may contribute to frailty development through persistent inflammatory responses and related biological pathways. Such mechanisms can partly explain the heterogeneity of health outcomes in older adults with multimorbidity and provide a biological basis for understanding these differences. Immune-inflammatory indicators include inflammation-related biomarkers and immune-related biomarkers. They can serve as auxiliary clinical data for assessing frailty and functional status. However, their clinical boundaries, predictive accuracy, and independent value for clinical decision-making remain unclear. At present, immune-inflammatory indicators should neither be used as an independent basis for frailty assessment, nor as evidence for nursing assessment and nursing decision-making. Instead, frailty assessment results should be interpreted in combination with comprehensive evaluation and patients' individual status. Several well-recognized authoritative existing scales cover multiple dimensions to identify at-risk populations and different frailty stages. Nursing management for older adults with multimorbidity requires comprehensive assessment and individualized intervention plans. Nurses should evaluate patients' frailty status, physical function, nutritional status, polypharmacy status and immune-inflammatory indicators to formulate nursing plans. Nurses should adjust and implement exercise, nutritional support and polypharmacy management protocols according to patients' nursing needs, with regular and dynamic reassessment. Continuous monitoring and individualized nursing management can maintain the physical function of older adults with multimorbidity, and improve nursing quality as well as the continuity of nursing services. To sum up, frailty-related immune characteristics can provide references for risk identification and individualized nursing, and offer a new perspective for explaining the heterogeneity of health outcomes among older adults with multimorbidity. However, existing evidence does not justify replacing standardized full-scale assessment with immune-related biomarkers, and such characteristics cannot be used as independent indicators for frailty evaluation or nursing stratification. Subsequent work needs to further explore how immune alterations relate to frailty development and progression, and how these findings can be translated into clinical practice. Researchers also ought to pinpoint target immune-inflammatory markers together with their clinically feasible cut-off points, and work out viable strategies to embed immune-derived data within evidence-based nursing workflows.

## Keywords

Older Adults with Multimorbidity, Frailty, Immunosenescence, Inflammaging, Nursing Management



## 1. 引言

多种慢性病共存的问题日益受到关注,加重了老年群体的负担[1],老年人多病共存问题逐渐突出,多病共存(multimorbidity)是指同一患者同时存在2种或2种以上慢性疾病,需长期综合管理[2],与单一疾病管理不同,其不仅增加疾病治疗复杂性,同时给老年人健康管理带来持续挑战。然而,依据疾病数量或采用单一管理模式难以充分解释老年多病共存患者之间的健康结局差异[3],提示临床还可能需结合衰弱、营养和免疫炎症相关信息开展风险评估。

衰弱反映机体生理储备下降和抗应激能力减弱,为解释多病共存老年患者健康结局差异提供了新的视角。Fried衰弱表型模型和Rockwood累积缺陷模型分别从功能表现和多维健康缺陷累积角度描述衰弱特征[4][5],已为多病共存老年患者衰弱识别和风险评估提供了重要的方法学基础。免疫衰老(immunosenescence)[6]和炎性衰老(inflammaging)[7]被发现可能是连接年龄增长、衰弱和多种慢性疾病的重要机制[8],单细胞多维分析有关衰老个体存在区别于健康老龄化的免疫细胞组成和功能特征的进一步发现,为理解衰弱相关免疫表型提供了新的生物学依据[9]。

本文将既往研究与衰弱相关的免疫细胞改变、慢性炎症及免疫状态紊乱概括为“衰弱相关免疫特征”,用于梳理其潜在临床意义,分析免疫炎症指标在综合评估中的辅助价值与应用边界,并从运动、营养、多重用药管理及连续照护等方面总结护理管理进展,以期是多病共存老年患者的个体化风险识别和综合管理提供参考,并非提出新的诊断或分层标准。

## 2. 多病共存老年患者衰弱相关免疫特征的理论基础

### 2.1. 老年人多病共存与衰弱的相互作用

老年人多病共存与衰弱相互影响[10]。共病可通过疾病负担增加、治疗方案复杂及活动受限等途径促进衰弱发生发展,衰弱则会降低患者对感染、手术及急性疾病等应激的耐受能力,增加老年人跌倒、骨折、住院、失能和死亡的风险[11],进一步增加共病管理难度。

