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A Narrative Review: Optimizing Care for the Medically Complex Geriatric Patient: Polypharmacy, Airway, and Home-Based Crisis Response

Sami Abdullah Alwagdani [(1)] , Kanosh Nakhilan Albathali [(2)] , Mazen Ayidh Mohammed Alotaibi [(3)] , Ahad Rayhan Alquayqie [(4)] , Furayhah Nafea Lafi Alruwaili [(5)] , Ismail Ahmad Ismail Alnumi [(6)] , Nessreen Muhammad Salem Algushiry [(7)] , Asma Mansor Alsedrah [(8)] , Shahad Sulaiman Alodhaiani [(8)] , Wejdan Hamed Saghir [(9)] , Raad Adel Alqeen [(10)] , Hadi Eidan Salim Aldhafeeri [(11)]

(1) King Faisal Complex in Taif ,Ministry of Health, Saudi Arabia,
(2) Hafr Al Batin South Abu Musa Al Ashari Health Center,Ministry of Health, Saudi Arabia,
(3) Al-Uraija Al-Gharbi Health Center – Riyadh,Ministry of Health, Saudi Arabia,
(4) Dumat Al-Jandal General Hospital, Al-Jawf,Ministry of Health, Saudi Arabia,
(5) Diabetes and Endocrinology Center in Arar,Ministry of Health, Saudi Arabia,
(6) Public Health, Riyadh Health, Ministry of Health, Saudi Arabia,
(7) Primary Health Care, Ministry of Health, Saudi Arabia,
(8) King Khalid Hospital In Alkharj, Ministry of Health, Saudi Arabia,
(9) Riyadh First Health Cluster, Tuwaiq Health Center,Ministry of Health, Saudi Arabia,
(10) Wa'ira Health Center, raalqeen,Ministry of Health, Saudi Arabia,
(11) Emergency and Disaster Management at the Health Cluster in Hafr Al-Batin,Ministry of Health, Saudi Arabia

Abstract

Background: The medically complex geriatric patient, characterized by multimorbidity, polypharmacy, and functional decline, represents a high-risk population for adverse outcomes, fragmented care, and excessive healthcare costs. Interdisciplinary failure in managing these intersecting needs is common. **Aim:** This narrative review aims to synthesize current evidence and propose an integrated, person-centered framework for optimizing care by synthesizing the distinct yet interconnected roles of pharmacy, family medicine, respiratory therapy, nursing, medical coding, dentistry, and emergency & disaster management. **Methods:** A comprehensive literature search was conducted across PubMed, CINAHL, Scopus, and Web of Science for peer-reviewed articles and guidelines published between 2010 and 2024, focusing on each discipline's contribution to geriatric care, polypharmacy, respiratory management, and disaster preparedness. **Results:** Effective care requires moving beyond siloed approaches to implement systematic medication reconciliation and deprescribing, integrated airway management, proactive oral health integration, accurate complexity coding, and embedded disaster preparedness into routine care plans. **Conclusion:** An intentional, structured interdisciplinary model that addresses pharmacotherapy, respiratory function, and crisis resilience is essential to improve outcomes, quality of life, and system sustainability for this vulnerable population.

Keywords: Geriatric Syndromes; Interprofessional Collaboration; Deprescribing; Multimorbidity; Disaster Preparedness

Introduction

The global demographic shift towards an aging population presents one of the most significant challenges to contemporary healthcare systems (Schulze et al., 2022). A substantial subset of this population, the medically complex geriatric patient, is defined not merely by chronological age but by the confluence of multiple chronic conditions (multimorbidity), associated polypharmacy (often defined as the use of five or more medications), functional and cognitive decline, and heightened vulnerability to acute crises (Boyd et al., 2014). These patients frequently navigate a fragmented healthcare landscape, transitioning between primary care, multiple specialty clinics, hospital admissions, and home-based services, often without effective coordination (Pel-Little et al., 2021). This siloed approach leads to predictable and costly failures: adverse drug events, preventable hospitalizations, iatrogenic complications, and poor quality of life (Fried et al., 2011). The economic burden is staggering, with a disproportionate share of healthcare expenditures directed towards this population, much of which is spent on managing preventable complications (Malakouti et al., 2021). Figure 1 links three major care challenges—polypharmacy, airway vulnerability, and home-based crisis response—to coordinated interventions, including systematic deprescribing, comprehensive airway management, and proactive home-based preparedness.

