



Gastrointestinal Infections in the Geriatric Population: Diagnostic and Therapeutic Challenges

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Abstract

Background: Gastrointestinal (GI) infections are a major cause of morbidity and mortality in the elderly. Age-related physiological and immunological changes increase susceptibility and complicate management.

Aim: To review the diagnostic and therapeutic challenges associated with gastrointestinal infections in geriatric patients, emphasizing common pathogens, atypical presentations, and treatment considerations.

Methods: A narrative review of literature was conducted using PubMed, Scopus, and Google Scholar. Studies, reviews, and clinical guidelines published between 2000 and 2024 addressing GI infections in older adults were analyzed.

Results: Immunosenescence, microbiota dysbiosis, polypharmacy, and comorbidities heighten infection risk and severity. Clostridioides difficile, norovirus, and foodborne bacteria are predominant pathogens. Diagnostic delays due to atypical symptoms and therapeutic challenges from drug interactions and antimicrobial resistance are frequent.

Conclusion: Managing GI infections in older adults requires early recognition, rational antimicrobial use, and integration of geriatric principles. Preventive strategies, including microbiome-based interventions and vaccination, hold promise for improving outcomes.

Keywords: Gastrointestinal Infections; Geriatrics; Clostridioides difficile; Norovirus; Antimicrobial Stewardship; Immunosenescence

Introduction

With rise in global life expectancy, the proportion of individuals aged 65 and older is rapidly growing, leading to a parallel rise in healthcare demands related to age-associated diseases. Gastrointestinal (GI) infections remain a significant cause of morbidity and mortality in the geriatric population [1]. GI infections in elderly individuals can have more severe clinical consequences, including dehydration, electrolyte imbalances, sepsis, and prolonged hospitalization [2,3].

Aging is associated with physiological and immunological changes that predispose older adults to infections. Immunosenescence—the gradual decline in immune function with age—compromises both innate and adaptive immunity, thereby reducing the host's ability to mount an effective response against enteric pathogens [4]. Additionally, alterations in the gut microbiota, decreased gastric acid secretion, slowed gastrointestinal motility, and increased prevalence of chronic comorbidities further exacerbate susceptibility to infection [5,6].

The diagnostic approach to GI infections in the elderly is particularly complex due to atypical symptomatology. Classic signs such as fever and diarrhea may be absent or muted, while non-specific manifestations like confusion, anorexia, or functional decline may predominate [7]. This often leads to delays in diagnosis and treatment or the initiation of empiric antibiotics without microbiological confirmation, which contributes to inappropriate antimicrobial use and resistance [8].

Moreover, elderly patients frequently reside in long-term care facilities, which are recognized as hotspots for outbreaks of *Clostridioides difficile*, norovirus, and other enteric pathogens [9]. In such settings, infection control is challenging, and recurrent infections are common. Therapeutic management in this group is further complicated by altered pharmacokinetics, polypharmacy, and increased risk of adverse drug reactions [10].

This review aims to examine the unique diagnostic and therapeutic challenges associated with gastrointestinal infections in older adults. It discusses the most common pathogens, the limitations of current diagnostic strategies, and the intricacies of antibiotic use in this vulnerable population, with an emphasis on optimizing outcomes through age-appropriate, evidence-based care.

Methodology of Literature Review

A literature review was conducted through PubMed, Scopus, and Google Scholar using keywords such as ‘gastrointestinal infections’, ‘elderly’, ‘geriatric population’, and ‘*Clostridioides difficile*’. Peer-reviewed articles, systematic reviews, and clinical guidelines published from 2000–2024 were included. Only English-language studies relevant to human subjects were selected. The findings were synthesized narratively to identify diagnostic, therapeutic, and preventive challenges.

Review of Literature

Age-related physiological changes predisposing to GI infections

Aging is accompanied by numerous anatomical, physiological, and immunological changes that increase the susceptibility of old-

er adults to gastrointestinal (GI) infections. These changes not only predispose the elderly to acquiring infections but also influence the severity of illness and response to treatment.

