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SUMMER 2026
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UPCOMING EVENTS

DEC 4-6 2026
OFP Future Leaders Program
Chicago, IL

2026 CALL FOR PAPERS

OFP accepts original articles from clinicians who write succinct, evidence-based, authoritative review articles with an osteopathic component that will assist osteopathic family physicians in patient care.

OFP is actively seeking review articles, brief reports, and clinical images of general interest to osteopathic family physicians, as well as related to our topics of interest as listed below. Submit an article at https://mc04.manuscriptcentral.com/ofp, or view information about article categories. Patient Education Handouts are considered as part of a package with a review article.

Submissions by students must include at least one supervising physician who is familiar with the content of the article.

Please note that DO authors of articles are eligible for up to 10 AOA 1-B CME credits per article.

RESERVE A TOPIC

If you are interested in writing on one of the suggested article topics below, or if you have another topic in mind, you can reserve the topic by emailing the *OFP* Editorial Office. Please provide your name and the review title you would like to reserve. Once you reserve a review article topic, you will receive an email confirmation from ACOFP. This will initiate a 3-month deadline for submission. If the paper is not received within 3 months, the system will release the review article topic for other authors to reserve.

2026 CALL FOR PAPERS

Clinical Images

Clinical image submissions on all topics are welcome. Images must be accompanied by an appropriate patient model release. OFP is particularly interested in clinical images in the following topic areas:

- Dermatology, especially common skin ailments of people of color
- Pediatrics
- Radiology
- Rheumatology

REVIEW ARTICLES

SUMMER ISSUE

Suggested themes:

- Heat-related illness
- Sports medicine & outdoor activity
- Travel, vector-borne diseases, and pretravel counseling
- Preventive care, adolescent physicals
- OMT for musculoskeletal injuries
- OMT for common summer sports injuries
- Water-related injuries
- Dermatologic conditions in summer

FALL ISSUE

Suggested themes:

- Back-to-school health
- Vaccinations
- Respiratory illness season
- Mental health and stress: screening tools, seasonal affective disorder, screening and monitoring in pediatric / adolescent populations
- Chronic disease management resets
- Annual Diabetes Management Optimization: New medications, GLP-1 updates
- OMT & Musculoskeletal
- Patient Education Handouts related to review articles

WINTER ISSUE

Suggested themes:

- Winter respiratory illness
- Mental health, stress, burnout
- Chronic conditions exacerbated in the winter
- Pain management, COPD, depression/ seasonal mental health disorders
- Cold-weather injuries
- Osteopathic manipulative treatment for common musculoskeletal injuries in the winter
- Holiday-related health topics (cardiac risk, diet, alcohol, travel)

2026 FUTURE LEADERS

The 2026 Future Leaders program will feature two opportunities for early and mid-career physicians:

- Future Leaders 1.0, open to third-year residents and new physicians-in-practice (years 1-5), introduces core leadership principles and practical skills, equipping residents and new physicians with the tools to begin leading effectively within their teams and organizations.
- Future Leaders 2.0 supports physicians as they step into more advanced leadership roles and broader organizational impact.

Both conferences will take place December 4-6, 2026, in downtown Chicago, IL. Apply today and make this the year to give your career a jump start!

"From the moment I arrived, I felt genuinely welcomed, valued, and invested in. The intimate size of the conference is part of what makes it so powerful and unique—you're able to truly connect with everyone in just a short time. I walked away with a deeper understanding of myself and my role as a leader in medicine."
– Cassandra Levitske, DO

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EDITOR'S MESSAGE

Caring for the Whole Patient, Every Day

Lindsay Tjiattas-Saleski, DO, MBA, FACOEP, FACOFP

As family physicians, we have the privilege of caring for patients across the entire spectrum of life, from the first newborn visit to the unique challenges and opportunities that accompany aging. Few specialties require such breadth of knowledge, adaptability, and lifelong learning. While this variety is one of the greatest rewards of Family Medicine, it can also make it challenging to stay current on the ever-expanding body of medical information.

In this Summer Issue of Osteopathic Family Physician, we are pleased to present a diverse collection of articles designed to provide both practical updates and valuable refreshers for the busy clinician. Several of the featured topics focus on issues that commonly affect our aging population, a group that continues to grow and whose healthcare needs become increasingly complex. Whether you are looking to learn something new, revisit an important clinical concept, or simply broaden your perspective, we hope this issue offers insights that you can immediately apply in practice.

As we move into the summer months, I would also encourage you to take time to care for yourself. Medicine is a profession built upon service to others, but our ability to provide compassionate care depends upon maintaining our own well-being. Spend time with family and friends, enjoy the longer days, soak up a little vitamin D, and take advantage of opportunities to rest and recharge. The relationships we cultivate outside of medicine often become our greatest sources of strength, perspective, and joy.

Perhaps you will find yourself reading this issue while relaxing on a beach, sitting beside a lake, traveling with loved ones, or simply enjoying a quiet evening on your back porch. Wherever this summer takes you, we hope Osteopathic Family Physician serves as both an educational resource and an enjoyable companion.

Thank you for your continued dedication to your patients, your communities, and the osteopathic profession. We appreciate your readership and wish you a safe, healthy, and rejuvenating summer.

FROM THE PRESIDENT'S DESK

Greg D. Cohen, DO, FACOFP *dist*.

Since my first message in April, I have been North, South, East, and West for ACOFP.

- I have traveled to Osteopathic meetings and schools in Orlando, Columbus, Maine, Seattle, and by the time you read this, even Ketchikan, Alaska.
- I have been to multiple Osteopathic Medical Schools and met with incredible students, residents, young physicians, and seasoned veteran Osteopathic family physicians. No matter where I went, we all shared so many of the same concerns. Burnout, prior authorizations, inboxes, pajama time, pressure to produce, AI, EMRs, increased overhead, the expansion of PAs and NPs, a confusing, ever-changing Board Certification process...The list goes on and on.
- On the advocacy front, we have signed on to multiple letters about changes needed in the prior authorization process, vaccination guidelines changes, cuts to Medicaid and Medicare, and access to care in rural America.
- I have spoken to leaders at NBOME, AOBFP, and AOA about our Board Certification process and the need to make it more user-friendly, more meaningful, and more responsive to our needs.
- Last month, during our inaugural Destination CME event, I presented on how to integrate OMT into a busy family practice.
- I have also started the process of transitioning our current Executive Director Bob Moore's retirement and finding our next Executive Director for 2027I cannot thank Bob enough for his extraordinary service leading ACOFP, and for his friendship.
- I am also continuing to practice full-time at my office at Lucas County Health Center Medical Clinic in Chariton, Iowa.

Later this year, I will be appointing a task force on AI integration into Osteopathic Family Medicine.

I am going to try to address some of our most frustrating issues in medicine today in each of my presidential messages this year. This message will try to take on Prior Authorization.

Prior Authorization is a time intensive, inefficient process for patients and physicians by which payers try to ensure the appropriateness or medical necessity of proposed care. Unfortunately, the goal has really been reducing payer expenses by redirecting prescribed care to less expensive options.

So what can we do:

1. Automate the process using electronic prior authorization tools within your electronic health record.
2. Assign a dedicated expert within your office who can learn the nuances and requirements of your top payers.
3. Learn from denials. Keep a master list of common denial reasons to help bulletproof your documentation and clinical rationale for a given request.
4. When all else fails, request a peer-to-peer review directly with the payer's medical director.

If anyone out there has additional strategies they have found successful on prior authorization or any of the frustrating issues on our list, please share them by contacting me at president@acofp.org.

Thank you.

Greg D. Cohen, DO, FACOFP *dist.*
2026-2027 President, American College of Osteopathic Family Physicians

Contact Dr. Cohen at president@acofp.org.

REVIEW ARTICLE

Measles in 2025: A Practical Review of Clinical Considerations and Epidemiology in the United States

Jacob Thaddeus, OMS-III[1]; Mary Elizabeth Bradley, OMS-III[1]; Jessica Claar, OMS-III[1]; Hanna S. Sahhar, MD, FAAP, FACOP[1]

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KEYWORDS

Measles

MMR

Pediatrics

Infectious disease

Vitamin A

ABSTRACT

Measles infections are on the rise with 2025 representing the worst year for measles cases in the United States (US) for over 30 years, jeopardizing measles elimination status in the US. The current predicament is a manifestation of declining measles vaccination rates, despite the measles vaccine being recognized as one of the most important and most effective modern childhood vaccines. According to US Centers for Disease Control and Prevention (CDC) data, in the decade prior to availability of a measles vaccine, the US recorded an average of 549,000 measles cases and 495 measles-related deaths per year. As a result of vaccination in the US, an entire generation of US physicians have been fortunate enough to practice in the postelimination era in which measles encounters are rare. However, the US now finds itself at an inflection point. If the current trend continues, the US could be on course for a sustained rise in annual cases and experience a return to endemic status. Prompt diagnosis and the provision of appropriate postexposure prophylaxis are crucial to minimizing measles-related complications and death. In anticipation of measles encounters becoming more common, the intention of this article is to provide readers with a comprehensive review of current guidelines regarding measles vaccination, treatment, and outbreak management. Further, a discussion of measles epidemiology is included to facilitate a better understanding of what factors contributed to recent outbreak years and the implications of current events on the future of measles incidence.

INTRODUCTION

Measles Virus

Measles (rubeola), is a viral illness caused by a single-stranded, negative-sense RNA virus of the *Morbillivirus* genus within the paramyxovirus family.[1] Its six structural proteins include two surface glycoproteins that are key virulence factors: hemagglutinin (H), which facilitates respiratory host cell attachment, and fusion (F), which promotes viral fusion and intercellular spread.[1,2]

Notably, the virus binds to the CD150 receptor on memory T and B lymphocytes, depleting host antibodies against common bacteria and viruses.[2] This ability induces "immune amnesia" in the host, increasing susceptibility to secondary infection for up to 2 to 3 years.[2]

Despite the typically high mutation rates of RNA viruses, measles is antigenically monotypic; its surface proteins have not shown significant variation over time.[2,3] The lack of genetic change means that inoculation, whether by infection or immunization, leads to presumed lifelong immunity.[3]

Of the 24 recognized genotypes, 18 have not been detected in at least ten years.[4] Among the six genotypes considered active, only two (B3 and D8) were identified in global measles cases during 2021.[4]

Transmission

Infection begins in alveolar macrophages and dendritic cells of the respiratory tract.[1] After replication, virions are transferred to the lung epithelium and shed via respiratory droplets.[5] Measles virus is capable of aerosol spread, allowing for transmission in closed spaces for 2 hours.[1]

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Following exposure, the incubation period is 11 to 12 days.[1] A person is considered infectious from 4 days prior to rash onset until four days after rash disappearance.[1]

Measles is highly contagious. R naught (R0), an indicator of transmissibility, is approximately 12 to 18, meaning that an infected person is likely to infect 12 to 18 other people.[6] For comparison, the estimated R0 of the original COVID-19 Alpha-variant was 1.22.[7,8] Further, with a secondary attack rate of 90%, infection is nearly guaranteed among susceptible populations following exposure.[1,9]

Presentation

Prodromal symptoms appear 11 to 12 days after exposure and include stepwise fever peaking at 103 to 105°F (39 to 40.5°C), cough, coryza, and conjunctivitis (Figure 1).[1] Koplik spots refer to blue-white lesions on a red background seen on the buccal mucosa (Figure 2); these spots appear 1 to 2 days prior to onset of the measles rash and are considered unique to measles infection.[1]

Measles rash is erythematous and maculopapular.[1] Classically, the rash appears at the hairline (Figure 3) then progresses caudally to the face and neck before eventually reaching the trunk (Figure 4), hands and feet.[1] The rash typically lasts 5 to 6 days.[1]

Diagnosis

Active infection is indicated by measles-specific IgM antibodies detected on ELISA.[1,10] Detection of viral RNA on RT-PCR can support the diagnosis when serology is inconclusive.[1,9,10] A combination of serologic testing and RT-PCR should be ordered for all suspected measles cases to maximize testing specificity and sensitivity.[10]

Complications

Otitis media and diarrhea represent the most common complications, each occurring in approximately 10% of measles cases.[11] Measles has the potential to cause profound, irreversible, bilateral sensorineural hearing loss.[12,13] Prior to widespread vaccination, measles had been a major cause of profound hearing loss in the United States, accounting for 5% to 10% of cases.[12]

Immunosuppression resulting from "immune amnesia" increases susceptibility to secondary infection, most notably pneumonia, which occurs at a rate of one per 20 measles cases in children and represents the primary cause of measles related death.[5,11,14]

Central nervous system (CNS) complications are uncommon but consequential. Measles associated neurologic manifestations include Primary Measles Encephalitis (PME), Acute Postinfectious Measles Encephalomyelitis (APME), Measles Inclusion Body Encephalitis (MIBE), and Subacute Sclerosing Panencephalitis (SSPE). CNS complications are described in Table 1.

FIGURE 1: Coryza and conjunctivitis seen in an 11-month-old male with confirmed measles infection. The image was taken in 2018 by one of the authors of this article.

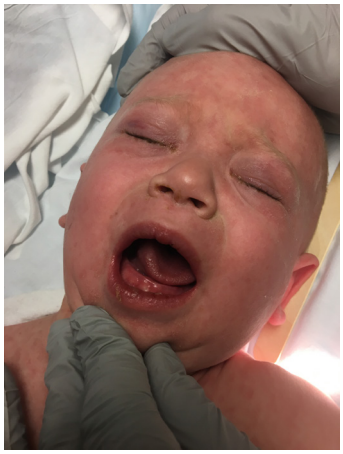
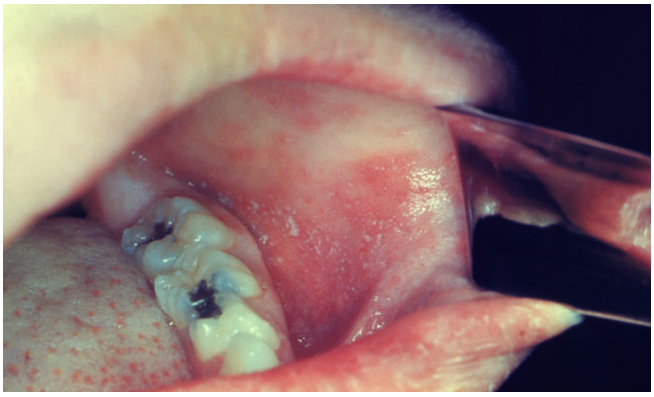


FIGURE 2: Bluish-white oral lesions on a red buccal mucosa (Koplik spots) seen in child with measles. This image was originally taken in 1953 and is published in the CDC Public Health Image Library (PHIL).



Overall, 20% of US measles cases require hospitalization.[11] Measles related deaths are predominantly the result of respiratory and neurologic complications and occur at a rate of 1 to 3 per 1000 reported cases.[10,11]

MEASLES VACCINE

History

During the decade prior to vaccine availability in 1963, the US reported an average of 549,000 measles cases and 495 measles-related deaths each year.[7] Childhood measles infections were so common that, even today, persons born before 1957 are assumed to possess immunity from prior infection.[7]

Initially, a single dose was recommended for all children, stimulating a profound decrease in US measles cases. However, outbreaks were still common, even in children with prior measles vaccination.[7] This prompted revisions in 1989, with eventual consensus that children should receive a second dose, promoting renewed decline in measles incidence.[7]

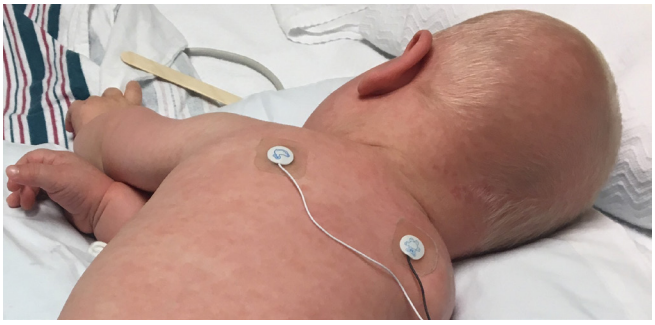
In the year 2000, measles was declared eliminated from the US, meaning that for 12 months cases were the result of isolated outbreaks rather than continuous spreading.[7] Since achieving elimination status, US measles cases have overwhelmingly been the result of importation by unvaccinated US residents. Importation involves travelling internationally to endemic regions, then developing infection soon after returning home.[7] Table 1 summarizes CDC epidemiologic data regarding measles cases and importations.

