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A Systematic Review of Patient Complexity and Clinical Protocols: Acute-on-Chronic Multi-Morbidity Management in the Emergency Department

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Abstract

Background: The 21st-century Emergency Department (ED) is faced with a rising number of patients with complex multi-morbidity (CMM) presenting with acute deteriorations, or "acute-on-chronic" illness. These patients have intricate interactions between chronic diseases, polypharmacy, cognitive impairment, and social vulnerability that frustrate traditional single-organ emergency care and lead to diagnostic uncertainty, iatrogenic harm, and poor outcomes.

Aim: The aim of this review was to summarize the literature on acute-on-chronic CMM in the ED and present the argument for the need to develop specialized, interdisciplinary protocols for physicians and nurses to improve care for this vulnerable population.

Methods: A narrative synthesis of the literature was conducted. The review analyzed the nature of CMM patients, critiqued existing care models like Geriatric ED guidelines, and proposed new protocol elements. Two new conceptual tools were developed: a nursing assessment framework and a formal communication tool for transitions in care.

Results: The comparison confirmed the presence of a mismatch between CMM patient needs and usual ED functioning. While models like GEDA provide a foundation, a more comprehensive, protocol-based solution is required. The review prompted the creation of two helpful tools: a protocol for a thorough nursing assessment (covering cognition, function, and social context) and a standard handoff tool for ensuring safe transitions to primary care.

Conclusion: A paradigm shift toward proactive, holistic, protocol-driven care is required for acute-on-chronic CMM patients. Specialized interprofessional protocols are fundamental to advancing patient safety and promoting sustainable emergency care. Future research must focus on the validation of complexity screening tools and the evaluation of the impact of these protocols on patient-centered outcomes.

Keywords: complex multi-morbidity, emergency medicine, geriatrics, clinical protocols, nursing assessment, care transitions, polypharmacy, patient complexity.

1. Introduction

The ED's primary mission is the stabilization of life-threatening illness and the diagnosis of unforeseen illness and injury. The patient population that presents for emergency care, however, has undergone a paradigm shift. Driven by a global aging population and advanced medical science that prolongs life with chronic disease, EDs ever more frequently treat patients for whom one discrete "emergency" is the exception, rather than the rule (1, 2). Instead, they are faced with a growing number of patients who have complex multi-morbidity (CMM)—two or more chronic illnesses that cumulatively lead to functional impairment, increased healthcare utilization, and fragmented care (3, 4). When these patients are admitted with an acute decompensation or a new problem added to their baseline state, they pose the clinical dilemma of "acute-on-chronic" illness (5).

Managing these patients in the time-pressured, resource-scarce, and occasionally siloed environment of the ED is a stark incongruity between system design and patient requirement (6, 7).

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Traditional ED pathways are often organ- or complaint-based (e.g., chest pain, abdominal pain, sepsis), which cannot reflect the intricate interplay of a patient's heart failure, chronic kidney disease, diabetes, and cognitive impairment (8). This can have a cascade of negative consequences, including diagnostic overshadowing, whereby new symptoms are incorrectly attributed to known diagnoses; inappropriate, costly, and possibly harmful diagnostic testing; and therapeutic conflicts, whereby treatment of one condition exacerbates another (9, 10).

The consequences extend beyond the patient to the ED system itself. CMM patients have significantly longer ED lengths of stay, higher hospital admission rates, and are at higher risk of return visits and readmissions within 30 days (11, 12). They are also at particularly high risk for adverse events during transitions of care, such as medication errors and poor communication with outpatient providers (13, 14). The conventional ED model, built for rapid throughput and algorithmic accuracy, is ill-equipped to manage the uncertainty and high risk of acute-on-chronic presentations (15).

There is a growing realization that there needs to be a paradigm shift. This needs to be from a reactive, disease-centered to a proactive, patient-centered approach that identifies and addresses complexity (16). A critical component of this development is the development and implementation of specialty clinical protocols for the nursing and physician workforce. Protocols would provide a structured yet flexible system to guide the specialized evaluation, management, and disposition planning required by this population (17, 18). The aim of this narrative review is to synthesize the current evidence and conceptual frameworks of acute-on-chronic CMM care in the ED.