### 2.2. 免疫衰老与炎性衰老

免疫衰老是指与衰老相关的免疫系统进行性衰退,炎性衰老指与衰老相关的慢性、低度全身性炎症,即便不存在明显刺激源也会发生[8]。随年龄增长,衰老细胞可逐渐积累并呈现衰老相关分泌表型(Senescence-Associated Secretory Phenotype, SASP),释放炎症介质、趋化因子及基质重塑因子,持续影响局部和全身炎症微环境[12]。

### 2.3. 衰弱相关免疫特征的内涵

本文所称“衰弱相关免疫特征”,是对衰弱或衰弱前期患者的免疫细胞组成改变、慢性低度炎症、免疫应答下降及免疫稳态失衡等现象的概括性表述。该概念旨在整合免疫细胞、炎症指标及临床结局研究中的相关证据,用于概括免疫炎症失衡、功能储备下降与共病患者照护需求增加之间的潜在联系,并为解释共病健康结局异质性及确定护理评估重点提供补充生物学视角。其不能替代Fried衰弱表型、临床衰弱量表或老年综合评估,也不构成标准化诊断或量化分层工具。

### 3. 衰弱相关免疫特征与老年人多病共存发生发展的机制联系

免疫衰老和炎性衰老通过其机制可影响老年人对感染的易感性及感染的恢复过程[13]。此外,慢性炎症还可能影响肌少症的发生与发展:持续升高的 IL-6、TNF- $\alpha$  等炎症因子与肌少症发生发展密切相关[14],肌少症则会进一步削弱功能储备及增加衰弱风险,最终可能导致照护需求的增加[15]。在老年人共病患者中,多病共存可能使机体维持慢性低度炎症状态,免疫炎症持续失衡可促进组织损伤和代谢异常,降低机体恢复能力,进而加重疾病负担并加速功能储备的损耗[16]。因此,免疫衰老、炎性衰老与衰弱之间并非简单的单向关系,而是可能通过炎症介导的功能损耗过程相互影响,目前已有研究发现,NLR 和 SII 升高与老年人随访期间新发衰弱风险增加相关,相关综述也提示慢性炎症水平与功能下降及衰弱形成存在稳定关联[17][18],基于此,对于已有相关免疫炎症指标检查的患者,可将指标信息与疾病状态、衰弱状态和功能变化等信息整合,作为综合评估的补充依据,不用于独立判断。因此,衰弱相关免疫特征主要为患者健康风险差异提供补充生物学信息,不能单独解释患者结局异质性或预测不良结局。

### 4. 衰弱相关免疫特征的临床评估价值及应用边界

老年共病患者的护理管理强调理协同、连续且全方位[19]。老年综合评估涵盖身体健康、功能状态、心理健康以及社会环境等[20];NICE 多病共存指南[21]强调在关注患者个人目标的前提下推动共同决策以改善生活质量;WHO 提出的老年人综合照护框架(Integrated Care for Older People, ICOPE)深度整合了基础评估、深度评估、个体化护理、实施与监测等护理路径[22]。

疾病和功能负担相近的患者仍可能呈现不同的衰弱轨迹和健康结局[23]。现有老年相关综合评估能够识别多数临床等方面的风险,但对免疫炎症变化与功能下降之间联系的解释相对有限。衰弱相关免疫特征不是作为替代现有评估工具,而是作为补充视角,帮助护理人员理解患者风险差异,并为评估重点及护理重点作个体化调整提供参考。

### 5. 衰弱相关免疫特征视角下的护理管理

衰弱相关免疫特征下的护理评估是在传统综合评估基础上整合患者已有的免疫炎症相关结局资料,重点识别根据评估得出的主要护理问题,而非依据单一指标建立新的风险分层。这种从统一管理转向动态、全程、个体化的护理思路,与精准健康强调整合生物学、临床及个人情境信息开展个体化健康管理理念相一致[24]。