At the time of this article, the US has maintained elimination status but is experiencing the most annual measles cases since 1992, jeopardizing this status.[11]

MMR vs MMRV

Adequate immunization requires two lifetime doses of a measles-containing vaccine.[1] This recommendation is based on evidence showing >99% of children develop serologic evidence of immunity after two doses compared to just 95% after a single dose at 12 months of age.[1,21]

FIGURE 3: Measles rash seen beginning at the hairline of 11-month-old male with confirmed measles infection. The image was taken in 2018 by one of the authors of this article.



Currently two combination vaccines exist: MMR (measles, mumps, rubella) and MMRV (which adds varicella coverage). Both vaccines are lyophilized, reconstituted using sterile water, and contain gelatin and neomycin.[1] Neither contains adjuvants or preservatives.[1]

Both MMR and MMRV vaccines are associated with a risk of febrile seizures.[22] Because MMRV carries a higher risk of febrile seizures in children ages 12 to 23 months (1:1,250 vs 1:2,500 for separate MMR and varicella vaccines), separate vaccines are recommended for the first dose.[22] MMRV is the preferred vaccine for the second dose given at 4 to 6 years of age, as the risk of febrile seizures has not been observed in children 4 to 6 years old.[21,22]

It is important to contextualize these risks, as approximately 2% to 5% of otherwise healthy children will have a febrile seizure in childhood. In either case, whether attributed to a vaccine or an idiopathic nature, these seizures are not associated with long-term sequelae.[22]

FIGURE 4: Measles rash shown extending along the trunk of 11-month-old male with confirmed measles infection. The rash can also be seen just above scalp line. The image was taken in 2018 by one of the authors of this article.

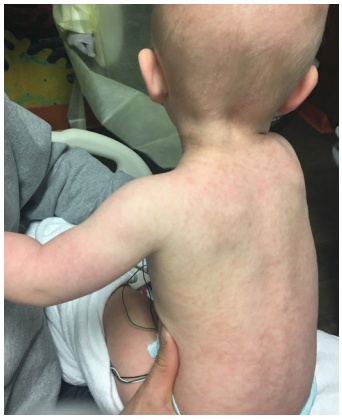


TABLE 1: Measles related neurological complications including incidence, symptomology, associations, and additional related information.[11,15-18].

Neurologic Complications	Incidence	Onset	Symptoms	Associations	Additional Information
Primary Measles Encephalitis (PME)	1:1000	During the primary infection	Fever, headache, altered mental status, and seizures.	Active measles infection	In 30-40% of cases, PME is fatal or causes permanent neurologic damage through elevated intracranial pressure.
Acute Postinfectious Measles Encephalomyelitis (APME)	1:1000	Weeks to months after infection	Altered mental status, ataxia, motor and sensory deficits, bowel and bladder incontinence.	Recent history of measles infection.	APME is considered a post infectious autoimmune response causing demyelination. Mortality is estimated to be ~20%.
Measles Inclusion Body Encephalitis (MIBE)	1:1000	1 to 6 months after infection	Altered mental status and refractory seizures	Immunocompromised children, especially those with lymphoblastic leukemia.	MIBE carries a mortality rate of approximately 75% and survivors are frequently left with permanent neurologic dysfunction.
Subacute Sclerosing Panencephalitis (SSPE)	4 to 11:100,000	7 to 10 years after infection	Onset marked by gradual behavioral changes (irritability, inattentiveness, declining academic performance). Within weeks to months, patients develop neurological symptoms such as ataxia, dyskinesias, and medically refractory seizures.	Measles infection early in life, particularly before 5 years of age.	SSPE is not caused by an active (or reactivated) measles infection, patients will not show infectious measles titers. Diagnosis is confirmed by high concentration of anti-measles antibodies on serum or CSF analysis. Unfortunately, no treatment exists and SSPE is fatal in 100% of cases.

Vaccination Recommendations

The standard childhood series includes an initial dose recommended at 12 to 15 months and a subsequent dose at 4 to 6 years of age.[1] If necessary, a second MMR vaccine can be given 28 days after an initial dose; MMRV requires a 3-month interval between doses.[1]

Adults born during or after 1957 without prior vaccination or evidence of immunity should receive at least one dose of MMR vaccine.[10] However, two doses of MMR are recommended for adult populations considered high risk for measles exposure (international travelers, healthcare personnel, students enrolled in higher education programs).[10]

Patients born before 1957 are considered to have presumptive immunity, with the exception of healthcare personnel.[10] Healthcare facilities should require all healthcare personnel born prior to 1957 to provide laboratory evidence of measles immunity or laboratory confirmation of disease and require two doses of MMR in persons lacking immunity.[10,21]

For international travel, two doses of MMR are recommended for all adults and children age >12 months old.[1] Infants age 6 to 11 months old should receive one MMR dose prior to traveling out of the country, however, this dose will not count toward the standard measles vaccine schedule.[10,21]

Postexposure Prophylaxis and Outbreak Management

Prompt diagnosis and the provision of postexposure prophylaxis (PEP) are important to minimizing measles related complications and death.

Specific recommendations for PEP depend on factors such as age, prior immunization, and duration of time since the exposure. Table 3 summarizes current CDC guidelines for measles PEP. These recommendations were determined in conjunction with the Advisory Committee on Immunization Practices (ACIP).

Options for PEP include the MMR vaccine and immunoglobulin (Ig), both of which are proven to modify disease course and reduce the risk of transmission and complications in susceptible individuals.[10,21] In eligible patients, the MMR vaccine is preferred over Ig PEP, but it has only demonstrated benefit when provided within 72 hours of an exposure.[10] With the exception of healthcare personnel, individuals who receive PEP within 72 hours of measles exposure are considered safe to return to childcare, school, or work.[10]

Of note, vaccination is recommended in all patients to offer protection against future exposures. However, following Ig PEP, MMR should be delayed by 6 months after intramuscular immunoglobulin (IMIG) or eight months after intravenous immunoglobulin (IVIG).[10]

Hospitalized patients should be placed in an airborne infection isolation room (AIIR) until 4 days following rash onset, or for the duration of illness if immunocompromised.[10,21] If negative pressure isolation rooms are unavailable, a single room with the door closed may be used temporarily while coordinating a transfer to an available AIIR.[10]

For healthcare personnel with presumptive measles immunity, neither PEP nor work restrictions are necessary, though symptom tracking is recommended for 21 days after exposure.[10,21]

Treatment of Measles

Currently, there are no FDA approved antiviral therapies for measles infection; its treatment is primarily supportive.[21,23] Antibiotics are reserved for treating secondary bacterial infections.[23,24]

Vitamin A supplementation has been shown to decrease mortality in children with measles infection.[23,24] Vitamin A

TABLE 2: Summarized data from the CDC regarding source of measles outbreaks since gaining elimination status in 2000. Data is grouped by years 2000-2019 and 2020-2023.[10,20]

		2001-2019		2020		2021		2022		2023	
		Cases	Percentage	Cases	Percentage	Cases	Percentage	Cases	Percentage	Cases	Percentage
International importation[a]		747	19%	7	54%	21	43%	23	19%	23	40%
US-acquired cases linked to importations	Epidemiologic link[b]	2,275	59%	4	31%	18	37%	11	9%	19	33%
	Virological link[c]	693	18%	1	8%	9	18%	87	72%	11	19%
US-acquired cases with unknown sourced		158	4%	1	8%	1	2%	0	-	5	9%
TOTAL		3,873		13		49		121		58	

[a] Any case resulting from exposure to measles virus outside of the United States, as evidenced by at least some of the exposure period (7–21 days before rash onset) occurring outside of the United States and rash onset occurring within 21 days of entering the United States without known exposure to measles in the United States within that time.

[b] A case in a chain of transmission which can be epidemiologically linked to an internationally imported case.

[c] A case in which an epidemiologic link to an internationally imported case was not identified, but for which viral genetic evidence confirms an imported measles genotype. An imported measles genotype refers to any genotype not occurring within the United States in a pattern indicative of endemic transmission.

[d] A case in which neither epidemiological or virological link to importation or to endemic transmission within the United States can be established.

TABLE 3: CDC recommendations for quarantine and PEP based on age and time since initial exposure.[10,17,21]

Demographic	Age Range	Measles Immune Status	Recommendations Based on Time Since Exposure		
			≤3 days (72 hours)	4-6 days	>6 days
Healthy children or adults	≥6 months	Immune[a]	Neither PEP nor home quarantine[b] is required		
	<6 months	Nonimmune[c]	IMIG[d] + 28-day home quarantine[b]		21-day home quarantine[b]
	6-11 months	Nonimmune[c]	MMR vaccinee (preferred) or IMIG[d]	IMIGd + 28-day home quarantine[b]	21-day home quarantine[b]
	≥12 months	Nonimmune[c]	MMR vaccine (preferred) or IVIGf	IVIG[f] + 28-day home quarantine[b]	21-day home quarantine[b]
		Partially immune[g]	2nd dose of MMR vaccineh should be administered; quarantine[b] is not required given history of vaccination		
Severely immune compromised	<12 months	Any immune status	IMIG[d] + 28-day home quarantine[b]		
		Any immune status	IVIG[f] + 28-day home quarantine[b]		
Pregnant[i]	All ages	Immune[a]	Neither PEP nor home quarantine[b] is required		
		Nonimmune[c]	IVIG[f] + 28-day home quarantine[b]		

[a]Immune status is defined as people having documented adequate (two-dose) vaccination against measles or presumptive evidence of immunity (persons born before 1957, serologic evidence of measles immunity, prior laboratory documentation of disease).

[b]Standard quarantine duration is 21 days after the last exposure; however, a 28-day period is recommended in patients receiving Ig PEP, since disease course may be modulated.

[c]Nonimmune status is defined as never receiving a measles-containing vaccine and lacking presumptive evidence of immunity (persons born before 1957, serologic evidence of measles immunity, prior laboratory documentation of disease).

[d]IMIG is recommended for infants <12 months of age (dose 0.5 mL/kg; maximum dose = 15 mL).

[e]MMR vaccine may be given to children 6-11 months old, however, vaccination before 12 months of age should not count toward the recommended two doses of measles vaccination. The standard measles vaccination schedule may be resumed 28 days after receiving the MMR vaccine.

[f]IVIG is recommended for severely immunocompromised people and pregnant women who are exposed to measles (dose 400 mg/kg). IVIG is preferred over IMIG in infants >12 months old as it eliminates additional needle sticks.

[g]Partial immunity is defined as having only a single dose of measles-containing vaccine.

[h]A 2nd dose of MMR vaccination should not be given sooner than 28 days after the initial dose.

[i]MMR vaccine is a live vaccine and contraindicated in pregnancy.

deficiency is associated with an increased rate of measles complications including xerophthalmia and blindness.[24] It is important to clarify, however, that this is largely based on studies from developing countries where malnutrition and vitamin A deficiency are more common and where the mortality associated with measles infections is significantly higher (3% to 6%) when compared to developed countries (0.01% to 0.1%).[23,24] Measles infection has been shown to influence serum retinol concentrations among patients in the US, with severity of illness being linked with a greater degree of decrease in retinol.[25]

TABLE 4: Recommendations for age-appropriate vitamin A supplementation in patients with acute measles infection.[21,23,24]

Age	Dose	Frequency/Schedule of Doses
Infants <6 months old	50,000 IU (15,000 µg RAE[a])	Standard: • Initial dose at time of diagnosis • Repeat dose 24 hours later Additional dose: • A 3rd dose should be given at 2 to 6 weeks after diagnosis if signs or symptoms of vitamin A deficiency are present.
Infants 6 to 11 months old	100,000 IU (30,000 µg RAE[a])	
Children >12 months old	200,000 IU (60,000 µg RAE[a])	

The World Health Organization (WHO) and the American Academy of Pediatrics (AAP) recommend vitamin A be given to all children with measles infection, regardless of country or hospitalization status.[21,23,24] Recommendations for vitamin A dosing are included in Table 4.

Vitamin A is not a substitute for vaccination and will not prevent infection.[21,23] Providers must counsel patients on appropriate use, as vitamin A toxicity can cause intracranial hypertension, visual disturbances, and hepatotoxicity.[26]

DISCUSSION

The Current Trend

During the 2025 calendar year, the CDC confirmed 2,283 cases and three deaths across 43 states—the highest number of cases in a year since 1991.[19] For perspective, there have been 6,768 US measles cases since 2000, meaning that 2025 accounts for ~34% of these cases.[19]

The primary source of outbreaks in the US is by importations from unvaccinated US citizens.[10,23] Importation refers to individuals who travel internationally to areas where measles is endemic, then develop an infection after returning home. From 2001 to 2019, there were a total

of 3,873 cases of measles in the US.[10] Of these cases, 747 (19%) represented a primary importation and a further 2,968 (77%) were directly traceable to the initial cases.[10]

How Did We Get Here?

Among the 2,283 cases reported in 2025, 93% occurred in unvaccinated individuals or those with unknown vaccination status.[19] The intent of this article is not to shame a group of people but rather to highlight the importance and efficacy of the measles vaccine in saving lives. However, it is appropriate to reiterate that much of the modern anti-vaccine movement is attributed to Andrew Wakefield's now infamous, and widely discredited, 1998 assertion that autism could be linked to the MMR vaccination.[28] Since the publication of this original claim by Wakefield, large scale case-control and ecological studies completed across multiple counties has shown repeatedly no increased risk between MMR vaccination and autism diagnosis.[28] In reality, the MMR vaccine is one of the most important and effective vaccines in existence.

A recent study attempting to quantify the global impact of the Expanded Programme on Immunization (EPI) found that from 1974 to 2024 the program prevented 154 million deaths by improving vaccination against 14 key pathogens.[29] Remarkably, the measles vaccine alone prevented 93.7 million deaths (60.8%).[29] It was the single greatest driver of lives saved by vaccination, across each year, region, and income level studied.[29] The study also estimated that the measles vaccine preserved an astonishing 5.7 billion years of life, ranking highest among the vaccines studied.[29]

Regarding US vaccination trends, a concerning decline in MMR immunization has been observed. A recent analysis of vaccination rates before and after the COVID-19 pandemic found that out of 2066 US counties, 1614 (78%) reported decreases in MMR vaccination, with an average decrease of 2.67% among the 2066 counties studied.[30]

Simultaneously, the vaccine exemption rate among US kindergartners appears to be increasing. The CDC reported the vaccine exemption rate to be 3.6% in the 2024 to 2025 school year, up from 2.2% in the 2020 to 2021 school year.[31]

Why Is the Current Trend a Concern?

The current trend represents a significant regression in control of a vaccine-preventable illness, jeopardizing measles elimination status in the US. Epidemiological modeling suggests there could be up to 851,300 measles cases over the next 25 years (~34,000 cases/year) if the current state-level vaccination trend (2004 to 2023) continues.[32] Given the estimated measles mortality of 0.1% to 0.3%, approximately 851-2,554 measles related deaths could be expected as a result.[22]

If the vaccination rate decreases by 10%, the number of estimated cases over 25 years increases to 11.1 million and measles related deaths increase to 11,100-33,300.[32] In contrast, a 5% increase in the vaccination rate would dramatically reduce the number of measles cases to just 5800 cases and 6 to 17 related deaths over the same time period.[32]

The modeling provides a stark depiction of how significant small changes in vaccination rates can be, particularly with respect to measles because of how transmissible the virus is among susceptible populations.

Measles Anywhere Is a Threat Everywhere

The potential for future measles cases in the US is largely influenced by the vaccination trend. However, because importations represent the primary source of US outbreaks, it's important to understand global trends in measles as well.

Since being founded in 2000, Gavi (Global Alliance for Vaccines and Immunization) has helped vaccinate 1.2 billion children in 78 low- and middle-income countries.[33] Gavi has provided measles vaccinations to approximately 248 million children through routine programs and a further 482 million by sponsoring follow-up campaigns.[33]

In 2024, the US provided $300 million to Gavi and is the third largest donor since 2000.[33] Unfortunately, as it stands, US funding for Gavi will not be renewed in the International Affairs 2026 Fiscal Year Budget, which eliminates funding for the World Health Organization and Gavi.[34] Eliminating funding for global vaccine initiatives may increase the risk of importation and contribute to future outbreaks in the US.

How Can We Reverse the Current Trend?

While no single person is to blame for the current trend, all physicians can play a role in eliminating measles, especially family medicine physicians.

At the individual level, it is important to maintain awareness of local, national, and global outbreaks and warning patients traveling to areas with ongoing outbreaks, especially if patients are unvaccinated or have a child <12 months old. In 2025, Mexico and Canada also experienced significant outbreaks, reporting 6152 and 5062 cases respectively.[27] India, where measles is considered endemic, recorded 19,068 cases.[27]

Improving the vaccination rate is critical to reversing the trend over the long term. Humans are the only reservoir for measles, meaning that complete eradication is feasible, though it requires immunization in 95% of the population.[5] As of 2024, WHO estimates that 76% of people globally have had two doses of a measles-containing vaccine,

up significantly from a mere 17% in 2000.35 Prompting discussion with vaccine hesitant families will be a difficult but necessary task to improve measles vaccination rate among children with a goal of 95% in each US state, and eventually the world.