The Acute-on-Chronic Patient: Defining a Complex Population

One cannot define complexity by simply listing diagnoses for the acute-on-chronic CMM patient. Complexity arises in this instance through the dynamic interplay of medical, cognitive, psychological, functional, and social factors (19). Its defining feature is the presence of multiple interacting chronic conditions, such as cardiovascular disease, diabetes, COPD, and renal impairment (20). This medical complexity is very often coupled with polypharmacy, which is often defined as the use of five or more medications (21). Polypharmacy is a major risk factor for adverse drug events, drug-disease interactions (e.g., prescribing an NSAID for pain in a patient with CKD), and prescribing cascades, where a new drug is prescribed to treat the side effect of another (22, 23). In the ED, obtaining an accurate medication history is challenging but crucial because the presenting acute issue may directly be related to a medication problem (24).

A significant proportion of CMM patients, particularly older patients, have some degree of cognitive impairment, dementia, or delirium (25). These conditions jeopardize history-taking, mask symptoms of acute illness, and complicate informed decision-making (26). Similarly, functional decline—dependence in activities of daily living (ADLs) or instrumental ADLs (IADLs)—powerfully predicts negative outcomes, including institutionalization and death (27). A single ED visit for a fall may be the sentinel event that reveals the gradual deterioration in the ability of a patient to live safely at home (28).

Care of CMM cannot be divorced from the social context. Social isolation, poverty, food insecurity, compromised health literacy, and frail systems of social support all have a profound impact on a patient's well-being and their ability to self-manage chronic disease (29, 30). A COPD and CHF patient may be readmitted not because of a breakdown in medical care, but because they cannot afford their medication, have no transportation to their follow-up appointment, or live in a home with poor air quality (31). The ED then often becomes the default safety net when these social systems fail (32). Figure 1 summarizes the conceptual framework of acute-on-chronic complexity in the ED.

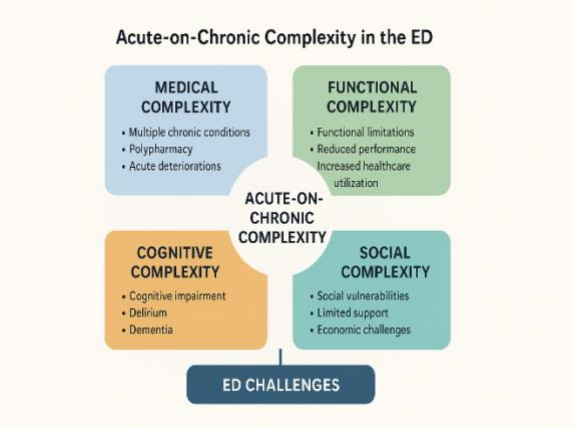

Figure 1. Conceptual Framework of Acute-on-Chronic Complexity in the ED

Limitations of the Traditional Emergency Department Paradigm

The ED's standard operation and cognitive paradigms are frequently inadequate to the needs of the acute-on-chronic patient, generating a series of systemic and clinical issues. The assessment and disposition time pressure can promote cognitive mistakes such as "anchoring," where clinicians focus on a single familiar diagnosis and prematurely shut down alternative possibilities (33). In a lethargic patient with established dementia, the symptom may at first be attributed to the dementia itself, thus missing an underlying infection, metabolic disturbance, or drug side effect (9). The non-specific presentation of illness in older, complex adults (e.g., falling, delirium, functional decline) only contributes to this diagnostic uncertainty (34).

The ED itself is hazardous for sick, complex patients. Immobilization on a stretcher for prolonged

periods can lead to deconditioning and pressure ulcers (35). The threat of exposure to nosocomial infection is constant (36). Diagnostic testing carries risk, e.g., contrast-induced nephropathy in a patient with underlying renal failure, or procedural complications of sedation (37). A hospital admission, often precipitated from the ED, exposes the patient to the risks of delirium, functional decline, and other hospital-acquired complications (38). The ED, by definition, is a temporary environment. Discharge communication breakdown is a well-known culprit of adverse events (39). For the CMM patient, an inadequate handoff to the PCP or inaccurate medication reconciliation can lead to treatment delays, medication issues, and rapid return to the ED (14, 40). The absence of a robust, system-wide mechanism for communicating the complex discharge plan for a complex patient is a fundamental flaw in the care continuum.