Altered gastrointestinal function

Gastrointestinal motility decreases with age, particularly in the colon, leading to slower transit time and a higher likelihood of bacterial overgrowth [6]. Additionally, aging is associated with reduced gastric acid secretion (hypochlorhydria), particularly in those taking proton pump inhibitors (PPIs), which compromises the stomach’s natural defense against ingested pathogens such as *Salmonella*, *Campylobacter*, and *Clostridioides difficile* [11]. Degeneration of enteric neurons and smooth muscle can also contribute to dysmotility, increasing the risk of constipation and diverticular disease, both of which may be complicated by infection [12].

Immunosenescence

One of the most important contributors to increased infection risk in older adults is immunosenescence—a gradual decline in both innate and adaptive immune responses. Aging impairs neutrophil chemotaxis and phagocytosis, reduces antigen presentation, and alters cytokine responses, making it harder to mount an effective response against GI pathogens [4]. Moreover, B cell function and mucosal IgA production decline, weakening the gut’s immune barrier against viral and bacterial invasion [13].

Gut microbiota dysbiosis

The gut microbiota undergoes significant compositional changes with aging. There is often a reduction in beneficial commensal organisms such as *Bifidobacteria*, along with an increase in potentially pathogenic bacteria [5]. Factors contributing to this dysbiosis include poor diet, comorbidities, polypharmacy (especially antibiotics), and reduced mobility. Alterations in the gut microbiome can impair colonization resistance, lower short-chain fatty acid production, and promote systemic inflammation—factors that collectively increase infection risk [14].

Impact of polypharmacy and comorbidities

Elderly individuals often have multiple chronic diseases, including diabetes, renal impairment, and cardiovascular disease, which may compromise immune defenses and gut function. Polypharmacy, including the frequent use of antibiotics, anticholinergics, opioids, and acid-suppressive medications, can exacerbate gut dysmotility and microbiota imbalance [14]. For example, PPIs are strongly associated with increased risk of *C. difficile* infection, particularly in nursing home populations [15].

Nutritional deficiencies and frailty

Malnutrition, common in frail older adults, further weakens gut barrier function and immune responses. Deficiencies in micronutrients such as zinc and vitamin D have been linked to increased infection risk and impaired immune modulation [16]. Frailty itself has been associated with altered inflammatory profiles and impaired resilience against infectious stressors.

Common gastrointestinal infections in older adults

Gastrointestinal infections in the geriatric population are not only more frequent but also more severe in their clinical course and consequences. Elderly individuals are at increased risk due to a combination of host factors—such as immunosenescence and comorbidities—and environmental exposures, particularly in long-term care settings. Below are the most common GI infections encountered in this age group.

Clostridioides difficile infection (CDI)

Clostridioides difficile infection is the most prevalent healthcare-associated GI infection in older adults and is a major cause of morbidity and mortality. Age over 65 is a well-established risk factor for both primary and recurrent CDI [17]. Risk factors include recent antibiotic use (especially fluoroquinolones, cephalosporins, and clindamycin), proton pump inhibitor (PPI) therapy, and hospitalization [15]. Elderly patients often present with non-specific symptoms such as anorexia, abdominal discomfort, or delirium, which can delay diagnosis. Severe disease, toxic megacolon, and treatment failure are more common in this population. Treatment has shifted toward newer agents like fidaxomicin and bezlotoxumab to reduce recurrence [18].

Viral gastroenteritis (Norovirus and Rotavirus)

Norovirus is a leading cause of acute gastroenteritis outbreaks in elderly care settings due to its high transmissibility and low infectious dose [19]. Outbreaks are often severe in nursing homes and hospitals, resulting in dehydration, falls, and hospitalizations. Symptoms such as nausea, vomiting, and diarrhea may be accompanied by lethargy and confusion. Immunity wanes with age, and repeated infections are common.

Rotavirus, while classically associated with paediatric infections, can also cause significant disease in elderly adults, particularly in institutional settings [20]. Vaccination of children has led to indirect protection (herd immunity), but outbreaks still occur in the unvaccinated elderly.

Bacterial foodborne infections

Older adults are particularly vulnerable to foodborne infections due to reduced gastric acidity and comorbid conditions. The most common pathogens include:

- *Salmonella* spp. – Often causes invasive disease in the elderly, with bacteremia in up to 5–10% of cases [21].
- *Campylobacter jejuni* – Associated with more severe dehydration and longer recovery in older adults [22].
- *Listeria monocytogenes* – Particularly dangerous for the elderly; can lead to septicemia and meningitis, especially in those consuming unpasteurized dairy or meats [23].