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REVIEW ARTICLE

Integrating Osteopathic Manipulative Medicine Into Hospice Care

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KEYWORDS

Hospice

Osteopathic medicine

Dyspnea

OMT

Anxiety

ABSTRACT

Hospice patients often experience persistent dyspnea, anxiety, and pain despite pharmacologic treatment. OMT is a gentle nonpharmacologic adjunct that may support comfort and reduce symptom burden near the end of life. However, hospice-specific clinical evidence describing OMT use remains extremely limited. This narrative review summarizes the available hospice and end-of-life literature related to OMT, highlights appropriate techniques, and discusses practical considerations for integrating OMT into interdisciplinary hospice care. Expanding hospice-focused osteopathic education and research may help define OMT's role in improving comfort, dignity, and whole-person care at the end of life.

INTRODUCTION

OMT is an established component of osteopathic practice used to reduce pain, relieve somatic dysfunction, and support physiologic function through gentle hands-on techniques. In the context of hospice care, these principles align with the central goal of promoting comfort, dignity, and quality of life for patients at the end of life.

Despite this conceptual fit, OMT remains infrequently described in hospice-specific literature, with limited published data describing its feasibility, utilization, or perceived value among hospice teams. Existing literature suggests that OMT may reduce symptom burden, improve ease of positioning, and support relaxation in terminally ill patients. However, these applications have not been widely integrated into hospice care models described in the literature.

Hospice utilization has risen steadily. Over 1.7 million Medicare patients received hospice care in 2021, with nearly half of all Medicare decedents using hospice services before death.[1] Despite this growth, many patients near the end of life continue to experience distressing symptoms, particularly dyspnea, anxiety, and pain, which are not fully managed by conventional pharmacologic therapies.

OMT has shown promise in alleviating such symptoms in select clinical contexts by improving respiratory mechanics, modulating autonomic tone, and reducing muscular tension.[2] However, published literature suggests that integration of OMT into hospice care may be constrained by logistical barriers and limited awareness among hospice providers. As of 2010, there were approximately 70,480 practicing doctors of osteopathic medicine (DOs) in the United States.[3] At that time, only about 300 DOs were practicing within hospice and palliative medicine, indicating a relative underrepresentation of osteopathic physicians in this area.[3]

Given their training in holistic patient-centered care, osteopathic family physicians are uniquely suited to help close this gap. The objective of this narrative review is to examine the current evidence and practical considerations for OMT, specifically in hospice care. We aim to summarize existing studies evaluating OMT in hospice settings, describe techniques most applicable to fragile or bed-bound patients, and discuss strategies to integrate OMT into interdisciplinary hospice practice.

METHODS

We conducted a narrative review of the literature to identify studies relevant to the use of OMT in hospice care. A PubMed search was performed using combinations of the following keywords: "*osteopathic manipulative treatment*,"

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"*OMT*," "*hospice care*," "*dyspnea*," "*anxiety*," "*terminal illness*," and "*symptom management*." Additional references were identified through manual review of bibliographies and relevant osteopathic journals, including *Journal of Osteopathic Medicine (formerly JAOA)* and *Osteopathic Family Physician,* as well as through Google Scholar.

Studies were included if they involved patients of any age (adult or pediatric) receiving OMT in inpatient, residential, or home-based hospice settings. Searches were limited to English-language publications from 2000 to 2024. Studies were excluded if they: focused exclusively on palliative or supportive care without explicit inclusion of hospice-enrolled patients or hospice-level care, did not involve OMT or osteopathic principles, were commentaries, editorials, or opinion pieces without original data, were not published in English, were published prior to 2000, or did not have full-text access available.

For the purposes of this review, *hospice care* is defined according to the Centers for Medicare & Medicaid Services (CMS) criteria as interdisciplinary comfort-focused care for patients with a prognosis of 6 months or less who have elected to forgo curative treatment in favor of symptom management and quality of life.[4] *Palliative care*, by contrast, refers to specialized medical care for patients with serious illness that may be provided concurrently with curative or life-prolonging therapies.

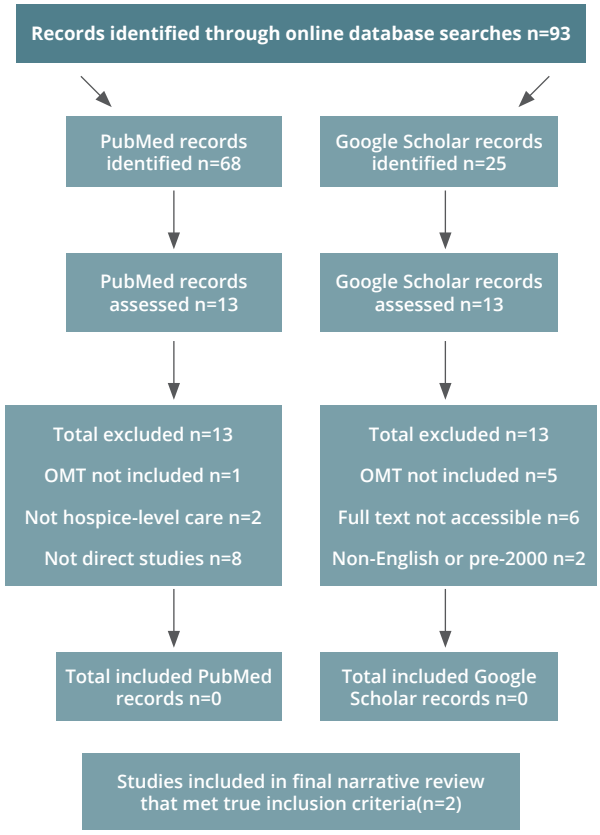
Although hospice care is considered a subset of palliative care, this review intentionally excluded studies conducted exclusively in palliative or supportive care settings, unless the patient population met hospice eligibility criteria or was explicitly described as receiving hospice-level care. However, because hospice-specific OMT research is limited, closely related palliative literature was briefly summarized for context in the "Results" section to highlight broader trends and conceptual relevance. This approach maintains a primary focus on hospice-level care while situating the findings within the larger field of end-of-life medicine.

To structure the analysis, studies were grouped into three categories based on their relationship to hospice care and OMT.

RESULTS

After applying the inclusion and exclusion criteria, no clinical studies were identified that directly evaluated OMT use in hospice-enrolled patients. As a result, Category A (hospice-specific OMT studies) contains no empirical studies. Because no studies met full inclusion criteria, the primary evidence base for OMT in hospice care is effectively absent. To contextualize this gap, we categorized additional literature describing theoretical OMT use in hospice and palliative care as Category B studies. Although these publications did not meet hospice eligibility criteria and were not included in the primary analysis, they provide relevant insights into OMT feasibility, safety, and symptom-relief potential in populations with serious or terminal illness. Acknowledging this adjacent body of work also ensures that relevant findings from similar patient populations are recognized, while maintaining a clear distinction between hospice and palliative care populations as defined in this review. To provide additional background, additional hospice and end-of-life focused articles that did not include OMT were reviewed separately (Category C). The search and study selection process is summarized in Figure 1.

FIGURE 1: Search and inclusion process.



Collectively, these sources demonstrate that OMT has been described as a feasible and well-tolerated adjunct for symptom management near the end of life, though empirical hospice-specific data remain sparse. The findings from each category are summarized below.

Category A: Hospice-Specific Studies

No studies met full inclusion criteria for Category A. Despite an extensive search, no clinical trials, observational studies, or case series were identified that examined the use of OMT specifically in hospice-enrolled patients or evaluated osteopathic interventions delivered within hospice programs. This absence highlights a critical evidence gap and underscores the need for formal research directly addressing OMT in hospice settings.

Category B: OMT in Palliative or Advanced-Illness Populations

Eight publications evaluated OMT in palliative-care or advanced-illness populations that did not meet hospice eligibility criteria, or were not conducted in hospice-enrolled patients, but provide valuable contextual insight. Varas et al presented an educational workshop abstract describing the role of OMT within hospice and palliative medicine through a mind-body-spirit framework.[3] The abstract highlights several key themes relevant to hospice practice, including the use of OMT as a low-risk nonpharmacologic adjunct for pain relief. The authors emphasize that, despite limited numbers of DOs practicing in hospice and palliative medicine, simple OMT techniques can be feasibly incorporated at the bedside. They described the use of gentle bedside OMT techniques, including soft-tissue stretching and decompression alongside myofascial release to alleviate pain and promote relaxation in hospice and palliative medicine patients.[3] The workshop describes the practicality of short low-intensity treatments for frail or bed-bound individuals, illustrating practical feasibility and growing interdisciplinary interest in OMT for comfort-focused care.[3] Choy provided a comprehensive narrative overview describing the potential role of OMT in hospice and palliative care, emphasizing its alignment with the concept of total pain.[5] Although the article did not present original clinical data, it outlined how OMT may complement pharmacologic symptom management for pain, dyspnea, bowel dysfunction, anxiety, and lymphedema. Based on studies from postoperative care, chronic low back pain, and pediatric oncology, Choy suggested that these findings may hold relevance for seriously ill hospice patients despite the absence of hospice-specific research. The author also discussed barriers to implementation, including limited awareness, a small evidence base, and uncertainty among clinicians. He argues that OMT represents a practical holistic modality that aligns well with family medicine principles and the goals of end-of-life care. Estrada et al outlined the relationship between osteopathic medicine and palliative care, shedding light on pertinent OMT skills through an interactive and hands-on workshop open to all healthcare workers.[6] Arienti et al conducted a small nonrandomized clinical trial in hospitalized geriatric oncology patients. In their study, they found that OMT significantly reduced pain over a 4-week period compared with baseline, although improvements in quality of life were not statistically significant.[7] While not performed in hospice settings, the study demonstrates that OMT can safely reduce pain in medically frail older adults with advanced cancer, which is an effect that may be relevant to symptom-management needs in hospice populations. Ngo et al published a narrative review summarizing OMT's potential to improve quality of life for palliative and end-of-life patients.[8] They highlight gentle techniques such as myofascial release, cranial manipulation, and lymphatic drainage as potential adjuncts for managing pain, dyspnea, gastrointestinal symptoms, fatigue, and emotional distress. The review emphasized that existing studies, primarily small randomized control studies and observational work conducted in palliative care units and oncology rehabilitation, suggest short-term improvements in comfort and reduced analgesic use.[8] However, the evidence remains limited. They suggest including osteopathic physicians in hospice and palliative care teams to foster a more integrative approach toward patient care. Importantly, the authors noted a complete absence of hospice-specific clinical research, underscoring the need for dedicated studies in hospice populations. Leleszi and Lewandowski describe the concept of "total pain" at the end of life, integrating physical, emotional, interpersonal, and existential suffering, and argue that good pain management must address all four domains.[9] They outline standard pharmacologic strategies and then situate osteopathic principles and OMT as complementary tools that can relieve somatic pain, support bowel function, and use therapeutic touch to reduce fear and isolation.[9] Although the article is conceptual rather than data-driven, it provides a theoretical framework for how OMT can be integrated into comprehensive end-of-life pain management. Mason et al surveyed 100 osteopathic physicians after an American Osteopathic Association end-of-life care workshop and found that the majority believed osteopathic principles improved their ability to care for terminally ill patients.[10] Although many respondents endorsed the value of OMT philosophically, fewer than half reported using OMT frequently in end-of-life care, and the study did not include hospice patients or clinical outcome data. Zal, in a textbook chapter on the osteopathic family physician's role at the end of life, reinforced the alignment between osteopathic principles and hospice goals, highlighting opportunities to address both physical and emotional dimensions of suffering.[11] Zal explains that the foremost goal is to support patients in living fully until the end of life, and that the physician's role is to make this possible with OMT.

While these studies were excluded from the primary hospice analysis, they collectively demonstrate consistent trends of symptom improvement, feasibility, and safety in populations with advanced illness. Their findings suggest that principles observed in palliative-care settings may be transferable to hospice practice and underscore the need for hospice-specific research evaluating OMT outcomes.

Category C: Theoretical and Educational Literature

Category C includes nonosteopathic publications that provide essential background on hospice care, symptom management, communication barriers, caregiver

experiences, and end-of-life decision making. Although these studies do not involve OMT or osteopathic medicine, they help define the clinical and emotional landscape in which OMT might be integrated. By outlining common challenges such as unmet symptom needs, delayed goals-of-care discussions, and fragmented hospice transitions, these articles offer context for understanding why gentle comfort-focused interventions, such as OMT, could be valuable in hospice settings even though direct evidence is lacking. Five publications qualified for this category.

Gugliucci, Malhotra, and Gaul described a hospice home-immersion project at their osteopathic medical school that allows osteopathic medical students to live and learn in their local inpatient hospice facility for 48 hours.[12] This experience served as an incredibly unique medical learning model that deepened students' understanding of hospice and reinforced presence and holistic care. Although OMT was not performed on these hospice patients, this model represents a high-yield educational platform for future hospice-specific OMT training. In an educational piece on end-of-life care, Albert comments that all physicians across their specialties should have competency in basic palliative care.[13] He emphasizes that quality palliative care is achieved through communication skills, interprofessional collaboration, and symptom management.[13] Albert further underscores symptom relief as a central priority for patients nearing the end of life. Zeng et al examined the effects of using complementary or alternative approaches in the care of hospice and palliative care patients through reviewing literature.[14] The symptoms evaluated included anxiety, pain, dyspnea, fatigue, nausea, and vomiting. Although the interventions used, such as acupressure, massage, meditation, and reflexology, differ in theory from OMT, the study of their application in this review provides useful insight and may help inform future research in alternative therapies in hospice care. In a recent case report of an older adult with advanced heart failure, Ansari et al illustrated how caregiver burden, cultural beliefs, and misconceptions about hospice can delay appropriate end-of-life care.[15] The article emphasized the importance of early palliative involvement, coordinated communication among clinicians, and aligning treatment with patient values. These concepts are the very principles that closely mirror the holistic approach central to osteopathic philosophy. Although their article is not focused on OMT, it provides relevant system-level context for understanding barriers to comfort-focused care in hospice settings. Mack et al conducted a qualitative study of bereaved caregivers of adolescents and young adults with cancer. Their study identified major barriers to optimal end-of-life care, including delayed or unclear prognosis communication, emotional distress, and limited hospice care options.[16] Caregivers consistently emphasized that comfort, emotional support, and alignment with patient values mattered more than the specific care model used, yet these goals were often unmet. This study provides important contextual insight into systemic and communication challenges that similarly affect hospice populations and underscore the need for holistic patient-centered approaches.

Collectively, this theoretical, educational, and implementation-based literature demonstrates that the primary obstacle to wider OMT adoption in hospice is not conceptual alignment but logistical feasibility. Expanding hospice-specific OMT training, establishing brief interprofessional workshops, and embedding communication protocols that normalize discussions of manual therapy within hospice teams could meaningfully enhance patient comfort and strengthen collaboration among clinicians.

OVERVIEW OF OMT TECHNIQUES RELEVANT TO HOSPICE CARE

OMT encompasses a range of hands-on techniques designed to optimize physiologic function and alleviate somatic dysfunction. In hospice care, these interventions must be adapted for safety, gentleness, and patient tolerance. The following techniques are among the most commonly discussed for potential use in end-of-life settings due to their gentle modifiable nature:

Rib Raising: Gentle mobilization of the thoracic soft tissues to improve rib cage compliance, enhance lymphatic drainage, and reduce sympathetic overactivity.[17,18]

Myofascial Release (MFR): Application of sustained pressure or stretch to relax fascial restrictions, decrease muscular tension, and promote comfort in patients confined to bed.[18,19]

Diaphragm Doming: A low-intensity technique supporting diaphragmatic motion, aiding respiration and lymphatic flow, particularly in patients with dyspnea or anxiety.[20]

Balanced Ligamentous Tension (BLT): A subtle indirect method ideal for frail or cachectic patients, allowing gentle repositioning of tissues toward a state of ease.[21]

Suboccipital Release: Focused decompression at the cranial base to relieve tension, reduce headaches, and modulate autonomic tone.[2,22]

Compression of the Fourth Ventricle (CV4): A cranial technique associated with parasympathetic activation and improved relaxation, sometimes used to reduce anxiety and promote sleep.[2,23]

Lymphatic Pump Techniques: Carefully modified rhythmic maneuvers to encourage lymphatic circulation and reduce congestion when tolerated.[17]

These modalities share the unifying goal of restoring physiologic balance, reducing sympathetic dominance, and relieving discomfort through gentle nonpharmacologic means. When appropriately applied within hospice care, they align with the osteopathic commitment to promoting comfort, dignity, and quality of life at the end of life.