Existing Models and Evidence for Organized Care

A number of existing models provide a foundation, evidence base for developing more comprehensive protocols for complex multi-morbidity (CMM) in the emergency department (ED), though largely focused on older adults. The most structured model seen is the Geriatric Emergency Department (GEDA) model, which promotes geriatric-focused care through guidelines that consist of screening for high-risk issues like delirium and functional decline, use of interdisciplinary teams, maintenance of a geriatric-friendly environment, and having formalized transition of care processes (41, 42). Evidence shows GEDAs reduce hospitalization and improve patient satisfaction, with heterogeneous effects on functional outcomes and readmissions (43, 44). While this framework is a necessary foundation, its geriatric primary focus needs to be expanded to younger patients with equivalent complexity, such as those with intellectual disability or young-onset multi-morbidity.

Aside from international models, single screening tools like the Identification of Seniors At Risk (ISAR) and Triage Risk Screening Tool (TRST) were piloted and validated to screen for high-risk older adults in the ED (45, 46). But while effective at flagging the need for more attention, such tools are risk identifiers, not management protocols, and do not specify what occurs next following a positive screen. Complementing these tools, research supports the efficacy of nurse-implemented interventions. Systematic reviews demonstrate that CGA in the ED prevents functional decline (47), and transitional care models led by advanced practice nurses have been found to reduce readmissions in chronic conditions like heart failure (48, 49). While these models highlight the primary role of nursing, they are often single research initiatives rather than comprehensive, standardized protocols with full integration into everyday ED practice.

Recommended Components of Specialized Nursing and Physician Protocols

Based on existing models and addressing identified gaps, we recommend that acute-on-chronic CMM patient specialized protocols be interdisciplinary, triggered by a positive screen for complexity, and integrated into ED flow. Possible essential components are outlined in the sections that follow. The ED nurse is typically the first and most frequent clinician interacting with the patient. They would be facilitated by a specialist nursing protocol to conduct a holistic evaluation of the patient outside the chief complaint. The protocol would be activated by a positive trigger (i.e., age >75, ISAR score ≥2, polypharmacy, or clinician suspicion). The core domains of such an assessment are outlined in Table 1.

The findings of this systematic assessment would be documented in a standard section of the electronic health record (EHR) and communicated directly to the attending physician to inform medical decision-making and disposition planning. The physician's role, integrally informed by the aforementioned nursing assessment, is to synthesize holistic patient data into a coherent, patient-centered management plan. One of the key components of a physician-driven protocol is the establishment of a framework for goal-concordant care. This is done by involving the patient and their caregivers early in the process of the encounter in a conversation regarding treatment preferences and goals of care in the setting of their acute illness and chronic illnesses, more than just code status, to find out what matters most to the patient, for instance, independence or comfort (56, 57). Figure 2 illustrates the integration of the specialized nursing assessment protocol and physician management protocol — from patient entry to discharge transition.

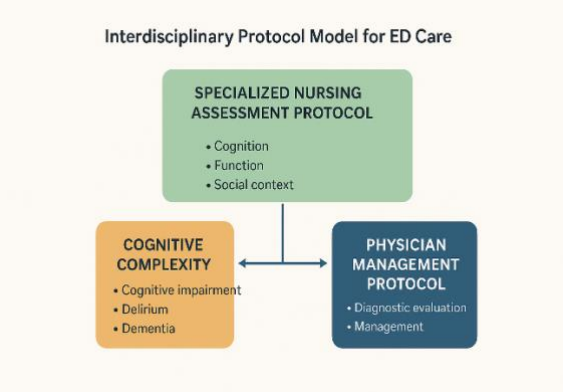

Figure 2. Interdisciplinary Protocol Model for ED Care

Further, the protocol must guide a complexity-informed diagnostic strategy, fostering a "less is more" mindset that carefully weighs risk and

benefit of testing versus the patient's frailty and stated goals, and also provokes consideration of atypical presentations of illness, such as myocardial infarction as a cause of delirium (58). Finally, there must be a systematic decision-making process, which is a checklist for safe discharge wherein medication reconciliation is completed, follow-up visits are scheduled within an ideal time frame, necessary home care services are coordinated, and patient and caregiver education is delivered and understood. This structured process is completed by a clear contingency plan and formalized handoff communication to the PCP, for which a proposed template is provided in Table 2.