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*Corresponding author e-mail: kanoshalbathali@gmail.com (Sami Abdullah Alwagdani).
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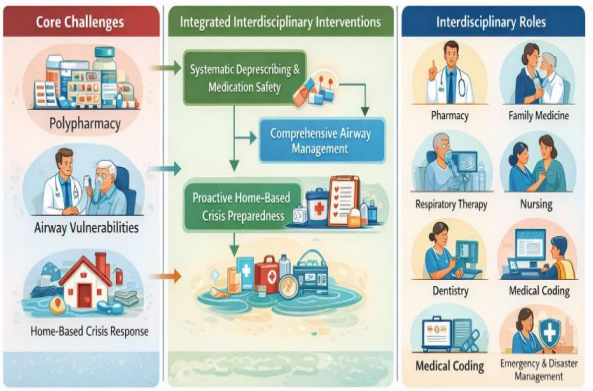

Figure 1. Conceptual framework illustrating an interdisciplinary approach to optimizing care for medically complex geriatric patients.

This review contends that optimizing care for this population requires a deliberate and structured integration of seven critical fields: Pharmacy, Family Medicine, Respiratory Therapy, Nursing, Medical Coding, Dentistry, and Emergency & Disaster Management. Traditionally, these disciplines operate in parallel, with limited formal interaction. However, the needs of the complex geriatric patient—such as managing the interplay between a heart failure medication and worsening renal function, preventing an aspiration pneumonia linked to poor oral hygiene, or ensuring continuity of care during a power outage—demand a cohesive strategy. This narrative review synthesizes contemporary evidence (2010-2024) to construct a practical, interdisciplinary framework. It will specifically focus on three high-yield, intersecting domains: (1) the mitigation of polypharmacy and its sequelae, (2) the proactive management of age-related respiratory and airway vulnerabilities, and (3) the integration of home-based crisis preparedness into standard care planning. The ultimate aim is to outline a model that replaces fragmented reactivity with proactive, person-centered integration, thereby enhancing safety, resilience, and dignity for medically complex older adults.

Medication Reconciliation, Deprescribing, and Safety

Pharmacotherapy management is the cornerstone of care for the medically complex geriatric patient, where the line between benefit and harm is exceedingly fine (Zazzara et al., 2023). Polypharmacy is endemic, often originating from appropriate treatment guidelines for individual diseases but becoming harmful in aggregate due to drug-disease interactions, altered pharmacokinetics/pharmacodynamics with aging, and increased risk of adverse events like falls, confusion, and hospitalization (Palmer et al., 2019). The pharmacist's role, therefore, must evolve from simple dispensing to active, integrated medication therapy management.

Rigorous medication reconciliation—a complete and accurate compilation of all medications a patient is taking, including prescriptions, over-the-counter products, and supplements—is the critical first step (Chiewchantanakit et al., 2020). Discrepancies during care transitions are a major source of error, and systematic reconciliation processes led by clinical pharmacists have been shown to reduce medication errors and potentially avoidable adverse drug events (ADEs) significantly (Bourne et al., 2022). Beyond reconciliation, the principle of deprescribing—the systematic process of identifying and discontinuing inappropriate or unnecessary medications—is paramount. Deprescribing requires a careful, collaborative review of the ongoing indication, effectiveness, and risk-benefit ratio of each drug in the context of the patient's life expectancy, goals of care, and care preferences (Reeve et al., 2014). Tools like the Beers Criteria and the STOPP/START criteria provide evidence-based frameworks to identify potentially inappropriate medications (PIMs) in older adults (Charles, 2023; O'Mahony et al., 2023).

The impact of pharmacist-led deprescribing interventions is profound. Studies demonstrate reductions in fall risk by minimizing psychotropic and anticholinergic burden, improvements in cognitive function, decreased incidence of delirium, and lower healthcare utilization (Weir et al., 2022). Success, however, is dependent on seamless collaboration with the primary care team and other specialists to align therapeutic goals and manage the underlying conditions appropriately. This pharmacological optimization creates a more stable foundation upon which other aspects of care, such as respiratory therapy and functional rehabilitation, can be effectively built (Zhou et al., 2023).