STRATEGIES

Barriers to OMT use in hospice include workforce limitations and challenges with training and routine clinical integration. Despite these challenges, integration is feasible through low-intensity high-yield approaches that align with the realities of hospice care. Gentle methods such as rib raising, suboccipital release, BLT, diaphragm doming, and CV4 can be performed safely at the bedside within minutes.[3] These techniques require minimal patient movement and are suited to reduce pain, anxiety, and dyspnea while enhancing relaxation and physiologic comfort.[5]

Embed OMT Within Daily Workflow

Integrating OMT into existing hospice routines normalizes its use and reinforces that it is not a separate procedure, but an extension of patient-centered care. For example, suboccipital release may be performed while discussing goals of care, rib raising during respiratory assessments, or MFR after repositioning or wound checks. Framing OMT as part of routine care may lower the perceived time burden and normalize its use within the hospice team.

Strengthen Team Communication and Documentation

Clear communication and documentation help interdisciplinary teams understand the purpose, expected outcomes, and safety of OMT. Charting in accessible language, for example, "gentle manual therapy for comfort," allows nonosteopathic staff to recognize its role within the care plan. Brief in-services or bedside demonstrations for nurses, aides, and chaplains can build trust, foster collaboration, and clarify shared goals for comfort and dignity.

Maintain Patient-Centered Consent and Comfort

Every OMT encounter in hospice must align with the patient's expressed goals of care. Clinicians should clearly communicate the intent—relief of dyspnea, anxiety, or pain—and continuously assess tolerance. Techniques should be stopped or adapted immediately if distress, fatigue, or emotional discomfort arises. Family education further reinforces transparency and ensures that OMT is understood as a gentle comfort-focused intervention.

CURRICULAR INTEGRATION AND FUTURE DIRECTIONS

Despite osteopathic medicine's emphasis on whole-person care, end-of-life and hospice populations remain underrepresented in formal osteopathic medical education. While most curricula include training tailored to pregnant, pediatric, and geriatric patients, few emphasize adapting OMT for terminally ill individuals. This limits preparedness and confidence in applying manual medicine in hospice settings.

Incorporating hospice-specific OMT education into both predoctoral and postgraduate curricula could better equip osteopathic family physicians to deliver compassionate nonpharmacologic care at the end of life. Educational initiatives might include:

- Didactic sessions on the pathophysiology of dyspnea, anxiety, and pain in terminal illness.
- Workshops demonstrating modified gentle techniques such as suboccipital release, BLT, and CV4.
- Simulated hospice scenarios that emphasize communication, empathy, and interprofessional collaboration.[11]

Early integration of these concepts into osteopathic curricula may reduce barriers such as time constraints, limited exposure, and institutional unfamiliarity. Preparing students early increases the likelihood they will apply OMT later in practice, particularly in community and home-hospice environments where osteopathic family physicians often lead interdisciplinary care.

CONCLUSION

In this review, no hospice-enrolled patient studies evaluating OMT were identified. The absence of robust clinical trials or implementation data should not be interpreted as evidence that OMT is not currently being used in hospice settings. Rather, this gap reflects a lack of systematic evaluation and reporting, which limits the ability to access prevalence, outcomes, and best practices. Therefore, the available literature relevant to hospice practice is largely educational and conceptual. Across these sources, gentle techniques such as MFR, rib raising, and BLT, are presented as safe and consistent with hospice goals of comfort and symptom relief. The existing evidence, though limited and indirect, suggests that OMT may serve as a valuable nonpharmacologic adjunct to conventional hospice interventions, with potential benefits including relaxation, easing pain and dyspnea, and enhancing quality of life at the end of life.

This review highlights a consistent theme of limited integration rather than demonstrated ineffectiveness. OMT remains infrequently incorporated into hospice care

models described in the literature, likely influenced by factors such as time constraints, limited provider training, and lack of interdisciplinary familiarity. Addressing these barriers through targeted education, improved communication within hospice teams, and institutional support for gentle bedside-appropriate techniques could meaningfully expand the scope of comfort-focused care.

As hospice utilization continues to rise, osteopathic family physicians are uniquely positioned to bridge this gap. Thoughtful integration of OMT into hospice practice has the potential to advance holistic evidence-informed symptom management. Doing so would embody the osteopathic commitment to treating the whole person, body, mind, and spirit, while preserving comfort and dignity in life's final chapter.

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REVIEW ARTICLE

Community Exercise Programs Promote Psychosocial and Physical Well-Being in Patients With Parkinson's Disease: A Guide for Osteopathic Clinicians

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ABSTRACT

Exercise in patients with Parkinson's disease (PD) helps improve motor symptoms, builds better habits such as healthier eating and medication compliance, helps alleviate comorbid conditions such as diabetes mellitus, hypertension, and heart disease, and delays disease progression. Total body exercise offered through community group exercise programs improves not only patients' physical function, but also their overall quality of life through interactions with others in social settings, which is often overlooked in traditional treatment models. Herein we describe several popular community-based programs that engage patients with PD both physically and socially and are available in many locations throughout the United States and internationally, and we provide information for connecting with them.

Modern dance, tango, ballet, boxing, tai chi, yoga, and aquatic therapy have been tailored for patients with PD at all levels of illness severity. They are diverse and appeal to patients with different exercise preferences. These programs not only provide total body exercise requiring focus on motor coordination, but they also address patients' cognitive, emotional, and social needs. PD patients who exercise in groups report greater symptomatic improvement, wider social networks, and a greater chance of continuing exercise compared to patients who exercise alone.

In addition to standard therapies, osteopathic clinicians can help educate patients about the benefits of holistic physical exercise and the importance of maintaining social contacts. A community-centered approach to PD treatment strongly supports patients' psychological, as well as their physical, well-being.

INTRODUCTION

Parkinson's disease (PD) is a progressive neurodegenerative disease in which motor symptoms are prominent, including tremors, rigidity, bradykinesia, stooped posture, shuffling gait, and restricted facial expression. Because of the panoply and progressive severity of symptoms, PD can profoundly affect patients' psychological and social well-being, as well as their physical function−people with PD are at risk of depression, disability, cognitive impairment, and social isolation.[1-3]

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In addition to OMT,[4,5] maintenance of physical mobility and social well-being is increasingly being offered through holistic programs that reflect real-world activities. Some are international in scope. Herein we describe several of these programs and provide information on how to engage with them. Increased awareness of these programs by the osteopathic medical community should promote their use by patients with PD and their caregivers, helping to maintain patients' physical health and reducing their isolation and loneliness. Brief introductions to several of the programs are followed by a Table providing "How to Get Involved" internet URLs.

METHODS

We selected several different community-based exercise programs that are active both within and outside the United States that have been sufficiently well-established

to be represented in the medical literature. We did not perform a scoping review; rather, we selected programs that are available in many communities and will be useful to practitioners treating persons with PD.

RESULTS

General Exercise

Aerobic exercises (cardiovascular exercise–"cardio") can help delay the progression of both cognitive and motor symptoms in PD.[2,6-7] Routine exercise helps patients build better habits, such as healthier eating and medication compliance, and has benefits for comorbid conditions including diabetes mellitus, hypertension, and heart disease.[8] A significantly greater percentage of patients who exercised in groups rather than individually reported symptomatic improvement, a greater chance of continuing exercise, and widening social networks.[2]

Dance Programs

For several decades, dance has been used as therapy for PD.[9] Dance is simple and safe and can be used at all stages of rehabilitation to improve mobility, balance, and strength; to decrease isolation; and to improve overall quality of life.[10-13]

DANCE FOR PARKINSON'S DISEASE

Background

In 2001, the Mark Morris Dance Group of Brooklyn, NY, in partnership with the Brooklyn Parkinson Group, began a dance class for patients with PD.[14] Led by professional dancers, the classes offer an opportunity for individuals to build confidence, strength, and flexibility and to express their creativity. As in typical modern dance, the instructors use imaginative phrases, such as "move your arms like a swan," fostering interpretation and creative expression.[15] Accommodation is made for degree of physical disability; some classes are conducted with participants seated in chairs.

Dance for PD is international, with programs in more than 300 communities across 28 countries. David Leventhal, a professional dancer, has led Dance for PD since its inception. Both in-person and interactive online classes are offered, and training and certification programs are available for patients and their caregivers.

BENEFITS

Dance can be used as a therapy for varying presentations of PD. Music-based dance interventions have multimodal benefits in mood, alertness, and quality of life.[16] Psychological benefits include an improved sense of achievement, control, and self-efficacy, and social benefits include a sense of camaraderie and connection. Group classes benefit participants' social well-being and help them motivate each other to improve their dance techniques.[17]

TANGO FOR PARKINSON'S DISEASE

Background

Tango differs from Dance for PD in that it is stylized, rather than free-form, and requires physical closeness and embrace. Tango also improves activities of daily living, sleep, and confidence in patients with PD.[18] Tango can be practiced in groups and at home; group classes are offered in many countries.

Benefits

While tango requires precise steps, movements, and stance, it is considered safe because it can be performed at a pace comfortable for the individual.[19] Tango engages multiple muscle groups, comparable to running or squatting. Compared to waltz and foxtrot, Argentine tango was found to be most effective for patients with PD, with improvement possibly owing to learned techniques to combat freezing of gait, a common PD symptom.[20] Tango also improves nonmotor symptoms by reducing fatigue, enhancing quality of life, and encouraging participation.[21]

BALLET FOR PARKINSON'S DISEASE

Background

There are group classes internationally offering ballet for patients with PD. The early program, commissioned by the English National Ballet, focused on educating participants about ballet, teaching fundamental exercises, and encouraging participants to build social connections, share personal experiences, and build self-confidence during "tea and biscuit" social time.[22] Ballet can be performed either in the seated position or standing at the ballet barre, thus accommodating persons of all mobility levels. Using the ballet barre in front of a mirror helps students focus on body alignment and breathing techniques.

Benefits

Ballet, requiring both strength and flexibility, can assist with gait, balance, and mobility, and reduce fall risk, a major concern in patients with gait instability.22 Lower-limb strength is improved through the movements of knee flexion and plantar flexion, improving mobility and reducing the risk of falls.[23] As with other forms of dance, group ballet classes foster social cohesion and emotional connections with fellow participants.

Rock Steady Boxing

BACKGROUND

Rock Steady Boxing was founded in 2006 by Scott Newman after he was diagnosed with PD, in partnership with boxer Vince Perez. The organization has expanded across 14 countries and has inspired many local programs.[24]

BENEFITS

Using noncontact boxing, Rock Steady Boxing highlights the advantages of routine stretching, resistance training, and aerobic and footwork exercises in a group setting for patients with PD. It improves both balance and motor function and requires participants to practice cognitive themes of coordination and memory by practicing punch combinations and defensive maneuvers.[25] Qualitative evaluation of 10 participants found that instructor enthusiasm, program modifiability, and social support were themes that challenged participants and encouraged program adherence.[26] Participants who were currently boxing were found to have better Parkinson's Disease Questionnaire-39 and Self-Efficacy for Exercise Scale scores compared to nonparticipants.[27]

Tai Chi and Yoga

BACKGROUND

The Chinese martial art of tai chi is a gentle form of exercise that uses deep breathing and relaxation techniques through slow flowing movements.

BENEFITS

In patients with PD, implementing tai chi improves flexibility, lower-limb strength, agility, and cardiovascular endurance. Modeled on the Tai Chi for Arthritis Program for symptomatic pain relief through gentle and rhythmic movements, tai chi can reduce anxiety and improve overall well-being in patients with PD.[28] Exercises include resistance training and stretching through wearing weighted vests and ankle weights while practicing diaphragmatic breathing.[29]

Similar to tai chi, yoga improves flexibility, strengthens leg muscles, and provides balance training to reduce risk of falls.[30] For persons with advanced PD, chair yoga is an excellent method for improving physical health and body awareness.

Aquatics

BACKGROUND

Aquatic therapy offers patients with PD the opportunity to exercise in hydrotherapy pools at all stages of the disease. Ai Chi is a water exercise that combines tai chi and qigong, during which participants implement breathing techniques and slow movements in shoulder-level water.

BENEFITS

Aquatic therapy is a full-body exercise in a heated pool. Owing to increased temperature and water buoyancy, aquatic therapy can help relieve muscle fatigue and discomfort.[31] Patients with early-stage PD had notable improvements in limb bradykinesia and joint rigidity.[32] Most patients who participated in a 6-week aquatic therapy study reported improvement in their gait and planned to continue classes after the study concluded.[33] Aerobic water exercises, including walking and dancing, also may improve cardiovascular health.[34] International consensus-based guidelines for aquatic therapy in PD have recently been developed.[35]

Following is a Table listing internet URLs for the programs reviewed above, as well as additional community programs for PD.

TABLE 1: How to Get Involved.

Dance for Parkinson's Disease

- Dance for PD: https://danceforparkinsons.org/support-us/join-as-a-member/
- Dance for PD at Home: https://danceforparkinsons.org/take-a-class/dance-at-home/
- Become a Trainer for Dance for PD: https://danceforparkinsons.org/train-with-us/start-training/
- Parkinson's Australia- Dance for Parkinson's: https://www.parkinsons.org.au/information-hub/exercise/dance-for-parkinsons/
- Dancing With Parkinson's Canada: https://www.dancingwithparkinsons.com/

Tango for Parkinson's Disease

- Stanford Medicine Tango for Parkinson's Disease: https://stanfordhealthcare.org/events/tango-for-pd-in-person.html
- Tango Therapy Project With Dr. Madeleine Hackney: https://www.tangotherapyproject.org/adapted-tango-for-people-with-parkinsons
- Parkinson's UK- Let's Tango for Parkinson's: https://localsupport.parkinsons.org.uk/activity/lets-tango-parkinsons?/
- Easy Tango (Martínez, Argentina)-Tango and Parkinson course: https://www.educations.com/institutions/easy-tango/tango-and-parkinson-course?

Ballet for Parkinson's Disease

- San Francisco Ballet: https://www.sfballet.org/school-community/adult-programs/parkinsons/
- Berkeley Ballet Theater: https://www.berkeleyballet.org/danceforpd
- American Repertory Ballet-Princeton Ballet School: https://arballet.org/access-enrichment/programs-2/dance-parkinsons-program/
- Canada's National Ballet School-Sharing Dance Parkinson's: https://www.nbs-enb.ca/dance-for-life/sharing-dance-parkinson-s/
- Scottish Ballet-Dance for Parkinson's Scotland: https://scottishballet.co.uk/move-with-us/dance-classes/dance-for-parkinsons/

Boxing

- Rock Steady Boxing: https://rocksteadyboxing.org/find-a-location/
- Counterpunch Parkinson's (New Zealand): http://www.counterpunchparkinsons.com/

TABLE 1: How to Get Involved. cont.

Tai Chi and Yoga

- Yoga for Parkinson's: https://www.yogaforparkinsons.com/
- Leen Bodies: https://www.leenbodies.com/about-kathleen
- Tai Chi for Parkinson's With Jane Arsham: https://www.apdaparkinson.org/events/virtual-tai-chi-for-parkinsons-with-jane-arsham/
- Tai Chi for Parkinson's Class: https://www.hoag.org/specialties-services/neurosciences/programs/movement-disorders-parkinsons/
- Parkinson's Disease and Taoist Tai Chi™ Arts: https://www.taoisttaichi.org/parkinsons-disease/

Aquatics

- American Parkinson's disease Association: https://www.apdaparkinson.org/uploads/files/Aquatic-Book_8-08---edited-2015-oUM.pdf
- Aquatic Therapy for Parkinson's and MS-Hurstville Aquatic (Australia): https://hurstvilleaquatic.com.au/aquatic-therapy-for-parkinsons-and-ms-supporting-neurological-wellness-with-gentle-exercises/
- Swim England: https://video.swimming.org/health-and-wellbeing/videos/international-aquatic-therapy-guidelines-for-parkinson-s-disease

Additional Exercise Therapies

- Bedford Group Boccia: https://localsupport.parkinsons.org.uk/activity/bedford-group-boccia-0
- Cycling for Parkinson's: https://cyclingforparkinsons.com/
- DopaBeats Drumming Classes: https://www.dopabeats.org/classes.html#/
- PingPongParkinson: https://www.pingpongparkinson.org/
- Singing With Parkinson's: https://www.parkinson.org/living-with-parkinsons/stories/singing-with-parkinsons

CONCLUSION

Herein we present several community group exercise programs shown to be both physically and psychologically therapeutic for patients with PD. Advantages of group exercise programs are that they are tailored for most PD severity levels, they are based on real-world activities (dance, boxing, etc), and they sustain and improve both physical mobility and social well-being. They are sufficiently diverse to appeal to patients with different exercise preferences. The programs have classes in many locations throughout the United States, and some are international as well. We urge osteopathic clinicians who treat patients with PD to explore these programs and recommend them to their patients as appropriate.