These infections can be life-threatening and often require hospitalization, especially in patients with diabetes, renal insufficiency, or immunosuppression.

Parasitic infections

Protozoal infections such as *Giardia lamblia* and *Cryptosporidium* spp. are less common but can occur in elderly individuals, particularly those living in poor sanitation or institutionalized settings. These infections tend to be more protracted and may result in significant weight loss and dehydration [24].

Antibiotic-associated diarrhea (AAD)

Not all diarrhea in older adults is infectious in etiology. Antibiotic-associated diarrhea (AAD) can occur in the absence of *C. difficile*, often due to disruption of normal gut flora. Common culprits include broad-spectrum antibiotics like amoxicillin-clavulanate and clindamycin. AAD can exacerbate frailty and lead to hospital admissions [25].

Atypical clinical presentations and diagnostic challenges

Diagnosing gastrointestinal (GI) infections in older adults poses significant challenges due to atypical presentations, overlapping symptoms with chronic illnesses, and physiological changes associated with aging. Delays in diagnosis can lead to serious complications such as dehydration, sepsis, or hospital-acquired infections. Recognizing these diagnostic pitfalls is essential to improving outcomes. In contrast to younger individuals, older adults often do not present with classic signs of GI infection such as fever, abdominal pain, or diarrhea. Instead, they may exhibit non-specific symptoms such as:

- Confusion or acute delirium
- Lethargy or reduced oral intake
- Functional decline or falls
- Exacerbation of comorbidities (e.g., heart failure, diabetes)

These subtle signs may be mistaken for normal aging or progression of chronic diseases, resulting in underdiagnosis or misdiagnosis [7].

Overlap with non-infectious GI conditions

Older adults often suffer from chronic gastrointestinal disorders such as diverticulosis, ischemic colitis, or drug-induced diarrhea that can mimic infectious gastroenteritis, especially when accompanied by systemic symptoms like malaise or leukocytosis [6]. Moreover, side effects from medications—including antibiotics, metformin, or NSAIDs—can cause diarrhea and abdominal discomfort, further complicating the clinical picture.

Diagnostic limitations in the elderly

Several factors make laboratory diagnosis more difficult in geriatric patients:

- Difficulty in obtaining stool samples due to incontinence or immobility
- Lower sensitivity of traditional stool cultures for many pathogens
- False positives in molecular tests, such as *C. difficile* PCR detecting colonization rather than infection [26]
- Delayed or absent inflammatory markers (e.g., CRP, leukocytosis), especially in frail or malnourished individuals [27]
- **Underutilization of Advanced Diagnostics:** Advanced tools—such as multiplex PCR panels, enzyme immunoassays (EIA), and stool toxin assays—are often underused in elderly patients due to concerns about cost, interpretation, or lack of training.
- **Risk of Overdiagnosis:** Sometimes, increased use of molecular assays can detect nonpathogenic organisms and lead to overdiagnosis and overtreatment in elderly [28].

Therapeutic challenges in geriatric patients

The treatment of gastrointestinal (GI) infections in older adults is complicated by age-related physiological changes, comorbid conditions, polypharmacy, and increased vulnerability to adverse drug reactions. In this population, therapeutic decisions require careful balance between efficacy, safety, and the risk of complications such as antimicrobial resistance or drug toxicity.

Polypharmacy and drug-drug interactions

Older adults frequently take multiple medications for chronic diseases such as hypertension, diabetes, and heart failure. The introduction of antibiotics can lead to clinically significant drug-drug interactions, particularly with anticoagulants (e.g., warfarin), antiepileptics, and QT-prolonging agents [29]. For example, macrolides and fluoroquinolones are known to increase the risk of arrhythmias when used with other QT-prolonging drugs that are commonly used in elderly care [30]. Polypharmacy also increases the risk of antibiotic-associated adverse effects, such as delirium, nephrotoxicity, or ototoxicity, especially with aminoglycosides or high-dose beta-lactams.