Family Medicine and Comprehensive Geriatric Assessment

The family physician or geriatrician serves as the essential hub in the wheel of interdisciplinary care. For the complex patient, a disease-oriented visit is insufficient. The Comprehensive Geriatric Assessment (CGA) is the gold-standard, multidimensional diagnostic process that evaluates medical, psychosocial, functional, and environmental capabilities and limitations (Parker et al., 2018). The CGA goes beyond diagnosing diseases to identify geriatric syndromes—such as frailty, sarcopenia, cognitive impairment, and incontinence—which are potent predictors of disability and mortality (Kong et al., 2022).

Central to this role is the integration of information from all other disciplines. The family physician synthesizes the pharmacist's deprescribing recommendations, the respiratory therapist's spirometry and overnight oximetry data, the nurse's report on home safety and caregiver stress, and the dentist's findings on periodontal health (Fromme et al., 2023). This holistic view enables primary diagnosis and, more importantly, the development of a unified, person-centered care plan that aligns with the patient's values and preferences through structured advanced care planning (ACP) conversations (Sudore

et al., 2017). ACP ensures that future medical decisions, especially during crises, reflect the patient's goals, whether focused on life extension, quality of life, or functional independence.

Furthermore, family medicine provides continuity across settings—from clinic to hospital to home. This longitudinal relationship is critical for monitoring the effects of medication changes, detecting subtle declines in respiratory status or functional capacity, and acting as the trusted point of contact for patients, families, and other care team members during a crisis. Without this coordinating function, even the best-intentioned specialist interventions can become disjointed or contradictory, leading to patient confusion and therapeutic mishaps (Skolarus et al., 2022).

The Role of Respiratory Therapy in Managing the Vulnerable Airway

Respiratory comorbidities such as Chronic Obstructive Pulmonary Disease (COPD), obstructive sleep apnea (OSA), and the general decline in respiratory muscle strength (sarcopenia) are highly prevalent and significantly contribute to morbidity in the aging population. Respiratory therapists (RTs) provide essential expertise that is often underutilized outside acute exacerbations. Their role in chronic management is vital for stability and prevention.

For patients with COPD, RTs are key in teaching proper inhaler technique—a frequent source of therapy failure—and implementing pulmonary rehabilitation programs tailored to geriatric capacities. These programs improve exercise tolerance, reduce dyspnea, and decrease hospitalization rates (Wouters et al., 2020). In OSA, RTs manage continuous positive airway pressure (CPAP) therapy, addressing interface issues, pressure intolerance, and adherence barriers, which are common in older adults with cognitive or sensory impairments (Belli et al., 2021). Perhaps less recognized is their role in managing "geriatric lung" physiology: reduced cough strength and impaired mucociliary clearance increase the risk of retained secretions and aspiration. RTs can train patients and caregivers in airway clearance techniques and supervised coughing to mitigate these risks (Lauwers et al., 2020).

Crucially, respiratory instability is a common precipitant of crises. An RT's assessment can identify patients at high risk for acute failure—such as those with marginal baseline oxygen saturation, poor effort tolerance, or frequent exacerbations. This risk stratification informs the family physician's plan and is critical data for the emergency management team when developing targeted support protocols for vulnerable populations during community-wide disasters, such as wildfires (compromising air quality) or heatwaves (increasing respiratory demand).

The Glue of Care: Nursing, Coordination, and Caregiver Empowerment

Nursing is the discipline that most consistently operationalizes the care plan across time and settings. For the home-dwelling complex geriatric patient, nursing's role is multifaceted: clinical care provider, care coordinator, educator, and advocate (Huot et al., 2022). Nurses conduct regular assessments for signs of clinical deterioration, manage wounds (a critical issue for immobile patients at risk for pressure injuries), administer complex medication regimens, and monitor for subtle side effects or functional decline that may signal an impending problem (Morilla-Herrera et al., 2016).

A paramount function is care coordination and transition management. Nurses facilitate communication between the family physician, specialists, pharmacists, and home health aides, ensuring that changes in medication, therapy, or goals are understood and implemented by all. They are often the first to identify that a patient is struggling with new CPAP equipment or that a wound is not healing, triggering timely interventions.