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REVIEW ARTICLE

Prostate Health: Screening and Management

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Benign prostatic hyperplasia

5-alpha reductase inhibitors

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UroLift

ABSTRACT

Prostate health is a critical concern for aging men, given the high prevalence of conditions such as prostate cancer and benign prostatic hyperplasia (BPH). Prostate cancer remains the most commonly diagnosed malignancy among American men, with significant morbidity and mortality rates. Concurrently, BPH affects a substantial portion of the male population, leading to lower urinary tract symptoms that can severely impact quality of life. This review aims to provide a comprehensive overview of current guidelines and practices in prostate health, focusing on early detection, appropriate screening, and effective management strategies.

INTRODUCTION

As men age, prostate health becomes increasingly important due to the high prevalence of prostate-related conditions such as cancer and benign prostatic hyperplasia (BPH). Prostate cancer is the most commonly diagnosed malignancy in American men, with an estimated 288,300 new cases and 34,700 deaths expected in the United States in 2023.[1] BPH is the enlargement of the prostate gland, which, as male patients age, leads to lower urinary tract symptoms such as frequency (needing to urinate often), urgency (a sudden need to urinate), nocturia (waking up at night to urinate), and weak urine stream. These symptoms can significantly impact the quality of life for affected men.

This represents a public health concern due to the high prevalence and potential complications that prostate-related conditions can impose on individuals. Prostate cancer poses a burden with potential for morbidity and mortality. Early detection and appropriate treatment are vital to mitigate these impacts.

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The goal of this review is to discuss current guidelines for prostate cancer screening, the role of prostate-specific antigen (PSA) testing and digital rectal exam (DRE), as well as the management of common urologic issues like BPH. The American Urological Association (AUA) recommends PSA-based screening in conjunction with shared decision-making (SDM) to weigh the risks and benefits of screening.[2] The American Cancer Society (ACS) also emphasizes the importance of SDM for men between the ages of 55 to 69 years, recommending against routine screening for men over 70 years.[3]

The AUA, in its latest guideline, emphasizes the use of PSA levels to guide screening intervals and the need for confirmatory testing before proceeding with further evaluation.[2] This aligns with the ACS recommendation for PSA testing in men at higher risk, such as those with a family history of prostate cancer or African American men.[3] For management of BPH, many treatment options are available, including lifestyle modifications, pharmacotherapy, and surgical interventions.

METHODS

This review is formulated from current evidence from major clinical guidelines and peer-reviewed literature. The primary source is from the guideline provided by the AUA, ACS, and US Preventive Services Task Force (USPSTF). Literature was identified through various publication platforms such as *Journal of Urology*, American Family

Physician, and Annals of Internal Medicine searches focusing on prostate cancer screening, PSA testing, DRE, BPH management, and emerging biomarkers. Priority was given to systematic reviews, meta-analyses, and recent clinical trials, while studies and established guidelines were included regardless of publication date when they represent current standard of care.

Note: While some references in this review predate 5 years, they represent established consensus guidelines and landmark studies that continue to inform current practice. Where available, more recent evidence has been incorporated to reflect contemporary approaches.

PROSTATE CANCER SCREENING: IMPORTANCE

Prostate cancer detection in early stages through screening allows for a higher percentage of successful treatments. In the United States, this type of cancer represents approximately 15.4% of all newly diagnosed cancer cases and accounts for 5.8% of cancer-related fatalities.[1] The likelihood of developing prostate cancer rises with age, and major risk factors include advancing years, a family history of the disease, and African American ancestry.[4] Studies suggest that screening men between 55 and 69 years old can lower mortality rates associated with prostate cancer.[1]

SCREENING GUIDELINES AND EXPERT RECOMMENDATIONS

The AUA advises PSA-based screening in men aged 55 to 69 years and prioritizes SDM, ensuring individuals understand both the advantages and drawbacks of screening.[2] Likewise, the ACS endorses SDM and suggests initiating screening at age 50 years for those at average risk, with earlier consideration for individuals facing greater risk.[3] The USPSTF advises that men within the 55 to 69 years age bracket should make screening decisions on an individual basis after evaluating both potential benefits and risks.[5] Table 1 shows the overlapping recommendations for prostate cancer screening among the three organizations.

TABLE 1: Prostate cancer screening guidelines by major organizations.

Organization	Age Range (Years)	Key Recommendations
AUA	55-69	PSA-based screening with SDM; individualized approach based on risk factors
ACS	≥50 (average risk), ≥45 (high risk)	SDM; earlier screening for African American men and those with family history
USPSTF	55-69	Individual decision making after discussion of benefits and harms; Grade C recommendation

Who Should Get Screened?

Average Risk: Screening is generally recommended for men between 55 and 69 years old.[2,3]

Higher Risk: Family history of prostate cancer or African American ancestry are higher risk factors; these individuals are urged to start screening as early as 40 to 45 years old.[3]

Risk Assessment Tools: Validated risk calculators can help guide screening decisions

- Rotterdam Prostate Cancer Risk Calculator
- UCSF-CAPRA Score for Prostate Cancer Risk
- D'Amico Risk Classification for Prostate Cancer

Patient-Centered Care and SDM

The conversation about screening should occur between the patient and healthcare professional. It is important to discuss the risks and benefits to ensure that the patient's health goals are considered.

UNDERSTANDING PSA TESTING

PSA is a test that measures PSA level in the blood, which may rise in men with prostate cancer. A normal PSA level is ≤4 ng/mL, though age-adjusted reference ranges are increasingly used (≤2.5 ng/mL for men aged 40 to 49 years, ≤3.5 ng/mL for men aged 50 to 59 years, ≤4.5 ng/mL for men aged 60 to 69 years, and ≤6.5 ng/mL for men aged 70 to 79 years).

PSA Collection

PSA collection requires a simple blood draw, ideally performed before DRE. Factors that can affect PSA accuracy include recent ejaculation, vigorous exercise, prostate manipulation, urinary tract infections, and certain medications (5α-reductase inhibitors can reduce PSA by approximately 50%).

While there is a correlation between PSA levels and cancer risk, the test has limitations. False positives occur in 12% to 15% of cases and overdiagnosis remains a concern, often leading to unnecessary follow-up procedures or treatments.[4] Overdiagnosis refers to the detection of cancers that would never have caused symptoms or death during a patient's lifetime, potentially leading to unnecessary anxiety, biopsies, and treatments with associated adverse effects. Given the variability in PSA test accuracy, abnormal results frequently require further diagnostic evaluations.[2]

Advantages: Can detect prostate cancer in its early stages, potentially reducing mortality rates.[1]

Disadvantages: High chance of false positives, potential for overdiagnosis, risk of unnecessary treatment and anxiety/stress.[1]

DRE: A SUPPORTING BUT LIMITED TOOL

DRE is an examination in which the physician manually checks the prostate gland through the rectum. The efficacy of DRE varies significantly with physician experience, with sensitivity ranging from 15% to 40% and specificity from 85% to 95% for detecting prostate cancer. Studies show that experienced urologists achieve higher detection rates than primary care physicians, though variability remains substantial.

While it can be used alongside the PSA test, current evidence suggests limited effectiveness as a standalone screening test.[5] The positive predictive value of DRE alone is approximately 6% to 25%, depending on the population studied. Although using DRE and PSA together may offer marginally increased detection, DRE as a tool for routine screening is not strongly recommended by current guidelines.[3]

KEY CHALLENGES IN PROSTATE CANCER SCREENING

One of the biggest challenges in prostate cancer screening is finding the right balance between early detection and potential downsides, such as overdiagnosis and overtreatment. Additionally, anxiety associated with screening results and the complexity of making informed choices add to the difficulty of implementing an effective screening strategy.[3]

Recent Advances and Research

According to the USPSTF—a group of healthcare experts who make recommendations for preventative care—men around age 40 years with average risk should participate in prostate health screening tests to trend their PSA levels.[5] Current evidence suggests that by trending these data, prostate cancer staging and disease progression may be identified.[6] PSA level screening tests have been shown to decrease deaths related to metastatic prostate cancer and other prostate diseases.[5] However, ongoing debates exist regarding the validity of using PSA levels for prostate cancer detection. One study found that screening PSA levels leads to only a slight reduction in disease-specific mortality over a 10-year screening period; however, it does not affect overall mortality.[7] As a result, there is ongoing development of other screening techniques, such as using urinary markers or 5α-reductase inhibitors. Alongside this debate is another that argues increased screening may lead to increased false positives and excessive biopsies or imaging procedures, leading to overdiagnosis and overtreatment. The main argument within this debate is that the decrease in mortality related to prostate-specific diseases is more likely due to treatment advances than screening advancements.[7]

The United States Food and Drug Administration (FDA) has recognized several biomarkers for prostate cancer diagnosis. The purpose of these biomarkers is to detect the presence of various factors produced by tumors and to measure specific disease processes. One common biomarker, PSA, is traditionally used first-line for the detection of prostate cancer.[8] While PSA is the most common, other biomarkers have been recently approved by the FDA. These two markers include ProPSA as part of the Prostate Health Index (PHI) and Prostate Cancer Antigen 3 (PCA3). Some examples include Prostate Health Index (PHI), Prostate Cancer Antigen 3 (PCA3), and ProPSA. The PHI is a mathematical formula that includes three separate biomarkers: PCA3, total PSA, and percent PSA 2. The measurements from these biomarkers aid in creating more patient-specific management recommendations. ProPSA has aided in indicating early disease process and tumor aggression.[8] Patients with suspected prostate cancer, due to PSA level or DRE, can benefit from the prostate-specific gene known as *PCA3*, due to its ability to be easily detected in post-DRE urine samples. These biomarkers, along with others undergoing FDA approval, show promising results for more advanced prostate cancer detection.

Furthermore, biomarker measurements, specifically PSA measurements, can result in false positives. These false positives pose an issue when attempting to diagnose prostate cancer; however, using medical imaging, the impact of these false positives can be reduced.[9] More specifically, magnetic resonance imaging (MRI) has proven effective in detecting, staging, and characterizing prostate cancer. This information can then be used to aid in determining treatment and management.[9] Additionally, prebiopsy multiparametric MRIs (mpMRIs) have proven useful in detecting and grading prostate cancer while also providing key information necessary for biopsy.[10] mpMRIs have a high negative predictive value, which increases the detection of prostate cancer and decreases the number of unnecessary prostate biopsies.[10]

Currently, high-risk patients with prostate cancer have limited treatment options, primarily using medications such as 5α-reductase inhibitors.[6] However, newer options, such as immunotherapy and gene therapy, are being studied as potential treatment options. Historically, prostate cancer has been considered immunologically "cold," meaning that it had a low immunologic response.[11] However, newly FDA-approved immunotherapies have become part of the standard of care for prostate cancer after showing promising results in patients with aggressive cancers.

Using these immunotherapies, cancer cells can be targeted and ultimately destroyed, utilizing the body's own immune response. This treatment option has shown promise by increasing survival rates and producing deep and long-term remission in patients with metastatic prostate cancer who previously had limited treatment options.[11] One of the first FDA-approved immune checkpoint inhibitors was ipilimumab, which showed approximately two to three times higher survival benefit after 3 years.[11] When ipilimumab was combined with nivolumab, studies showed a 15% increase in survival rates.[11] Immunotherapies are beginning to show promising results in prostate cancer treatment, allowing a few to become standard of care. However, many immunotherapies are still undergoing research, which could bring new therapeutic approaches for advanced prostate cancer.

Additionally, gene therapy is another emerging treatment that aims to effectively alter or express a specific gene in tumor cells while limiting additional harm to healthy cells.[12] There are many mechanisms by which gene therapy attempts to alter cancer cells, including programmed cell death (apoptosis), altering enzymes to generate harmful compounds, or directly suppressing tumor genes. Recently authorized medications, such as rucaparib and olaparib, have shown efficacy in the treatment of prostate cancer by slowing disease progression, decreasing pain, and potentially extending the lives of prostate cancer patients receiving these treatments.[12] While these new treatment modalities show positive outcomes, the most effective treatments are combination therapies. These therapies combine immunotherapy, chemotherapy, radiation therapy, and/or hormone therapy and have proven to be more effective than single standalone treatments.[12]

BENIGN PROSTATIC HYPERPLASIA (BPH)

BPH is a prevalent nonmalignant enlargement of the prostate gland that predominantly affects aging men, with incidence rates exceeding 50% by age 60 years and reaching up to 90% by age 85 years.[14,15] BPH arises from the hyperplasia of stromal and epithelial cells, particularly within the transitional zone, driven by hormonal imbalances especially in androgen and estrogen signaling, chronic inflammation, and growth factor pathways.[13-15] Clinically, BPH presents as lower urinary tract symptoms (LUTS), which include obstructive symptoms such as hesitancy and a weak stream, as well as irritative symptoms like frequency, urgency, and nocturia.[13] These symptoms profoundly disrupt quality of life by impairing sleep, increasing anxiety, and limiting daily function and mobility.

Diagnosis of BPH

Diagnosis of BPH begins with a detailed clinical assessment, including patient history and the use of validated symptom questionnaires such as the International Prostate Symptom Score (IPSS), which evaluates the severity of LUTS and their impact on quality of life.[16,17] Physical examination through DRE provides a general assessment of prostate size and consistency, though its accuracy in determining prostate volume is limited.[17]

Imaging and laboratory evaluations complement clinical assessment: uroflowmetry measures urine flow rate, with a Qmax (highest rate the urine flows) less than 10 mL/s indicating possible obstruction; postvoid residual (PVR) volume assessed by ultrasound helps detect incomplete bladder emptying; and PSA levels aid in excluding malignancy and predicting disease progression.[16-19] These combined diagnostic tools offer a comprehensive framework for evaluating BPH, guiding individualized treatment strategies, and monitoring response to therapy in accordance with guidelines from the AUA.[19]

Conservative Management

Conservative management is a foundational approach in the treatment of BPH, particularly for men with mild symptoms. Lifestyle modifications such as reducing fluid intake before bedtime, limiting caffeine and alcohol, maintaining a healthy weight, and engaging in regular physical activity have been shown to significantly alleviate LUTS and improve quality of life.[20,21] Patient education on these changes is crucial, as they empower individuals to manage symptoms without immediate pharmacologic or surgical intervention.[22]

In cases where symptoms are not bothersome or progressive, watchful waiting, also referred to as active surveillance, is recommended. This strategy involves regular monitoring of symptoms and prostate health without initiating immediate treatment, offering a safe and effective option for men with stable mild LUTS.[23,24]

OMT Considerations

Osteopathic approaches to LUTS may include techniques targeting pelvic floor dysfunction, sacral and lumbar spine alignment, and autonomic nervous system balance. Specific osteopathic manipulative treatment techniques that may benefit patients with BPH-related symptoms include:

- Pelvic diaphragm release techniques.
- Sacral counterstrain and muscle energy techniques.
- Chapman reflex treatment for urogenital dysfunction.
- Balanced ligamentous tension approaches to the pelvis.

While evidence for OMT in BPH is limited, these approaches may provide adjunctive benefit as part of a comprehensive treatment plan, particularly for patients seeking nonpharmacologic interventions.

Pharmacologic Treatments

Pharmacologic treatment of BPH primarily targets symptom relief and disease progression. Alpha-blockers, such as tamsulosin, act by relaxing smooth muscle in the prostate and bladder neck to improve urine flow and alleviate LUTS; they are fast-acting and effective but may cause side effects like dizziness, hypotension, and ejaculatory dysfunction.[26,27]

In contrast, 5α-reductase inhibitors, such as finasteride and dutasteride, reduce prostate volume by inhibiting the conversion of testosterone to dihydrotestosterone and are particularly beneficial for men with enlarged prostates, though side effects may include decreased libido and erectile dysfunction.[27] Combination therapy with alpha-blockers and 5α-reductase inhibitors has shown superior symptom improvement and reduced risk of BPH progression compared to monotherapy.[28,29] Additionally, antimuscarinic agents may be used in patients with persistent irritative symptoms, such as urgency or frequency, especially when overactive bladder coexists with BPH.[26]

Minimally Invasive Procedures

Minimally invasive procedures for BPH provide a promising balance between efficacy and safety. Transurethral resection of the prostate (TURP) remains a gold standard, offering substantial symptom relief and improved urinary flow, though it carries risks such as bleeding, infection, and retrograde ejaculation.[29,30]

Laser therapies, like HoLEP and GreenLight, have emerged as effective alternatives, showing comparable outcomes to TURP but with reduced perioperative morbidity, including shorter catheterization time and less bleeding.[31,32] Newer approaches such as UroLift and prostatic artery embolization (PAE) also demonstrate efficacy, especially in preserving sexual function, making them appealing for younger or sexually active patients.[33,34]

Surgical Management

Surgical intervention is generally reserved for patients with severe or refractory symptoms, or those experiencing complications like recurrent urinary retention, bladder stones, or renal insufficiency.[34,35] Postoperative care is crucial, with enhanced recovery protocols such as early mobilization and optimized pain management leading to improved outcomes and shorter hospital stays.[37] Despite the small risk of complications, patients typically report significant symptom relief and better quality of life after surgery.[38] Understanding these therapeutic options reinforces the importance of individualized care based on symptom severity, prostate anatomy, and patient preference.