Altered pharmacokinetics and pharmacodynamics

With age, there is a decline in renal and hepatic function, changes in body composition (increased fat-to-lean mass ratio), and reduced gastrointestinal absorption, all of which can significantly affect drug metabolism and clearance [10]. These changes require adjustments in antibiotic dosing—especially for renally excreted agents like vancomycin, aminoglycosides, and certain cephalosporins—to avoid toxicity while maintaining therapeutic levels.

Increased risk of adverse drug reactions

Older adults are more susceptible to adverse drug reactions (ADRs) due to decreased physiological reserve. Common complications include:

- Gastrointestinal bleeding with certain antibiotics (e.g., NSAID co-use)
- Delirium with fluoroquinolones or high-dose penicillins
- Renal impairment with aminoglycosides or combined nephrotoxic therapies
- *Clostridioides difficile* infection (CDI) recurrence with broad-spectrum antibiotics [31]

Management of recurrent infections

Recurrent gastrointestinal infections, particularly CDI, are more frequent in older adults. Treatment of recurrence may require the use of fidaxomicin, bezlotoxumab, or fecal microbiota transplantation (FMT)—therapies that may be costly or logistically difficult to access in resource-limited or long-term care settings [32].

Antimicrobial stewardship in elderly care settings

Antibiotic overuse is prevalent among older adults, often driven by diagnostic uncertainty and the tendency to treat non-specific symptoms. Studies suggest that 30–50% of antibiotic prescriptions in long-term care facilities may be inappropriate [33]. Stewardship interventions—including audit-and-feedback, deprescribing protocols, and prescriber education—can help reduce inappropriate use without compromising patient safety.

Moreover, tools such as delayed prescribing strategies, clinical decision algorithms, and infectious disease consultation can guide

appropriate antibiotic initiation and duration. Besides, for frail elderly individuals with advanced dementia or limited life expectancy, there are times when the risks of aggressive antimicrobial therapy may outweigh the benefits. In those situations, palliative approaches, and shared decision-making is important for ethical and patient-centered management [34].

Risk of GI infections in long-term care facilities

Long-term care facilities (LTCFs) present unique challenges for the prevention, diagnosis, and management of gastrointestinal (GI) infections among the elderly. These institutions cater to individuals with multiple comorbidities, cognitive decline, and functional dependence—factors that increase the susceptibility to infections and complicate their management. Besides, many of the residents of Long Term Care Facilities suffer from dementia or other cognitive impairments, which may hinder their ability to report symptoms like abdominal pain, nausea, or changes in bowel habits [27]. This can result in delayed diagnosis and result in inappropriate or delayed treatment. Behavioral changes, such as agitation or reduced appetite, may be the only early indicators of GI infection in them.

Factors like close living quarters, shared dining spaces, and frequent contact between residents and healthcare staff in the long term care facilities poses a high-risk environment for GI outbreaks, especially those caused by norovirus and *Clostridioides difficile*. Norovirus, with its low infectious dose and environmental resilience, can spread rapidly through contaminated surfaces, food, or direct contact, affecting up to 50% of residents during an outbreak [19]. *C. difficile* spores are equally persistent and pose a significant risk in settings where residents frequently receive antibiotics or acid-suppressive therapy [35]. Outbreaks in these facilities are associated with high hospitalization rates, prolonged illness, and increased mortality.

It becomes pertinent for the staff to observe hand hygiene and comply with the contact precautions [36] to prevent cross infection.

Diagnostic and therapeutic limitations

Diagnostic work-up in LTCFs is often constrained by limited access to laboratory services, imaging, or endoscopy. Delays in sample collection and transportation reduce the utility of stool cultures and toxin assays. Similarly, therapeutic decisions may be hampered by a lack of intravenous access, challenges in monitoring renal function, and limited on-site clinical expertise [33]. These limitations often result in empirical therapy or unnecessary transfers to acute care hospitals.

Ethical Considerations in Antimicrobial Use

The **goals of care** in elderly residents—particularly those with advanced dementia, terminal illnesses, or frailty—must be taken into account when initiating antibiotics. Overuse of antimicrobials may prolong discomfort, increase antimicrobial resistance, and lead to adverse outcomes such as delirium or CDI [37]. Shared decision-making involving the patient, caregivers, and healthcare team is essential, and palliative approaches may be more appropriate in certain cases.