#### 5.1. 多维风险评估

1) **疾病与治疗负担:** 关注共病数量、出现及持续时间、治疗过程及用药情况。

2) **衰弱状态评估:** 衰弱状态是多维风险评估的核心。护理人员可采用 FRAIL 量表(FRAIL scale)或临床衰弱量表(Clinical Frailty Scale, CFS)进行衰弱风险筛查与衰弱程度评估,并可结合 ADL/IADL 及近期体重变化等,筛查异常者应进入进一步综合评估或多学科转介[25]。

3) **营养评估:** 采用简版微型营养评定(MNA-SF)[26]等营养风险筛查工具,并结合体重变化、BMI 及进食情况进行营养风险筛查。

4) **已有免疫炎症资料的辅助评估:** 对已经具有血常规或炎症检查结果的患者,可在医师完成医学解释后,利用其中免疫炎症相关指标变化作为辅助风险信息[17]。相关指标应结合衰弱与功能状态等综合解释,不作为护理诊断、情境划分或干预决策的独立依据。

#### 5.2. 系统护理视角下的情境划分

纽曼系统模式强调个体在压力源作用下防御能力和系统反应的动态变化,可为多病共存老年患者的

连续护理管理提供理论参照[27]。结合上述多维评估结果, 本文从护理管理角度将老年共病患者状态归纳为相对稳定、风险增加和功能失代偿三类典型护理情境, 用于总结不同状态下的护理关注重点。相对稳定情境指衰弱、功能及营养状态较个体基线基本稳定; 风险增加情境指衰弱筛查结果、活动能力、日常生活能力或营养状态等出现偏离个体基线的变化, 但尚未发生明显功能失代偿; 功能失代偿情境指患者出现明显功能下降、照护依赖增加或安全风险升高。三类情境可随病情、功能储备及干预反应发生动态转换, 用于组织不同阶段的护理目标和管理重点, 不构成新的诊断标准或量化分层工具。基于上述多维风险评估及护理情境划分, 本文构建多病共存老年患者衰弱相关免疫特征视角下的护理管理概念性路径, 涵盖多维风险评估、不同护理情境下的目标与动态管理, 以及贯穿全流程的复评和多学科协同, 见图 1。