Perhaps the most critical nursing intervention is caregiver education and support. Family caregivers are the backbone of long-term care for complex patients, yet they are often under-trained and over-burdened. Nurses teach essential skills: medication management, mobility assistance, recognition of respiratory distress or signs of infection, and proper oral and skin care. Empowering caregivers not only improves patient safety and comfort but also reduces caregiver burnout, a significant risk factor for institutionalization (Adelman et al., 2014). The nurse's ongoing relationship provides a window into the home environment's safety and the caregiver's capacity, information vital for realistic crisis planning.

Medical Coding and Reflecting Complexity

Medical coding, often viewed as a purely administrative or financial function, is in fact a critical component of clinical communication and population health management. Accurate coding directly influences the quality of care for complex geriatric patients. The use of specific International Classification of Diseases (ICD-10) codes for multiple chronic conditions (MCCs), geriatric syndromes (e.g., frailty, falls, sarcopenia), and the severity of illness ensures that the patient's true complexity is communicated across the healthcare system (Passamonti et al., 2022).

When complexity is accurately captured, it enables several key functions. First, it supports appropriate risk adjustment and reimbursement, ensuring that providers and healthcare systems are financially equipped to manage the higher resource needs of these patients. Second, it facilitates better care coordination. Accurate problem lists, built from correct codes, give every member of the care team—from pharmacist to respiratory therapist—a clear picture of the patient's active issues. Third, and most importantly for systemic improvement, robust coding data allows for the identification of high-risk cohorts through population health analytics. Healthcare systems can use this data to proactively target patients

with specific risk profiles (e.g., polypharmacy + COPD + history of falls) for interdisciplinary review, deprescribing clinics, or enrollment in advanced care management programs (Hewner et al., 2021). Furthermore, coding for preventive care coordination services (Chronic Care Management codes in the U.S.) provides a mechanism to fund the non-face-to-face care coordination work essential for this population, performed by nurses and other team members (Wang et al., 2023).

Dentistry's Role in Preventing Systemic Decline

Oral health is inextricably linked to systemic health, a connection that is magnified in the frail elderly. Dentistry's role extends far beyond cavities and dentures. Poor oral hygiene and untreated periodontal disease create a chronic inflammatory burden and a reservoir of pathogenic bacteria. This significantly increases the risk of aspiration pneumonia, a leading cause of death in older adults, especially those with dysphagia or compromised airway reflexes (Molina et al., 2023). Dentists and dental hygienists are essential in assessing and managing this risk through regular professional care and patient/caregiver education on effective oral hygiene techniques, even for edentulous patients.

Dental issues directly impact nutrition and medication. Ill-fitting or painful dentures can lead to malnutrition and weight loss, accelerating sarcopenia and frailty. Xerostomia (dry mouth), a common side effect of numerous medications (anticholinergics, diuretics, antidepressants), not only causes discomfort and increases caries risk but can also impair swallowing and the absorption of sublingual medications. Dentists can diagnose xerostomia, recommend salivary substitutes or stimulants, and work with the pharmacist to identify potentially causative medications for deprescribing consideration (Wolff et al., 2017).

Integrating routine oral health assessment into the CGA and ensuring dental care access for homebound patients are crucial yet often overlooked strategies. Addressing oral pain and infection can improve nutritional intake, reduce systemic inflammation, lower pneumonia risk, and enhance overall quality of life, making it a powerful, low-tech intervention within the interdisciplinary model (Fortuna et al., 2023).

Emergency and Disaster Management Integration

Medically complex older adults are disproportionately vulnerable during public health emergencies and personal health crises, such as prolonged power outages, extreme weather events, or pandemics. Traditional disaster planning often overlooks their specific, technology-dependent needs. Proactive integration of emergency and disaster management principles into routine care is therefore a moral and practical necessity (Barbato et al., 2022).

A foundational strategy is the development and maintenance of a registry for vulnerable populations by healthcare systems or public health departments, in collaboration with primary care providers (Jester et al., 2023). This registry, built from the accurate coding data previously discussed, can be used for targeted outreach, welfare checks, and prioritized resource allocation (oxygen tank delivery, medication refills, cooling center transportation) during a crisis (Dosa et al., 2020).