Table 1: Key Domains for a Specialized Nursing Assessment Protocol for Acute-on-Chronic CMM Patients

Domain	Key Assessment Components	Potential Screening Tools/Questions
1. Cognitive Status	• Baseline cognition vs. acute change (delirium) • Ability to provide history • Decision-making capacity	• 4AT for delirium (50) • Short Blessed Test or Mini-Cog for dementia screening (51) • Informant questions: "Is his/her thinking worse than usual?"
2. Functional Status	• Pre-illness baseline for ADLs (e.g., bathing, dressing) and IADLs (e.g., shopping, managing medications) • Use of assistive devices • Recent falls (previous 6 months)	• "Tell me what a normal day is like for you." • Direct questions: "Did you need help with bathing/dressing before coming in today?" • Timed Up-and-Go test if feasible (52)
3. Medication Review	• Accurate medication list (using brown bag review, pharmacy records) • Identification of high-risk medications (e.g., anticoagulants, insulin, opioids) • Adherence challenges	• "Can you show me all the bottles of pills you take at home?" • Use of Beers Criteria or STOPP/START criteria as a reference (23, 53) • Collaboration with ED pharmacist if available
4. Social & Environmental Context	• Living situation (alone, with family, facility) • Availability of social support/caregiver burden • Access to food, transportation, financial resources • Advance care planning presence	• "Who helps you at home?" • "What worries you about going home?" • Screening for health literacy (e.g., Single Item Literacy Screener) (54) • Inquiry about Health Care Proxy or MOLST/POLST forms
5. Geriatric/Complex Syndromes	• Screening for fall risk, frailty, pressure injury risk, incontinence	• Clinical observation for frailty (e.g., slow gait, weakness) • Braden Scale for pressure injury risk (55)

Table 2: Proposed Structured Communication Tool for ED-to-PCP Transition of Acute-on-Chronic CMM Patients

Section	Information to Include
Patient Identifying Information	Name, DOB, Date of ED Visit, MRN
ED Provider Information	Attending Physician Name, ED Contact Number
Summary of ED Presentation	• Chief Complaint • Pertinent ED course, diagnostics, and results • ED Diagnosis/Final Impression
Baseline Complexity Assessment (from Nursing Protocol)	• **Cognition:** Baseline status and any acute findings (e.g., "Baseline dementia, no signs of delirium") • **Function:** Pre-illness ADL/IADL status (e.g., "IADL-dependent, required home health aide for bathing") • **Social:** Key social factors (e.g., "Lives with daughter who is primary caregiver")
Reconciliation & Treatment Plan	• **Medication Changes:** List all medications stopped, started, or changed with clear instructions. • **Pending Results:** Note any lab/imaging results still pending. • **Treatment Initiated:** Antibiotics, steroids, etc., with planned duration.
Follow-up Plan & Reason for Referral	• **Specific Action Requested:** e.g., "Please reassess for functional decline in 5 days," "Wound check in 1 week," "Re-evaluate diuretic dose." • **Appointment Details:** Date and time of scheduled follow-up. • **Key Concerns for PCP:** e.g., "Worsening heart failure symptoms," "Possible caregiver burnout."
Patient/Caregiver Understanding	Brief note on education provided and their apparent understanding (e.g., "Patient and daughter verbalized understanding of new medication and follow-up plan.")

Implementation Challenges and Future Directions

Protocol development is only the starting point; actual implementation faces overwhelming challenges. The most significant barrier by far is perceived time pressures in a busy ED (59). A protocol must be streamlined with easy triggers and task delegation. Leveraging EHR integration for automated screening and documentation templates is crucial. The role of allied health professionals—clinical pharmacists for medication reconciliation, social workers for complex psychosocial assessment—is crucial and must be formally incorporated into the protocol (60).

Outcome measures for these protocols must extend beyond traditional ED metrics like length of stay. Success must be measured by patient-centered outcomes: 30-day readmission rates, patient and caregiver satisfaction, functional preservation, and goal-concordant care (61). Demonstrating a return on investment, such as inpatient cost savings from avoided admissions, will be critical for health system buy-in and long-term sustainability.

Conclusion

One of the biggest challenges to modern emergency care is the rising number of patients with acute-on-chronic complex multi-morbidity. Their needs cannot be met by working harder within the constraints of an old-fashioned, disease-focused model. The redesign has to be considered and systematic. This review argues that the development and implementation of individualized, interdisciplinary protocols for medical and nursing is a cornerstone of this redesign. By providing a structure for holistic assessment, complexity-informed decision-making, and sustainable care transitions, these protocols can minimize iatrogenic risk, improve patient and provider satisfaction, and ultimately deliver more safe, effective, and compassionate care to the ED's most vulnerable patient population. The time has come to move from describing the problem to implementing and studying the solutions.

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