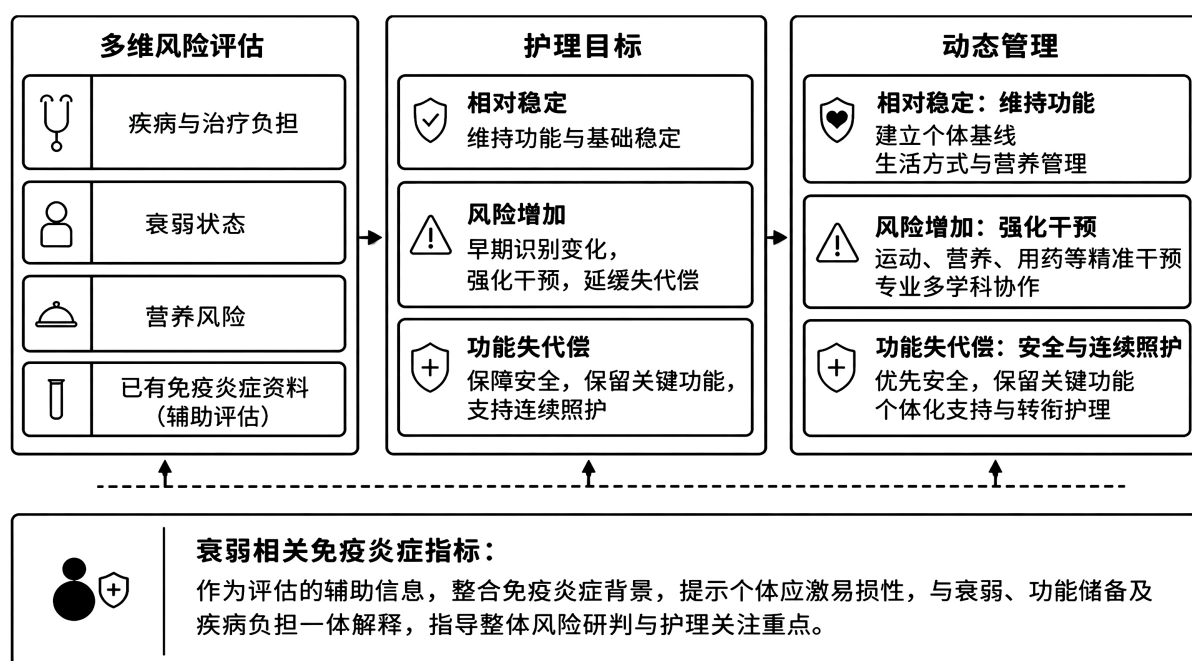


**Figure 1.** Conceptual framework for nursing management from the perspective of frailty-related immune features  
**图 1.** 衰弱相关免疫特征视角下的护理管理路径(概念性框架)

### 5.3. 相对稳定情境的基线建立与功能维持

对处于相对稳定情境的患者, 护理重点是建立可供纵向比较的个体基线, 并维持现有功能。基于衰弱评估及老年综合评估, 本文建议护理人员记录衰弱评估结果、ADL/IADL、体重变化、进食及营养状况, 并结合近期疾病波动了解患者临床背景, 以建立便于动态比较的个体基线[25][28]。在疾病状态允许的情况下, 鼓励患者根据个体功能水平开展适宜的有氧、抗阻及平衡训练[29], 并结合患者营养状况和共病特点开展膳食指导[26]; 随访过程中将患者当前状态与个体基线比较, 发现衰弱或功能、营养状态恶化时, 再次开展多维评估, 并根据主要风险调整个体化照护计划[30]。

### 5.4. 风险增加情境的风险识别与强化管理

对处于风险增加情境的患者, 护理目标是识别与状态恶化相关的主要可干预因素, 根据主要风险确定管理重点, 实施针对性的个体化干预, 延缓恶化及失代偿进程。已有免疫炎症相关临床资料发生变化时, 应结合具体情况综合解释, 相关指标仅作为综合风险评估的辅助信息, 不作为护理情境划分或干预决策的独立依据[18]。

若经评估患者衰弱风险增加、体功能出现下降趋势,应转介相关专业人员进行进一步评估,制定个体化多组分运动方案,方案应为以循序渐进且具有适当挑战性的平衡训练为核心、并辅之以其他适宜运动形式[31]。若经评估患者营养风险增加,同样及时转介营养专业人员结合疾病状态、近期体重变化及个体需求等制定个体化营养支持方案[32]。对于用药管理困难者,护理人员应做好药物核对、用药能力评估、不良反应观察及患者和照护者教育等相关护理工作,以减少重复用药、漏服、误服等用药问题。研究已表明护士主导的药物整合在老年共病患者多重用药管理中具有一定改善作用[33],药物方案调整需由医师、药师等专业人员依据患者情况共同完成。

### 5.5. 功能失代偿情境的安全维护与连续照护

对处于功能失代偿情境的患者,护理重点应转向安全维护、现有功能维护及照护连续性保障。老年综合评估应涵盖自理能力、移动能力、认知功能及谵妄、情绪、营养和社会状况等核心维度;评估及基于评估制定的照护计划应由跨专业团队共同实施,并重视患者及照护者的参与[28]。

在全面评估的基础上,整合疾病波动、活动能力、进食能力和患者自身目标对活动和营养方案进行调整[25][32];对于经过评估具备活动条件的患者,应鼓励患者在住院期间保持一定的适量活动,协助其离床、穿衣,并定时站立和步行[34];对移动能力受限的患者,应在明确患者的活动需求条件下,协同康复专业人员评估并提供专业的活动方案[28]。对于存在营养风险的患者,应进一步开展营养评估,由营养专业人员结合疾病状态、营养风险和患者目标调整个体化营养支持方案[26]。