At the individual level, creating a personalized "go-bag" or "stay-box" should be a standard component of care planning. This kit, developed with input from all disciplines, might include: a 7-14 day supply of all medications (reviewed by pharmacy), a printed medication list and care plan, backup batteries or a portable power source for CPAP machines and oxygen concentrators (identified by respiratory therapy), non-perishable nutritional supplements that accommodate dental/chewing limitations (suggested by nursing/dentistry), and supplies like denture adhesives and skin barriers. The family physician and nurse educate the patient and caregiver on when and how to use the kit and activate emergency plans.

This approach transforms disaster preparedness from an abstract concept into a concrete, personalized extension of chronic disease management. It empowers patients and caregivers, reduces panic, and minimizes the likelihood of a routine crisis escalating into a catastrophic emergency department visit or hospitalization.

Synthesis and Proposed Framework for Interdisciplinary Action

The evidence synthesized from these seven fields reveals not just a collection of parallel needs, but a web of interdependencies. A failure in one domain often precipitates a cascade of failures in others. For example, inappropriate polypharmacy (Pharmacy) causing xerostomia and delirium exacerbates oral disease (Dentistry) and impairs airway protection (Respiratory Therapy), leading to aspiration pneumonia, which may be miscoded as simple pneumonia (Medical Coding), triggering an ED visit where the patient's goals of care (Family Medicine) are unknown, and their home oxygen equipment lacks a backup power source (Emergency Management).

To counter this, we propose a Geriatric Complexity Integration (GCI) Framework, centered on a recurring, structured Interdisciplinary Complexity Rounds (ICR) model. The process begins with the Family Physician, using a CGA to identify a high-risk patient. This triggers a scheduled ICR, either in-person or virtual, involving or receiving input from representatives of all seven fields (see Table 1 for a detailed breakdown of roles and actionable interventions).

The outputs of the ICR are compiled into a shared, accessible care plan. This living document includes the reconciled medication list, respiratory crisis triggers, caregiver contact and capability notes, and the personalized disaster plan. It is stored in the

electronic health record and provided in a printable format to the patient and caregiver. Crucially, this process is not a one-time event but a recurring cycle, scheduled at regular intervals (e.g., every 6-12 months) or triggered by a sentinel event (hospitalization, new diagnosis, caregiver change).

Table 1: Interdisciplinary Roles within the Geriatric Complexity Integration (GCI) Framework

Discipline	Core Action in ICR	Key Deliverable/Intervention
Pharmacy	Conduct pre-meeting med review against Beers/STOPP criteria.	A prioritized deprescribing proposal with a monitoring plan.
Family Medicine	Synthesize inputs, articulate patient goals, and finalize a unified care plan.	A person-centered care plan document, including an ACP summary.
Respiratory Therapy	Assess device adherence, cough efficacy, and baseline respiratory stability.	Education plan for patient/caregiver; crisis threshold parameters.
Nursing	Report on functional status, home safety, wound care, and caregiver capacity.	A caregiver support and education checklist, and a coordination log.
Medical Coding	Review problem list for accurate reflection of syndromes & complexity.	Updated and coded problem list to guide population health outreach.
Dentistry	Provide oral health status and aspiration risk assessment.	Recommendation for oral hygiene protocol or urgent dental referral.
Emergency & Disaster Mgmt	Assess personal preparedness for likely home-based crises.	A personalized crisis plan and "stay-box" checklist.

Table 2: Measurable Outcomes for Evaluating the GCI Framework

Domain	Process Metrics	Outcome Metrics
Polypharmacy	% of patients with Beers Criteria medication reviewed; # of medications deprescribed per patient.	Reduction in fall rates; reduction in ADE-related hospitalizations.
Care Coordination	Completion rate of shared care plans; frequency of documented interdisciplinary communication.	Reduced 30-day readmission rates; improved patient/caregiver-reported care coherence.
Crisis Resilience	% of high-risk patients with a documented personalized disaster plan.	Reduction in crisis-driven ED visits for preventable complications (e.g., dehydration, oxygen failure).
Systemic Health	% receiving annual oral health assessment as part of CGA.	Reduction in hospitalizations for aspiration pneumonia.
Cost & Utilization	Accurate coding of MCCs and care coordination services.	Total cost of care; shift in utilization from acute to managed outpatient care.