CONCLUSION

This review provides an extensive overview of current practices in prostate health, focusing on detection, screening, and the management of prostate-related conditions. Prostate cancer screening requires clinicians to balance the early detection benefits and the harm from overdiagnosis and overtreatment. SDM remains paramount, with validated risk assessment tools and emerging biomarkers enhancing our ability to personalize care.

For BPH management, the spectrum of available treatments from conservative approaches through surgical intervention allows for truly individualized care based on symptom severity, patient preferences, and anatomic considerations. The integration of osteopathic principles and emerging minimally invasive techniques further expands therapeutic options.

These issues not only impact individual health and quality of life but also present broader public health challenges. By prioritizing education, evidence-based screening protocols, and timely treatment, healthcare providers can help reduce the burden of prostate-related conditions and support healthier outcomes for men as they age. Future research continues to refine our understanding of optimal screening strategies and therapeutic approaches, promising even more personalized and effective care.

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REVIEW ARTICLE

End-of-Life Symptom Management for Family Physicians

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KEYWORDS

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ABSTRACT

For osteopathic family medicine physicians, caring for patients at the end of life (EOL) is embedded into the continuum of care we offer and necessitates a level of familiarity with providing sufficient symptom management. This article presents an overview of symptom management at EOL, with high-yield diagnosis and treatment approaches for the most common symptoms, including pain, dyspnea, nausea/vomiting, delirium/agitation/anxiety, constipation, and oropharyngeal secretions. Additionally, this will serve as a guide to enhance the osteopathic family physician's ability to deliver compassionate, high-quality end-of-life care, ensuring greater comfort and support for patients and their loved ones.

INTRODUCTION

Osteopathic family physicians are unique in that they often serve as continuity physicians throughout a patient's entire life. An important component of this longitudinal care includes end-of-life (EOL) management, focusing on comfort through symptom control, honoring the patient's dignity, and supporting the patient and their loved ones throughout the process. For the purposes of this article, EOL refers to the hours to days prior to death. Given that each EOL scenario is unique, care in this time requires flexibility, ingenuity, and a thorough appreciation for the etiology of symptoms. Physicians must frequently reassess a patient's comfort at EOL to ensure minimal suffering. This article, sourced from current studies, will present the most common EOL symptoms that arise, their etiology, and best-practice management.

PAIN

Pain is reported to be one of the most common symptoms at EOL.[1] Recognizing signs of pain and subsequently providing effective care are important in allowing for a patient to die without suffering. As patients get closer to EOL, their ability to communicate is often diminished, thus making it more difficult for them to report their symptoms. Management of pain at EOL includes evaluating a patient for nonverbal signs of discomfort, evaluating for the etiology of potential pain, and knowing how to appropriately dose pain medications, including opioids.

Types of Pain

Nociceptive pain is a result of damage to the soft tissues (somatic) and internal organs (visceral).[2] Somatic pain occurs from mechanical (pressure), thermal (hot or cold), or other stimulation that typically causes sharp localized pain such as burns, fractures, or wounds. Visceral pain occurs in the setting of inflammation, ischemia, or stretching of the organs or bones and may be harder to localize.[3]

Neuropathic pain is the result of an injury to peripheral or central nerves and may be described as electric or radiating in nature. Potential etiologies of neuropathic pain include peripheral neuropathies and injuries to nerve roots or plexuses.[3]

Lastly, the concept of "total pain," first introduced by Dame Cicely Saunders, is a way to acknowledge pain that is not always an isolated physical experience but can be a complex psychological and emotional experience as well. A patient's "total pain" impacts their perception and experience of an illness, which is why an interdisciplinary approach to pain is ideal.[4]

Evaluation

Evaluating a patient's pain involves inquiring about specific descriptors such as onset, precipitating and palliating factors, quality, region/radiation, severity, and timing.

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While numeric scales attempt to provide objective and standardized measures for pain, it is equally important to evaluate the impact of a patient's pain on their function. This may include asking a patient to relate the numerical severity of their pain to their functional ability, such as their comfort in reading a book, watching TV, and ambulating around the home.[5]

As patients become less communicative near EOL, clinicians must rely on other signs and symptoms of pain. Various tools have been developed to better evaluate pain nonverbally. One such tool is the Pain Assessment in Dementia (PAIN-AD) scale, originally developed to assess pain in patients with dementia. This tool is based on five behavioral indicators, each scored as 0, 1, or 2 out of 10 total points:

- Breathing (appearance of work of respirations).
- Negative vocalization (such as moaning).
- Facial expression (frowning, grimacing).
- Body language (rigid, tense).
- Consolability (distractibility by reassurance), see Supplemental 1.[6]

The Adult Non-Verbal Pain Scale (NVPS) is utilized to rate the appearance of face, movement, and level of guarding alongside physiologic signs of changes in systolic blood pressure, heart rate, and respiratory rate. Lastly, the Critical Care Pain Observation Tool (CPOT) assesses pain through observation of facial movement, body movements, and muscle tension.[6]

It is prudent to anticipate potential sources of pain for the patient at EOL. Consideration of pain level prior to the active dying process is beneficial especially for patients with chronic or acute pain; a scheduled regimen may be indicated. It can also be appropriate to premedicate a patient prior to repositioning, wound care, toileting, or suctioning, especially if they are no longer able to communicate their needs.

Management

Each patient requires different considerations for their pain regimen. Regimens, whether scheduled, as needed, or a combination of both, may require adjustment to account for changes in the patient's ability to take oral medications, changes in severity of pain, or renal and/or hepatic dysfunction. Renal and hepatic dysfunction may necessitate a rotation from one medication to another.

While opioids are a mainstay of treatment for pain at EOL, it is still appropriate to utilize nonopioid medications such as anti-inflammatories, topical and transdermal lidocaine, steroids, and acetaminophen. Nonopioid medications are indicated in mild pain or in pain that is not opioid-responsive. Neuropathic agents are appropriate to continue if the route of administration is tolerated by the patient, and they continue to yield benefit from the medication. Notably, if a patient is actively dying or approaching EOL, they may stop taking oral medications abruptly. This possibility should be accounted for when managing pain at EOL.

Opioids are an ideal agent to utilize in the EOL patient, as they have a fast onset and multiple routes of administration, including intravenous, subcutaneous, oral, sublingual, and rectal. Opioid frequency is based on pharmacokinetics for the different routes of administration, although there can be variability from patient to patient. For example, oral opioids can be safely given as frequently as every 60 minutes and intravenous opioids as frequently as every 10 minutes, as indicated and tolerated. If pain appears to be uncontrolled at the current dose, it is reasonable to increase the dose by 50% to 100% for the next administration. At times, a continuous infusion may be utilized to manage pain if a patient requires multiple doses of opioids every hour for comfort. Opioid infusion rates should be based on the prior 24-hour oral morphine equivalence, or if a 24-hour window of data is not available, the prior few hours. Note that even when an infusion is running, acute symptom management is still achieved with as-needed pain medications concurrently, not the infusion itself. An infusion can be safely increased after 12 to 18 hours at its current rate, as it takes about four half-lives to reach a steady state.[7,8] See Table 1 for initial PRN dosing of opioids in acute symptom management.

TABLE 1: Initial PRN dosing of opioids in acute symptom management at EOL.

Opioid	Dosing
Morphine[a]	2.5-10 mg PO q1hr PRN 2-10 mg IV q10min PRN or SQ q30min PRN
Hydromorphone (Dilaudid)	2-4 mg PO q1hr PRN 0.5-2 mg IV q10min PRN or SQ q30min PRN
Fentanyl[b]	25-100 mcg IV q10min PRN or SQ q30min PRN
Oxycodone[a]	2.5-10 mg PO q1hr PRN
Note the time to Cmax for different opioid formulations: PO: 1 hour, SQ: 30 minutes, IV: 10 minutes	

[a]Highly concentrated formulations available.

[b]Safest in renal impairment with eGFR <30.

Dyspnea

Similar to the concept of "total pain," patients can experience "total dyspnea," which not only compromises physical comfort but amplifies emotional and psychological suffering.[9] Management requires a multidisciplinary approach that targets reversible causes when appropriate, optimizes symptom control, and incorporates psychosocial support.

Etiology

The source of a patient's dyspnea can have multiple etiologies and is sometimes a combination of different factors. Dyspnea can result from cardiac (congestive heart failure, ischemic disease, pericardial effusion), pulmonary (chronic obstructive pulmonary disease [COPD], pulmonary fibrosis, infections, complications of malignancy such as effusions or obstruction from a mass), metabolic (acidosis), or even hematologic conditions (severe anemia), often with different mechanisms of action that can direct treatments to best address the symptom.[10]

Considerations

Initial management of dyspnea should focus on addressing the underlying cause of the symptom. This may include stabilizing a patient's cardiopulmonary status with breathing treatments, airway clearance devices such as chest vests or cough assist systems, diuretics to reduce fluid in the thorax, and, at times, palliative radiation to target malignancies.[11,12] These treatments may be most helpful earlier in a disease process or with a more functional patient, but for those closer to EOL, these interventions may be limited due to the patient's tolerance, fatigue, ability to participate, or severity of dyspnea.

Supplemental oxygen use at EOL is not titrated to address oxygen need but rather is used sparingly in settings where a patient feels it helps their breathlessness. There is concern that certain levels of oxygen support may prolong the EOL process. This topic is routinely discussed with the patient and family so they may make an informed decision regarding continuation or cessation of this intervention.[13]

For patients with conditions such as advanced COPD or neuromuscular disease, noninvasive ventilation (NIV) may improve comfort, sleep quality, and even short-term survival. Thus, a short-term trial of NIV may be appropriate, if it is within a patient's goals of care at EOL.[13]

Pharmacologic Management

Low-dose opioids are the cornerstone of pharmacologic management of dyspnea at EOL. They reduce central perception of breathlessness and may decrease ventilatory drive, thus easing respiratory distress. Along with full mu-agonist opioids, buprenorphine, a partial mu-agonist, may be considered in treatment of dyspnea, though additional research is needed to demonstrate its clinical impact.[14]

Benzodiazepines, while not first-line, can be helpful for patients with dyspnea accompanied by significant anxiety or panic. However, their use should be individualized and closely monitored due to potential adverse interactions when used in conjunction with opioids.[14] Starting with low doses of benzodiazepines, to monitor how a patient responds both with improvement in symptoms and with potential side effects, is most appropriate.

Also, steroids play a role in management of dyspnea resulting from inflammatory disorders, such as advanced COPD, pulmonary fibrosis, or a systemic inflammatory state.[14]

Nonpharmacologic Management

For patients with mild dyspnea or anxiety contributing to the distress of this symptom, nonpharmacologic measures may be utilized to improve quality of life. Measures such as using a fan on the patient's face, opening windows for airflow, position adjustments, relaxation techniques, and support from family or friends can all be very impactful. Additionally, it is often necessary to acknowledge the distress related to dyspnea, the emotional toll it takes, and how hard it can be as a caregiver to witness. Open discussion of a patient's goals for comfort and re-evaluation of their lived experience can be essential in addressing this symptom.[14]

OROPHARYNGEAL SECRETIONS

Etiology

As EOL approaches, the ability to swallow or clear one's throat of saliva that has settled in the oropharynx is reduced due to increased sedation. These normal secretions can accumulate and lead to an audible gurgling sound, sometimes referred to as the "death rattle," and it raises concern amongst those at bedside with the patient. Although there is no explicit evidence suggesting that secretions are distressing to patients, family members and clinical team members may interpret this as a concerning symptom that requires treatment.[15]

Management

Nonpharmacologic management includes gentle oropharyngeal suctioning (avoiding deep suctioning to avoid irritation and discomfort), repositioning to the lateral recumbent position for postural drainage, and discontinuing intravenous fluids or enteral feeds.

Anticholinergic agents are often used as pharmacologic treatments for secretions. Some anticholinergic agents, like scopolamine, cross the blood-brain barrier (tertiary amines), resulting in higher risk of sedation and potential delirium. A typical initial choice is glycopyrrolate, which does not cross the blood-brain barrier and is typically well tolerated.[15] Additionally, a significant part of secretion management is educating the family and caregivers. It is important to discuss that these symptoms are a common part of the dying process, and to describe how the patient will be monitored for distress and treated appropriately.[16] See Table 2 for medications typically used to treat secretions.

NAUSEA AND VOMITING

Etiology

Effective management of nausea, both pharmacologic and nonpharmacologic, is essential at EOL due to the significant distress it can cause.

When evaluating a patient's nausea, a detailed history is critical to guide medical management. For example, initial therapies may differ depending on whether the nausea is due to brain metastases with cerebral edema, chemotherapy-induced nausea, a pancreatic mass abutting the stomach, or a malignant bowel obstruction causing oral intolerance. Understanding the underlying pathophysiology will lead towards a more effective regimen.

Evaluation and Management

Evaluation of nausea and vomiting should include questions regarding timing, onset, relation to medications or food, precipitating factors (e.g., movement), constipation, and prior treatment responses.

Management with a mechanism-based treatment scheme is always appropriate. However, depending on the clinical scenario and efficacy of such a regimen, empiric treatment and addition of second-line therapies not associated with the etiology of nausea may also be appropriate. Due to decreased patient alertness at EOL, it may be appropriate to schedule antiemetics instead of offering them as needed.[17] Refer to Table 3 for a detailed list of antiemetics, the receptors they target, pathways for nausea, and which medications can be used for which pathway.[17,18] Understanding why a patient is experiencing nausea or vomiting will help guide providers to the medications that can treat the underlying mechanism.

Additionally, it is imperative to consider potential side effects a medication may have and how they may play a role in the broader context of the patient's EOL. Common adverse reactions from antiemetics include constipation (ondansetron), cramping or abdominal pain (metoclopramide), fatigue (ondansetron, haloperidol, or prochlorperazine), delirium (scopolamine, antihistamine), and QTc prolongation (ondansetron, haloperidol, prochlorperazine, olanzapine, certain antihistamines).[18-20]

CONSTIPATION

Etiology

A potentially overlooked issue at EOL is constipation. As patients become less verbal and mobile, irregularity of bowel movements (BMs) may be overlooked as a cause of distress. If a patient's oral intake decreases over time, their BMs may also become less frequent. Unlike decreased urine output, fewer BMs are not a sign of impending death. If a patient has not passed a BM in 2 to 3 days and there is evidence of worsening pain, nausea, emesis, or delirium, then it is appropriate to evaluate for and potentially treat constipation.[21]

TABLE 2: Medications to treat secretions

Medication	Dose	Onset (Duration)	Comments	Side Effects
Anticholinergic agents (tertiary amines)				
Atropine	1% ophthalmic drops – 1 drop SL	30 min (2 hours)	High risk of delirium and sedation due to crossing the blood brain barrier	Dry mouth, urinary retention, constipation, delirium, palpitations, restlessness
Scopolamine Transdermal Patch	1 patch 1.5 mg TD q72hr PRN	12 hours, ~24 hours to steady state		
Hyoscyamine (Levsin)	0.125 SL or SC			
Anticholinergic agents (quaternary amines)				
Glycopyrrolate (Robinul)	0.2-0.4 mg SC or	1 min (2-4)	Thickens secretions	Dry mouth, urinary retention, constipation, delirium, palpitations, restlessness
	1-2 mg PO TID	30 min (7)	Poor oral absorption	
Expectorant				
Guaifenesin (mucolytic)	200 mg-400 mg PO q4hr PRN	30 min (4-6 hours)	To thin out thick secretions	Nausea, vomiting
Nebulized treatments				
Hypertonic saline 3%	3-4 mL	2 min (4 hours)	Stimulates cough, decreases sputum elasticity	Risk of bronchospasm, consider using with bronchodilator
N-acetylcysteine	1-10 mL of 20% solution q2hr PRN	5 min (1 hour)	Mucolytic agent	

Constipation at EOL may be worsened by regular use of opioids, known to slow motility of the gut, increase anal sphincter tone, and make stools harder to pass as the body absorbs more water from stools the longer they remain in colonic transit.[22] Additionally, becoming less mobile and using some medications (such as ondansetron) can also contribute to slowed bowel motility.