### 5.6. 动态复评与多学科协同

多学科协作和动态评估应贯穿护理管理全过程,而不只是在明确衰弱后启动。WHO 老年人综合照护框架强调持续监测[30],因此,护理人员应在随访及患者状态变化时,整合衰弱状态、营养状况、疾病状态和已有免疫炎症资料等信息,并及时与相关的学科专业人员沟通评估结果,为个体化照护计划的调整提供专业的信息支持。

衰弱相关免疫特征主要用于解释老年人多病共存患者在衰弱演变和健康结局方面的差异,同时可为识别不同阶段评估和护理重点提供补充性的生物学视角,不作为护理评估和护理措施实施的独立依据。上述护理情境及其护理管理路径是借鉴纽曼系统模式的系统观,并结合现有衰弱评估和老年共病护理管理证据形成的概念性归纳,尚需通过专家论证及前瞻性研究验证其可行性和临床应用价值。

### 5.7. 基于衰弱相关免疫特征视角下护理管理路径的临床应用情境示例

多病共存老年患者入院后,护士可依据衰弱相关免疫特征视角下的护理管理路径开展初始综合评估。评估内容包括疾病与治疗负担、衰弱状态、功能水平、营养状况、多重用药情况以及已有免疫炎症相关资料等。其中,免疫炎症相关指标主要用于辅助护理人员理解患者整体风险状态及可能存在的功能变化趋势,不作为独立的护理分层依据。

根据综合评估结果,护理人员可将患者状态纳入不同护理情境,并制定相应护理目标。对于评估结果处于相对稳定情境的患者,护理工作主要在于建立患者个体化健康基线、围绕维持患者功能展开相关运动营养等指导及关注患者免疫炎症相关信息是否出现持续异常变化,并结合功能、营养及临床状态综合判断风险趋势等;对于评估处于或者进入风险增加情境的患者,护士应对基础的运动、营养及用药等方面展开管理强化或调整;对于评估处于或者进入功能失代偿情境的患者,护理工作应围绕着安全维护及连续性照护,强化风险管理、调整运动方案、建立连续性护理计划。在整个护理过程中,护士需要进入评估 → 干预 → 再评估 → 调整的循环管理模式,根据患者状态变化及时优化护理策略,实现个体化、动态化护理管理。

## 6. 挑战与展望

老年共病带来的一系列复杂问题导致传统“疾病导向”的单一管理模式已难以满足患者需求。衰弱相关免疫特征为老年共病患者护理管理提供了新的理论视角,但其临床转化仍面临多方面挑战。第一,概念尚未建立。现有研究对衰弱相关免疫改变的定义、检测指标等存在较大差异,尚未形成统一的特征组合或临床阈值。第二,现有研究以横断面和一般老年人群为主,针对不同共病组合、疾病活动和治疗因素的纵向研究不足,因果关系仍不明确。第三,运动、营养及综合护理可能改善功能结局,但免疫炎症指标能否作为护理干预效果指标,以及其与相关护理结局的关系,仍需前瞻性研究验证。

未来研究可从几个方向推进:一是构建适用于护理场景的综合风险评估模型,将衰弱状态、功能水平、营养状况、用药负担及免疫炎症指标等共同纳入,并验证其预测效能和临床适用性;二是开展纵向队列研究,明确炎症免疫指标与衰弱进展、疾病负担之间的关系;三是设计以护理干预为核心的随机对照研究,验证运动、营养、睡眠和药物整合对多病共存老年患者功能和炎症相关结局的影响。

## 7. 小结

现有研究表明,老年多病共存患者衰弱的发生发展与免疫衰老及炎症衰老密切相关,机制间的相互作用影响着患者的功能状态和健康结局。衰弱相关免疫特征可为解释患者健康结局的异质性提供补充视角,尚不能替代标准化衰弱评估、营养评估,也不宜作为独立护理分层依据。护理管理应整合疾病及治疗负担、衰弱、营养和已有免疫炎症资料等,通过运动干预、营养支持、用药安全管理及连续照护实施个体化干预,并将多学科协作和动态评估贯穿护理管理全过程。未来仍需加强针对多病共存老年患者的纵向研究和护理干预研究。

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