Challenges and Future Directions

Implementing this model faces significant barriers. Reimbursement structures in many health systems still favor volume over value and do not adequately compensate for the time required for interdisciplinary meetings or non-face-to-face care coordination. Professional cultures and training programs often lack emphasis on interdisciplinary practice. Technological barriers include the lack of interoperable health records that seamlessly share the unified care plan across all settings and providers.

Future efforts must focus on policy advocacy for value-based payment models that fund integrated care, educational reforms to instill interprofessional competencies early in training, and health IT innovation to create tools that facilitate, rather than hinder, this kind of teamwork. Research should prioritize rigorous implementation science studies to test the GCI Framework in diverse settings and measure its impact on the quadruple aim: improving patient experience, population health, caregiver and provider well-being, and reducing per capita cost.

Conclusion

Caring for the medically complex geriatric patient is one of healthcare's most demanding challenges, revealing the limitations of siloed, disease-centric models. This review argues that optimization is achievable only through a deliberate synthesis of expertise from Pharmacy, Family Medicine, Respiratory Therapy, Nursing, Medical Coding, Dentistry, and Emergency & Disaster Management. By systematically addressing polypharmacy through deprescribing, proactively managing vulnerable airways, integrating oral health into systemic care, leveraging accurate data to reflect complexity, and embedding personal crisis preparedness into routine care, this interdisciplinary approach can prevent the costly and degrading cycles of decline and hospitalization. The proposed Geriatric Complexity Integration Framework offers a practical pathway to translate this synthesis into action. It is a call to move

beyond fragmented reactivity and build a system capable of providing coherent, dignified, and resilient care for our most vulnerable older adults.