Management

If there is a concern for constipation at EOL, the benefit versus burden of intervention should be considered, such as pain or discomfort associated with suppository or enema administration or the inability to safely tolerate oral intake.

If a patient can tolerate intervention, the best practice is prevention with a bowel regimen taken daily, either

TABLE 3: Medications to treat nausea and vomiting.

	Receptor(s)	Input That May Cause	Medication Choices and Common Initial Dosing
Chemoreceptor trigger zone	D_2, $5HT_3$, NK_1	Increased intracranial pressure (ICP), infections, intracranial mass, irritants such as chemotherapy, opioids, or alcohol	**Anti-inflammatory effective for cerebral edema** *Steroids* (dexamethasone daily has minimal mineral corticosteroid effect and lower dosing) **Dopamine antagonists** *Prochlorperazine* 10 mg PO or IV q6hr PRN *Metoclopramide* 10 mg PO or IV q8hr PRN *Haloperidol* 0.5-2 mg PO q4-6hr PRN *Trimethobenzamide* 300 mg PO or 200 mg IM TID-QID PRN *Chlorpromazine* 25 mg IV or PO q6hr PRN **Serotonin and dopamine antagonists** *Olanzapine* 5 mg ODT QHS *NK1 antagonist* *Aprepitant* 125 mg PO x 1 an hour before chemotherapy on day 1, 80 mg PO every AM on days 2 and 3 of chemotherapy
Gastrointestinal tract	$5HT_3$ (serotonin), mechanoreceptors and chemoreceptors	Gastric and bowel distention such as with obstruction or gastroparesis, tumor or cancer burden, severe constipation, irritation from radiation, medications, infections, chemotherapy	**Serotonin antagonist (5HT3)** *Ondansetron* 4 mg ODT or IV q6hr PRN *Granisetron* 10 mcg/kg/dose IV 30 min before chemotherapy **Promotility agent** *Metoclopramide* 10 mg PO or IV q8hr PRN Somatostatin analog (reducing splanchnic blood flow and inhibiting multiple hormones involved with digestion) *Octreotide* 50-100 mcg SC or IV q8-12hr **Anti-inflammatory** *Steroids*
Vestibular	H_1 and acetylcholine	Motion-related	**Antihistamine and acetylcholine antagonist** *Meclizine* 12.5-25 mg PO daily PRN *Promethazine* 12.5-25 mg PO, IV, or IM q4-6hr PRN **Acetylcholine antagonist (anticholinergic)** *Scopolamine TD patch q72hr*
Cerebral cortex	Intracerebral projections, exact receptors not elucidated	Sensory input, pain, fear, anxiety, anticipatory	*Lorazepam* 0.5-1 mg IV q6hr PRN

scheduled or as needed.

For patients with daily opioid use, it is recommended to utilize a stimulant laxative, such as senna or bisacodyl, alongside an osmotic laxative such as polyethylene glycol, both scheduled daily. The use of a combination of stimulant and osmotic laxatives in patients taking opioids specifically targets the mechanism responsible for opioid-induced slowed transit and constipation.[22] See Table 4 for the more commonly utilized laxatives, their typical dosing regimen, and special considerations with use.

If a patient is not taking anything by mouth and they are thought to have constipation causing discomfort, it is appropriate to trial a stimulant laxative suppository, such as bisacodyl, and consider an enema if the suppository is ineffective. There is no preference for what type of enema is administered at EOL. However, the patient's medical history and tolerance of such a procedure should be included in the consideration of what type of enema to give. Caution should be exercised with patients who may have bowel obstruction or perforations, where stimulant laxatives, promotility agents such as metoclopramide, or mu-receptor antagonists such as methylnaltrexone may be contraindicated.[23]

Additionally, integrative therapies, such as massage, acupuncture, or osteopathic manipulative medicine, can be considered low-risk noninvasive treatments. Fiber and increased fluid intake are not typically recommended at EOL, as a patient's level of alertness and oral intake are often poor. Fiber supplementation can worsen constipation caused by opioids, adding bulk to the stool without targeting the mechanism by which the slowed transit and constipation is caused.[24]

TABLE 4: Constipation medications.

Laxative Type	Drug Name (Generic)	Typical Dosing	Considerations With Use
Osmotic laxatives	Polyethylene glycol	17 g powder packet dissolved in 4 oz liquid daily	Caution in kidney disease with possible electrolyte derangements
	Lactulose	10 g powder packed or 10 g per 15 mL liquid, take 10-20 g 1-3x daily	May cause bloating, flatulence, cramping, and nausea or vomiting
	Magnesium citrate	150 mL 1-2x daily, max 300 mL/day	Caution in kidney disease with possible electrolyte
	Magnesium hydroxide	2400 mg 1-2x daily (400 mg/5 mL)	Use caution in patients with ileostomy or colostomy
Stimulant laxatives (contraindicated in acute abdomen such as obstruction or perforation)	Bisacodyl	P O: 5 mg, 10 mg or 15 mg tab daily, max 30 mg/day PR: 10 mg suppository, retain 15-20 min, daily	May cause cramping and suppository may be contraindicated in proctitis, neutropenia, or if localized mass near rectum
	Senna	8.6 mg tab 2-4 tabs daily-BID, max 4 tabs BID, or similar dose in liquid	May be dose limited due to cramping
Stool softener	Docusate	100 mg 1-2x daily	Poor evidence for use in opioid-induced constipation[25]

DELIRIUM, AGITATION, ANXIETY

Etiology

Delirium with or without agitation and anxiety is frequently experienced at EOL. Causes of delirium may include metabolic derangements (due to renal failure, malnutrition, dehydration, or other etiologies), infection, medication side effects, pain, or other effects specifically related to a terminal disease (e.g., effects of dementia, brain mass).[26]

Anxiety may be due to other factors such as symptom burden, fear of physical distress while dying, existential distress, medication side effects, or exacerbation of pre-existing conditions such as posttraumatic stress disorder, generalized anxiety disorder, or panic disorder.

Nonpharmacologic Management

Nonpharmacologic treatment of delirium is consistent with treatment when not at EOL and includes frequent reorientation of patient to their environment, day/night regulation, avoiding delirium-causing medications if possible, and utilizing sensory aids such as glasses and hearing aids.

Additionally, nonpharmacologic treatment of anxiety includes a thorough symptom assessment (specifically, evaluating pain and shortness of breath, both of which can induce significant anxiety), psychosocial-focused and interdisciplinary visits when indicated (such as social work and spiritual care support), and continued standard of care management of anxiety as feasible depending on the patient's ability to participate. Examples of reliable standards of care management of anxiety include mindfulness, meditation, cognitive behavioral therapy (CBT), breathing, prayer, and distraction.[27]

Pharmacologic Management

A combination of nonpharmacologic interventions and medication use is standard for delirium, agitation, and anxiety. In practice, a patient and their caregiver's safety are a priority, and agitation causing harm or distress should be treated; however, studies have shown conflicting evidence for this practice, and even which pharmacologic treatments are most effective. Antipsychotics (haloperidol, chlorpromazine, and olanzapine being the most common) and benzodiazepines have long been mainstays of treatment, and they are commonly used for these distressing EOL symptoms.[28] When a patient has a prognosis of hours to days, oral administration of medications can become more problematic and thus reliance on medications administered via alternate routes is necessary.

Commonly, short- to intermediate-acting benzodiazepines are utilized for swift and robust symptom management. Frequently chosen medications are alprazolam (Xanax; 0.25 mg to 2 mg) and lorazepam (Ativan; 0.5 mg to 2 mg), with the latter being more commonly used due to a longer half-life up to 20 hours and multiple forms of administration (IV, SL, PO).[29] The risk of reliance, abuse, or sedation related to benzodiazepine use is accepted in the setting of such a short prognosis and the great benefit seen with use of these medications. Other usual anxiety treatments such as selective serotonin reuptake inhibitors (SSRIs) are often less helpful due to the length of time required for such medications to take effect.

OSTEOPATHIC MANIPULATIVE TREATMENT (OMT)

The American Osteopathic Association's policy statement for EOL care states, "at end of life, the goal is comfort for the patient and psychosocial support of the family."[30] Osteopathic physicians are holistic in their approach to

patient care, and thus, well prepared to care for a patient at EOL. Currently, there are no specific guidelines regarding the use of OMT in this scenario.

Additionally, EOL care has improved with increased specialty training through hospice and palliative care fellowships and exposure in primary care residency training programs. The coinciding principles of treating the whole person as osteopathic physicians and addressing the many sources of suffering in palliative care, align in the goal to comprehensively address a person's EOL symptoms and quality of life.[31]

Despite the lack of evidence-based OMT specifically recommended for EOL, there are a handful of studies that evaluate OMT in clinical scenarios that may present in hospice care or at EOL. Recently, a 2025 study demonstrated that OMT may impact the efficacy of standard cancer pain management, reducing overall opioid use, and improving pain and symptom scores. Treatment techniques included indirect myofascial release, soft tissue pressure, and craniosacral techniques.[32] No high-velocity low-amplitude (HVLA) techniques were documented as being utilized in any of the studies reviewed for this article. Given the fragile nature of many patients at EOL, specifically the possible presence of pathologic fractures, bone metastases, anatomic instability, or physical conditions that make it difficult to precisely locate the joint where HVLA would be performed, or for the patient to tolerate it comfortably, HVLA may be contraindicated in many patients.

For dyspnea, a recent systematic review demonstrates OMT techniques of diaphragmatic stretching and manual diaphragm release may help patients with COPD, increasing diaphragm excursion, chest expansion, and exercise capacity.[33]

This is highly relevant as COPD was the fifth leading cause of death in the United States in 2023.[34] Additionally, a literature review on visceral techniques used on patients with irritable bowel syndrome (IBS) reflected reduction in symptoms and improvement in quality of life, especially for patients with constipation-predominant type.[35] Research is still needed in multiple areas; however, the trained osteopathic physician is well equipped to evaluate the impact of appropriate OMT techniques for patients under their care.

Regarding oropharyngeal secretions, anxiety, nausea, and vomiting there is little evidence of OMT for symptom relief in acute and chronic conditions, thus warranting additional research, specifically for EOL symptoms.

As palliative care grows as a specialty, there is an increase in interest in how osteopathic physicians will play a role in a field whose values closely align with osteopathic training and philosophy. In 2022, a small study evaluated the impact of adding OMT to standard palliative symptom management, demonstrating that OMT had a positive impact on patient symptoms, however, was not statistically significant, likely due to a very low sample size.[36]

CONCLUSION

Osteopathic family physicians play a critical role in the care of patients across the continuum of their medical journeys. Management of patients at the end of their life requires diligent observation and appropriate titration of medications for relief from symptoms as well as compassionate care extending to a patient's loved ones. The integration of OMT into care at EOL is a natural fit for the most holistic approach. This article serves as a general guide to common symptoms at EOL and acknowledges the continued need for research as to how OMT can best be integrated into this area of medicine.

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APPENDIX 1: PAIN-AD Scale

Behavior	0	1	2	Score
Breathing Independent of vocalization	Normal	• Occasional labored breathing • Short period of hyperventilation	• Noisy labored breathing • Hyperventilation • Cheyne-Stokes respirations	
Negative vocalization	None	• Occasional moan or groan • Low level speech with a negative or disapproving quality	• Repeated troubled calling out • Loud moaning or groaning • Crying	
Facial expression	Smiling or inexpressive	• Sad • Frightened • Frown	• Facial grimacing	
Body language	Relaxed	• Tense • Distressed pacing • Fidgeting	• Rigid • Fists Clenched • Knees pulled up • Pulling or pushing away	
Consolability	No need to console	• Distracted or reassured by voice or touch	• Unable to distract, console, or reassure	
Total				0 – 10

PAIN-AD scale is based on five observations of the patients, scored as 0, 1, or 2 up to a total of 10.
Higher scores suggest higher pain that is experienced by the patient.

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REVIEW ARTICLE

Traumatic Injury in the Elderly: Exploring Injuries Associated With the Use of Mobility and Disability Aids in Adults 65 Years and Older

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KEYWORDS

Geriatrics

Mobility aids

Falls

Patient lifts

Injury prevention

ABSTRACT

As the geriatric population continues to grow, the use of mobility and disability aids–including canes, walkers, wheelchairs, and patient lifts–has become increasingly common. While these devices are essential for maintaining independence and preventing falls, they are not without risks. This review examines injuries associated with mobility aids, particularly lifts, in adults aged 65 years and older, emphasizing patterns of injury, high-risk populations, and implications for family medicine practice. While most discussions center on ambulation-related falls, emerging data highlight that transfer-related incidents involving mechanical or manual lifts pose a greater injury risk, particularly to the head and neck and disproportionately affecting women and individuals over 85 years of age.[5] Biomechanical vulnerability, age-related musculoskeletal decline, and improper device use all contribute to this elevated risk. Osteopathic manipulative medicine offers a nonpharmacologic option to enhance balance and proprioception, thereby reducing fall risk and complementing preventive care strategies.[11] Family physicians are uniquely positioned to mitigate these risks by providing patient and caregiver education, coordinating in-home services, and addressing systemic barriers to mobility aid use. Understanding the injury risks associated with these devices and implementing targeted preventive strategies can significantly enhance safety and patient outcomes.

INTRODUCTION

Mobility and disability aids, including canes, walkers, rollators, and wheelchairs and lifts play a vital role in maintaining independence and preventing falls among the geriatric population and adults with disabilities. In the United States, nearly 24% of community-dwelling adults aged 65 years and older rely on at least one mobility device, and this number is expected to rise with an aging population.[1] While these devices are designed to enhance safety and functional mobility, they are not entirely without risks. Injuries and falls related to mobility aids pose a significant concern in primary care, often resulting from improper use, poor fit, or environmental factors leading to emergency department visits, hospitalizations, loss of function, and increased caregiver strain.

Mechanical and manual patient lifts warrant particular attention. Despite their intended purpose of facilitating safe transfers, these devices account for a disproportionate number of traumatic events. These risks are especially pronounced in older adults with frailty, osteoporosis, or neurologic impairment. Understanding the specific risks, injury patterns, and vulnerable populations affected by these devices is critical for family physicians seeking to deliver safe and comprehensive care.[2]

Although mobility aids are widely used, substantial gaps persist in provider training, caregiver instruction, and standardized safety practices. The objective of this review is to examine the traumatic injuries associated with mobility and disability aids in adults aged 65 years and older, and to highlight evidence-based strategies within family medicine to enhance safety and patient outcomes.

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METHODS

This review was conducted using publicly available data from the United States Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS).[3] The query was built using the most recent 5 years, 2020 through 2024. Injury-associated products were divided by selecting codes 1706, 1707, and 1889, which represent crutches/canes/walkers, wheelchairs, and elevators or other lifts (excluding escalators/hoists/jacks/forklifts/automotive lifts), respectively. Age was grouped in years of 5 from aged 65 years to 85 years and older. All body parts were included in the search but were categorized into head and neck, upper extremity, torso, lower extremity, internal, all body, and unknown location of injury. All diagnoses and dispositions were included.

No injury cases were identified under codes 1706 or 1707 within the selected timeframe and inclusion parameters. This absence reflects NEISS data collection and sampling data, in which only emergency department–treated injuries directly related to a consumer product are captured. Patients who seek care at the primary care clinic or through nursing home and assisted living care are excluded from the data. Furthermore, the NEISS database will exclude cases if the sample number for the product code is too small to generate a stable national estimate. Consequently, only data pertaining to product code 1889, elevators and patient lifts, were manually extracted and organized thematically across categories including age distribution, gender, and injury locations.

Peer-reviewed literature was identified using the National Institutes of Health (NIH) databases, including PubMed and PubMed Central. Search terms included combinations of "geriatrics," "mobility aids," "falls," "patient lifts," "injury prevention," and "osteopathic manipulative medicine (OMM)." Emphasis was placed on articles that included information relative to the injury pattern, patient demographics, or outcomes related to the use of canes, walkers, wheelchairs, or lifts in adults aged 65 years or older. Studies were excluded if they focused on pediatric or nongeriatric populations. Eligible studies were reviewed to evaluate device-specific injury trends, age and gender-related disparities, and adjunctive interventions such as OMM and education.