Advance care planning and documentation

Infection episodes often prompt discussions about the resident's overall health status and future care preferences. Advance care planning (ACP) can help align treatment with patient values, avoiding unwanted hospitalizations or invasive interventions. Documentation of infection-related preferences (e.g., do-not-hospitalize or do-not-antibiotic orders) ensures consistent care across providers [38].

Future directions and research gaps

Despite increasing awareness of gastrointestinal (GI) infections in the geriatric population, numerous knowledge gaps and system-level limitations persist. As populations continue to age worldwide, addressing these gaps through targeted research, innovation, and policy changes is essential to improving outcomes in this vulnerable group.

Age-specific diagnostic algorithms

Current diagnostic criteria for GI infections are largely based on younger or general adult populations. In older adults, atypical pre-

sentations, such as confusion or falls without overt GI symptoms, often go unrecognized. There is a need for validated, geriatric-specific diagnostic algorithms that incorporate functional decline and cognitive status into early recognition protocols [27]. Additionally, stool test interpretation must account for asymptomatic colonization, particularly in *Clostridioides difficile* and norovirus.

Innovations in microbiome-based therapies

With the growing understanding of the gut microbiome's role in immunity, microbiota-targeted therapies hold promise for both treatment and prevention of GI infections. Fecal microbiota transplantation (FMT) has shown success in treating recurrent *C. difficile*, but its long-term safety and utility in frail older adults require further study [32]. Research into next-generation probiotics, prebiotics, and synbiotics tailored to geriatric physiology is also warranted [5].

Vaccination strategies for GI Pathogens

There is currently no licensed vaccine for norovirus or *C. difficile*, despite their high burden in older adults. Clinical trials for norovirus vaccines are ongoing, and the inclusion of elderly populations—particularly those in long-term care settings—must be prioritized [39,40]. Strategies for optimizing herd immunity through pediatric vaccination (e.g., rotavirus) should be further leveraged to protect older adults indirectly.

Antimicrobial stewardship adapted to LTCFs

While antimicrobial stewardship is well established in hospitals, LTCFs often lack dedicated programs due to resource limitations, staff turnover, and fragmented care models. Future efforts should focus on scalable stewardship interventions—including clinical decision aids, point-of-care diagnostics, and telehealth-based infectious disease support—for long-term care environments [33].

Integration of geriatric assessment in infection management

There is a growing recognition that treatment of infections in older adults must go beyond pathogen eradication and consider frailty, cognitive function, nutrition, and polypharmacy. Future studies should assess comprehensive geriatric assessment (CGA) as a tool to guide personalized treatment decisions and improve infection-related outcomes [41].

Data gaps and research inclusion

Older adults, particularly those with cognitive impairment or in LTCFs, are underrepresented in clinical trials for infectious diseases. Ethical and logistical barriers have contributed to a lack of age-specific evidence. Policies encouraging inclusive research design, expanded use of surrogate consent, and real-world data from electronic health records can help bridge this evidence gap [42].

Emerging evidence suggests that lipopolysaccharides (LPS) from gram-negative bacteria contribute to systemic inflammation and ‘inflammaging’ in older adults [43]. While routine clinical measurement of circulating LPS is not yet standard practice, future diagnostic frameworks may integrate endotoxin assessment in high-risk geriatric patients. Additionally, ensuring microbiological safety of dairy-derived probiotic and fermented products by monitoring for gram-negative contamination may reduce infection risk in immunocompromised elderly populations [44,45].

Discussion

The literature consistently demonstrates that gastrointestinal infections in older adults are influenced by immunosenescence, comorbidities, and environmental exposures. Clostridioides difficile and norovirus predominate in long-term care settings, with high morbidity and mortality. Diagnostic delays, polypharmacy, and altered pharmacokinetics complicate treatment. Antimicrobial stewardship and targeted preventive strategies are essential to mitigate recurrence and resistance. Emerging research on microbiome restoration and vaccines may revolutionize prevention and therapy in this vulnerable population.

Conclusion

Gastrointestinal infections in the geriatric population require a multidisciplinary approach integrating early diagnosis, judicious antimicrobial use, and geriatric care principles. Preventive measures—such as vaccination, infection control, and antimicrobial stewardship—remain cornerstones of management. Future research must prioritize geriatric-specific diagnostic tools and therapies tailored to physiological aging and comorbidity.

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