References

1. Adelman, R. D., Tmanova, L. L., Delgado, D., Dion, S., & Lachs, M. S. (2014). Caregiver burden: a clinical review. *Jama*, *311*(10), 1052-1060. doi:10.1001/jama.2014.304
2. Barbato, D., Bryie, L., Carlisle, C. M., Doroodchi, P., Dowbiggin, P., & Huber, L. B. (2022). Chronically unprepared: emergency preparedness status among US medically vulnerable populations. *Journal of Public Health*, *30*(7), 1775-1783. https://doi.org/10.1007/s10389-021-01487-0
3. Belli, S., Prince, I., Savio, G., Paracchini, E., Cattaneo, D., Bianchi, M., ... & Balbi, B. (2021). Airway clearance techniques: the right choice for the right patient. *Frontiers in medicine*, *8*, 544826. https://doi.org/10.3389/fmed.2021.544826
4. Bourne, R. S., Jennings, J. K., Panagioti, M., Hodkinson, A., Sutton, A., & Ashcroft, D. M. (2022). Medication-related interventions to improve medication safety and patient outcomes on transition from adult intensive care settings: a systematic review and meta-analysis. *BMJ quality & safety*, *31*(8), 609-622.https://doi.org/10.1136/bmjqs-2021-013760
5. Boyd, C. M., Wolff, J. L., Giovannetti, E., Reider, L., Weiss, C., Xue, Q. L., ... & Rand, C. (2014). Healthcare task difficulty among older adults with multimorbidity. *Medical care*, *52*, S118-S125. *DOI:* 10.1097/MLR.0b013e3182a977da
6. Charles, C. V. (2023). 2023 AGS Beers Criteria® for Potentially Inappropriate Medication Use in Older People: A Summary of the Updates. *The Senior Care Pharmacist*, *38*(9), 352-354. https://doi.org/10.4140/TCP.n.2023.352
7. Chiewchantanakit, D., Meakchai, A., Pituchaturont, N., Dilokthornsakul, P., & Dhippayom, T. (2020). The effectiveness of medication reconciliation to prevent medication error: A systematic review and meta-analysis. *Research in Social and Administrative Pharmacy*, *16*(7), 886-894. https://doi.org/10.1016/j.sapharm.2019.10.004
8. Dosa, D. M., Skarha, J., Peterson, L. J., Jester, D. J., Sakib, N., Ogarek, J., ... & Hyer, K. (2020). Association between exposure to Hurricane Irma and mortality and hospitalization in Florida nursing home residents. *JAMA network open*, *3*(10), e2019460-e2019460. doi:10.1001/jamanetworkopen.2020.19460
9. Fortuna, G., Whitmire, S., Sullivan, K., Alajbeg, I., Andabak-Rogulj, A., Pedersen, A. M. L., ... & Brennan, M. T. (2023). Impact of medications on salivary flow rate in patients with xerostomia: a retrospective study by the Xeromeds Consortium. *Clinical oral investigations*, *27*(1), 235-248. https://doi.org/10.1007/s00784-022-04717-1
10. Fried, T. R., Tinetti, M. E., & Iannone, L. (2011). Primary care clinicians' experiences with treatment decision making for older persons with multiple conditions. *Archives of internal medicine*, *171*(1), 75-80. doi:10.1001/archinternmed.2010.318
11. Fromme, E. K., Montgomery, C., & Hickman, S. (2023). Advance care planning in the United States: a 2023 review. *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen*, *180*, 59-63. https://doi.org/10.1016/j.zefq.2023.05.006
12. Hewner, S., Chen, C., Anderson, L., Pasek, L., Anderson, A., & Popejoy, L. (2021). Transitional care models for high-need, high-cost adults in the United States: A scoping review and gap analysis. *Professional Case Management*, *26*(2), 82-98. *DOI:* 10.1097/NCM.0000000000000442
13. Huot, C., Cruz-Knight, W., Jester, D. J., Wenders, A., Andel, R., & Hyer, K. (2022). Impact of establishing a Geriatrics Workforce Enhancement Program clinic on preventive health and Medicare Annual Wellness Visits. *Gerontology & Geriatrics Education*, *43*(2), 285-294. https://doi.org/10.1080/02701960.2020.1854247
14. Jester, D. J., Peterson, L. J., Andel, R., & Dosa, D. M. (2023). Winter storm Uri reduced availability of daily direct-care nurse staff in Texas nursing homes. *Journal of Applied Gerontology*, *42*(10), 2148-2157. https://doi.org/10.1177/07334648231175428
15. Lauwers, E., Ides, K., Van Hoorenbeeck, K., & Verhulst, S. (2020). Outcome measures for airway clearance techniques in children with chronic obstructive lung diseases: a systematic review. *Respiratory research*, *21*(1), 217. https://doi.org/10.1186/s12931-020-01484-z
16. Malakouti, S. K., Javan-Noughabi, J., Yousefzadeh, N., Rezapour, A., Mortazavi, S. S., Jahangiri, R., & Moghri, J. (2021). A systematic review of potentially inappropriate medications use and related costs among the elderly. *Value in health regional issues*, *25*, 172-179. https://doi.org/10.1016/j.vhri.2021.05.003
17. Molina, A., Huck, O., Herrera, D., & Montero, E. (2023). The association between respiratory diseases and periodontitis: A systematic review and meta-analysis. *Journal of Clinical Periodontology*, *50*(6), 842-887. https://doi.org/10.1111/jcpe.13767
18. Morilla-Herrera, J. C., Garcia-Mayor, S., Martín-Santos, F. J., Uttumchandani, S. K., Campos, A. L., Bautista, J. C., & Morales-Asencio, J. M. (2016). A systematic review of the effectiveness and roles of advanced practice nursing in older people. *International journal of nursing studies*, *53*, 290-307. https://doi.org/10.1016/j.ijnurstu.2015.10.010

19. O'Mahony, D., Cherubini, A., Guiteras, A. R., Denkinger, M., Beuscart, J. B., Onder, G., ... & Curtin, D. (2023). STOPP/START criteria for potentially inappropriate prescribing in older people: version 3. *European geriatric medicine*, *14*(4), 625-632. https://doi.org/10.1007/s41999-023-00777-y
20. Palmer, K., Villani, E. R., Vetrano, D. L., Cherubini, A., Cruz-Jentoft, A. J., Curtin, D., ... & European Geriatric Medicine Society Pharmacology special interest group. (2019). Association of polypharmacy and hyperpolypharmacy with frailty states: a systematic review and meta-analysis. *European Geriatric Medicine*, *10*(1), 9-36. https://doi.org/10.1007/s41999-018-0124-5
21. Parker, S. G., McCue, P., Phelps, K., McCleod, A., Arora, S., Nockels, K., ... & Conroy, S. (2018). What is comprehensive geriatric assessment (CGA)? An umbrella review. *Age and ageing*, *47*(1), 149-155. https://doi.org/10.1093/ageing/afx166
22. Passamonti, F., Corrao, G., Castellani, G., Mora, B., Maggioni, G., Gale, R. P., & Della Porta, M. G. (2022). The future of research in hematology: Integration of conventional studies with real-world data and artificial intelligence. *Blood Reviews*, *54*, 100914. https://doi.org/10.1016/j.blre.2021.100914
23. Pel-Littel, R. E., Snaterse, M., Teppich, N. M., Buurman, B. M., van Etten-Jamaludin, F. S., van Weert, J. C., ... & Scholte Op Reimer, W. J. (2021). Barriers and facilitators for shared decision making in older patients with multiple chronic conditions: a systematic review. *BMC geriatrics*, *21*(1), 112. https://doi.org/10.1186/s12877-021-02050-y
24. Reeve, E., Shakib, S., Hendrix, I., Roberts, M. S., & Wiese, M. D. (2014). Review of deprescribing processes and development of an evidence-based, patient-centred deprescribing process. *British journal of clinical pharmacology*, *78*(4), 738-747. https://doi.org/10.1111/bcp.12386
25. Schulze, J., Breckner, A., Duncan, P., Scherer, M., Pohontsch, N. J., & Lühmann, D. (2022). Adaptation and validation of a German version of the Multimorbidity Treatment Burden Questionnaire. *Health and Quality of Life Outcomes*, *20*(1), 90. https://doi.org/10.1186/s12955-022-01993-z
26. Skolarus, L. E., Robles, M. C., Mansour, M., Sudore, R. L., Reynolds, E. L., Burke, J. F., ... & Brown, D. L. (2022). Low engagement of advance care planning among patients who had a stroke or transient ischemic attack. *Journal of the American Heart Association*, *11*(6), e024436. https://doi.org/10.1161/JAHA.121.024436
27. Sudore, R. L., Lum, H. D., You, J. J., Hanson, L. C., Meier, D. E., Pantilat, S. Z., ... & Heyland, D. K. (2017). Defining advance care planning for adults: a consensus definition from a multidisciplinary Delphi panel. *Journal of pain and symptom management*, *53*(5), 821-832. https://doi.org/10.1016/j.jpainsymman.2016.12.331
28. Wang, P., Vienneau, M., Vogeli, C., Schiavoni, K., Jubelt, L., & Mendu, M. L. (2023, June). Reframing value-based care management: beyond cost reduction and toward patient centeredness. In *JAMA Health Forum* (Vol. 4, No. 6, pp. e231502-e231502). American Medical Association. doi:10.1001/jamahealthforum.2023.1502
29. Weir, K. R., Ailabouni, N. J., Schneider, C. R., Hilmer, S. N., & Reeve, E. (2022). Consumer attitudes towards deprescribing: a systematic review and meta-analysis. *The Journals of Gerontology: Series A*, *77*(5), 1020-1034. https://doi.org/10.1093/gerona/glab222
30. Wolff, A., Joshi, R. K., Ekström, J., Aframian, D., Pedersen, A. M. L., Proctor, G., ... & Dawes, C. (2017). A guide to medications inducing salivary gland dysfunction, xerostomia, and subjective sialorrhea: a systematic review sponsored by the world workshop on oral medicine VI. *Drugs in R&d*, *17*(1), 1-28. https://doi.org/10.1007/s40268-016-0153-9
31. Wouters, E. F., Posthuma, R., Koopman, M., Liu, W. Y., Sillen, M. J., Hajian, B., ... & Franssen, F. M. (2020). An update on pulmonary rehabilitation techniques for patients with chronic obstructive pulmonary disease. *Expert review of respiratory medicine*, *14*(2), 149-161. https://doi.org/10.1080/17476348.2020.1700796
32. Zazzara, M. B., Villani, E. R., Palmer, K., Fialova, D., Corsonello, A., Soraci, L., ... & Liperoti, R. (2023). Frailty modifies the effect of polypharmacy and multimorbidity on the risk of death among nursing home residents: Results from the SHELTER study. *Frontiers in Medicine*, *10*, 1091246. https://doi.org/10.3389/fmed.2023.1091246
33. Zhou, D., Chen, Z., & Tian, F. (2023). Deprescribing interventions for older patients: a systematic review and meta-analysis. *Journal of the American Medical Directors Association*, *24*(11), 1718-1725. https://doi.org/10.1016/j.jamda.2023.07.016.