Figure 1 shows data retrieved from the NEISS database between 2020 and 2024 for all injuries that were reported in people over 65 years in both males and females. The data are grouped into 5-year ranges. Initially the number of cases from the 65- to 69-year category to the 75- to 79-year category decreased. The number of cases starts to rise in the 80- to 84-year category with 126 cases. The highest number of reported cases, 207, are in the 85+ years and older category, which may reflect the larger proportion of individuals in this category due to its broader age range.

FIGURE 1: Number of total injuries in the population over the age of 65 years, categorized in 5-year intervals. Data are collected from the NEISS database between 2020 and 2024.

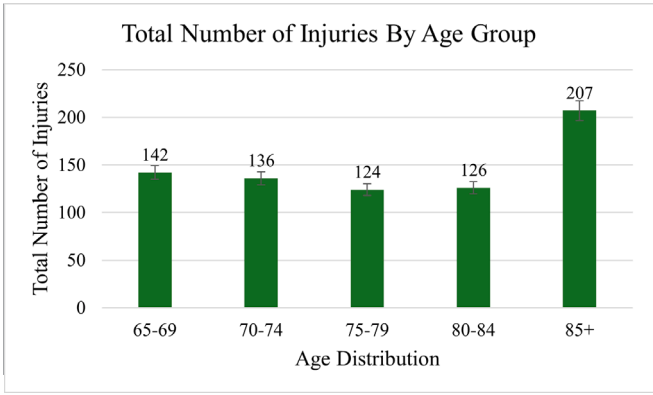


FIGURE 2: Number of total injuries in people over 65 years of age separated by male and female genders between 2020 and 2024. All data were collected from the NEISS database.

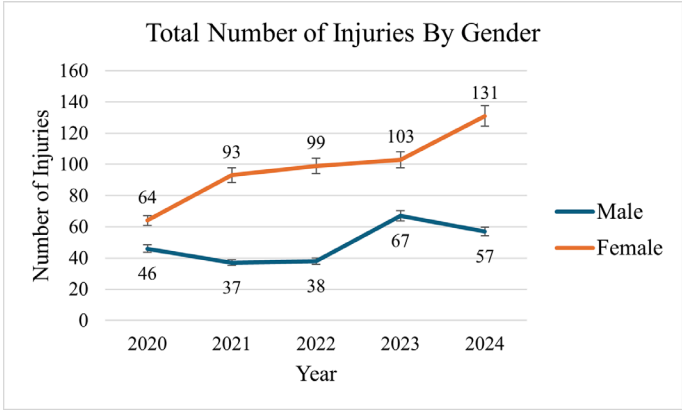


Figure 2 shows the total number of injuries in people over 65 years of age separated by male and female gender between 2020 and 2024. In the line graph, the orange bar with the associated R2 value represents the female injuries and the blue bar with the associated R2 value represents the male injuries. There was an overall increase in the number of cases in both male and female genders. In female cases from 2020 to 2021, the number of cases increased by 29, remained relatively stable from 2021 to 2023, and then rose by an additional 28 cases in 2024. The R2 = 0.9031 for female cases indicates a statistically significant increase in female cases. In male cases from 2020 to 2021, the number of cases decreased by nine, remained relatively stable from 2021 to 2022, rose by 29 cases in 2023, then decreased by ten in 2024 as represented in Figure 2. The R2 = 0.4085 shows statistical significance but is not as strong as the

female cases.

Figure 3 shows the types of injuries reported to the NEISS database for people over 65 years between 2020 and 2024. Head and neck injuries consistently accounted for the highest number of cases, with cases rising by 23 between 2020 and 2024. Injuries to the upper extremity and torso showed a notable rise over the study period, upper extremity cases rose by 23, and torso cases rose by 19 during the 2020 to 2024 study period. There was a lower increase in the number of lower extremity cases, increasing by eight over the study period. Internal injuries were rarely seen, with only one reported case in 2024. All body and unknown injuries remained low across the study period with an unusual peak in unknown injuries in 2023.

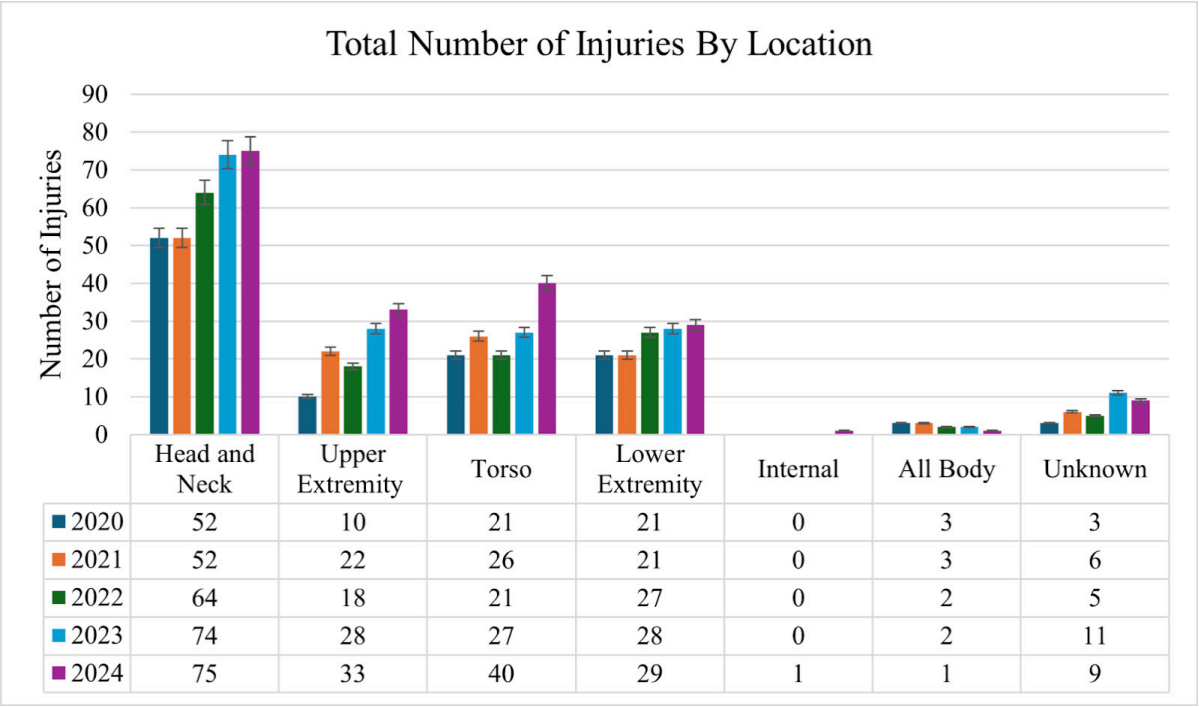
DISCUSSION

Data extracted from the NEISS database, together with the supporting literature, provide an overview of injury patterns associated with mobility aids in the geriatric population. Although no reportable cases were identified for canes, walkers, or wheelchairs within the dataset, the injuries linked to patient lifts offer valuable insight into a high-risk area of mobility assistance. The analysis revealed consistent trends in gender and injury location. These findings form the basis for a broader discussion on the mechanisms, contributing factors, and preventive opportunities related to mobility-aid injuries in older adults.

Mobility Aids and Patient Population

Mobility aids are widely used by older adults to compensate for impaired gait, balance dysfunction, and musculoskeletal decline, with nearly 24% of community-dwelling individuals 65 years of age and older relying on at least one such device.[1] Canes are typically employed for minor balance support or unilateral weakness, while walkers provide a broader base of support and are commonly used by individuals with bilateral lower-extremity instability or deconditioning. Wheelchairs, by contrast, are reserved for those with more profound mobility limitations, neuromuscular disorders, or cardiopulmonary compromise, and are associated with reduced ambulatory fall risk but higher baseline frailty.[4] While these devices are intended to enhance safety, their use introduces new injury risks–most notably falls related to improper technique, poor device fit, or environmental obstacles. However, data increasingly show that the highest proportion of mobility-related injuries among older adults occurs not during ambulation with these aids, but rather during transfers involving manual or mechanical lifts.[5] These findings suggest that while traditional mobility aids carry recognized fall and fracture risks, transfer mechanics and lift-related activities may represent a more acute source of injury burden in the geriatric population

FIGURE 3: Data collected from the NEISS database of types of injuries in the population age 65 years and older between 2020 and 2024. Types of injuries include head and neck, upper extremity, torso, lower extremity, internal, all body, and unknown.



	Head and Neck	Upper Extremity	Torso	Lower Extremity	Internal	All Body	Unknown
2020	52	10	21	21	0	3	3
2021	52	22	26	21	0	3	6
2022	64	18	21	27	0	2	5
2023	74	28	27	28	0	2	11
2024	75	33	40	29	1	1	9

and warrant targeted preventive strategies.

The Effects of Age and Gender

Figure 1 displays how the total number of injuries from mobility lifts among adults ≥65 year from the year 2020 to 2024 remains relatively constant and has no significant variance, with the exception of individuals aged 85 years and older. The increase seen within the 85 years of age and older group may be attributable to deterioration in overall health status with age including balance difficulty, bone fragility, etc.[6] Similarly, as seen in Figure 2, elderly women experience a significantly higher incidence of injuries related to mobility lift use compared to men. One study analyzing 3932 mobility aid-associated falls found that women represented 70.5% of cases, with rates twice as high in fracture and hospitalization than men.[7] The disparity is attributed in part to higher baseline prevalence of osteoporosis and reduced bone mineral density among elderly women and aging populations, increasing fracture risk even with low-energy mechanisms. Gender-related differences in reporting and healthcare-seeking behaviors may further influence injury detection, as older women are more likely to seek care after a fall, while men may underreport or delay evaluation.[8] Together, these findings underscore the need for gender-informed fall-prevention strategies, including targeted training for mobility aid use, mobility lift use, and earlier screening for musculoskeletal frailty in elderly women.

Location of Injury

Falls involving patient lifts, particularly mechanical or manual sit-to-stand and floor lifts, are associated with a disproportionately high rate of head and neck injuries in older adults due to biomechanical and situational factors unique to the transfer process, as seen in Figure 3. Unlike ambulatory falls where forward momentum often leads to distal extremity impact, lift-related incidents typically involve vertical collapse or uncontrolled backward descent, placing the occiput, cervical spine, and posterior cranium at direct risk of blunt trauma. Data from observational safety analyses show that falls from lifts frequently result in occipital lacerations, concussions, and cervical strain due to lack of protective reflexes and the inability of frail patients to brace during descent.[9] These forces are exacerbated in patients with preexisting degenerative joint disease, vertebral osteoporosis, or limited neck mobility, further increasing the likelihood of injury to the head and cervical region. The high center of gravity during upright transfer also makes lateral balance more difficult, contributing to sideward falls that put the arms, torso, and lower extremity at risk for injury. This injury pattern emphasizes the need for stricter adherence to lift protocols, caregiver training, and proper fit and function of mechanical transfer devices in the geriatric setting.

PREVENTING AND TREATING WITH OSTEOPATHIC MANIPULATIVE THERAPY

OMM offers a nonpharmacologic approach to improving balance. Because OMM can improve patient balance, it aids in reducing the risk of falls in patients with and without the dependence of mobility aids and can increase postural balance in elderly patients requiring mobility lifts. The University of North Texas Health Science Center conducted a research study that demonstrated a comprehensive protocol of seven OMM techniques applied weekly over 4 weeks improved postural stability of patients over the age of 65 years.[10] Their protocol consisted of soft-tissue and myofascial release to the thoracic, lumbar, and sacral regions. Myofascial release was also directed towards the shoulders and scapulae bilaterally. The cervical spine was treated with myofascial release, counterstrain, muscle energy, or soft-tissue techniques for release and correction, depending on the severity. Cranial mechanics were assessed and treated with occipital and condylar decompression, venous sinus technique, V-spread and frontal-parietal lifts, CV4 technique, and counterstrain of tender points. In total, OMM techniques were applied for 25 to 30 minutes.

Together, these techniques improve joint mobility, enhance proprioceptive feedback, reduce somatic dysfunction, and optimize neuromuscular coordination, all of which contribute to better postural control and improve balance in older adults. The physiologic mechanisms underlying these improvements are multifactorial. By reducing somatic dysfunctions and fascial restrictions, OMM enhances proprioceptive input from the joint capsules and muscles, improving neuromuscular coordination and postural reflexes.[11] Additionally, gentle cranial and cervical techniques may optimize vestibular function and cerebrovascular flow, further stabilizing balance control.[12] When incorporated into comprehensive geriatric care, OMM can complement physical therapy and exercise-based interventions to provide a gentle modality to treat frail and mobility-limited patients. While OMM can be beneficial for this population, there are certain relative contraindications that must be considered. Specifically, high-velocity low-amplitude (HVLA) techniques are generally avoided in this population due to osteoporosis, osteoarthritis, and vascular compromise.[13]

TACKLING EDUCATION, RESOURCES, AND BARRIERS

In the management of injuries associated with mobility aids in the geriatric population, family medicine serves as a cornerstone for establishing comprehensive patient-centered care. Through proactive education, physicians

equip both patients and caregivers with tools to safely integrate assistive devices, adapt home environments, and build confidence in mobility, thereby reducing fall risk.[14] Home health services, coordinated through the family practitioner, deliver tailored interventions such as skilled nursing, physical therapy, and occupational therapy to assess and modify the home setting for safer mobility.[15] Additionally, government-funded programs, such as Medicare's Home Health Benefit and local Area Agencies on Aging provide financial and logistical support for in-home care and assistive device acquisition.[16] Despite the widespread use and need for these resources, stigmatization of mobility aid use in older adults often leads to delayed or inappropriate adoption of necessary devices, which can increase the risk of fall and injury.[17] Other barriers to mobility aid use include lack of access to local medical offices, limited transportation to appointments, and increased costs.[18] Medicare Part B will cover 80% of the cost of mobility aids, but only after the deductible has been met.[19] Family medicine practitioners are uniquely positioned to address the barriers affecting mobility aid use by fostering open dialogue, normalizing the use of mobility aids, and encouraging proactive management with available resources.

LIMITATIONS

A key limitation across the study is the reliance on emergency department data, which may disproportionately capture higher-acuity cases and exclude individuals who seek care through the primary care physician or manage injuries at home, thereby underestimating the true incidence of mobility device–related falls. Differential access to care based on gender, socioeconomic status, and living environment may influence utilization of the emergency department as well.[8] Self-reported data in mobility aid use and fall history introduce potential misclassification bias whether from poor recall, injury circumstances, or injury outcome.[1] Additionally, lack of longitudinal follow-up limits the access to data to observe recovery, functional decline, or recurrent injury. Because the NEISS query did not yield sufficient reportable cases for mobility aids, such as canes, walkers, or wheelchairs, the detailed analysis of age, gender, and injury location reflects only lift-related incidents; therefore, findings cannot be generalized to other categories of mobility aids.

CONCLUSION

Mobility aids are essential for maintaining independence and reducing fall risk in older adults, but their use, specifically during transfers involving mechanical or manual lifts, can introduce significant injury risks, particularly head and neck trauma. Transfer-related falls involving mechanical or manual lifts represent a substantial portion of reported injuries related to mobility aids in the geriatric population, with the highest numbers observed among patients aged 85 years and older and a disproportionate representation of women. These patterns highlight the need for improved caregiver training, stricter lift protocols, and patient-specific risk assessments that consider age, gender, and functional mobility. OMM offers a promising, nonpharmacologic approach to improving balance and reducing falls through techniques that enhance proprioception, postural control, and neuromuscular function. Family medicine practitioners play a critical role in addressing barriers to safe mobility aid use by educating patients and caregivers, coordinating supportive services, and advocating for early intervention. Future research should move beyond emergency department data to capture broader and longer-term outcomes, ultimately guiding more effective patient-centered strategies for mobility safety in older adults.

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CASE REPORT

Alpha-gal Syndrome Presenting as Isolated Diarrhea Following Exposure to Red Meat: A Case Report

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KEYWORDS

Alpha-gal

AGS

IgE-mediated food allergy

Alpha-gal syndrome

Food allergy

ABSTRACT

Alpha-gal syndrome (AGS) is an emerging immunoglobulin E (IgE)-mediated food allergy linked to tick bites, typically presenting as delayed anaphylactic reactions following consumption of mammalian meat products. We present the case of a patient with AGS (elevated alpha-gal IgE) who displayed an atypical clinical presentation of isolated gastrointestinal symptoms without systemic allergic manifestations, including urticaria. The patient's symptoms completely resolved after eliminating red meat from her diet. This case highlights the variable presentations of AGS and the importance of considering this diagnosis in the absence of typical urticarial and anaphylactic symptoms.

INTRODUCTION

Alpha-gal syndrome (AGS) is an emerging food allergy defined by an immunoglobulin E (IgE)-mediated hypersensitivity reaction in response to galactose-alpha-1,3-galactose (alpha-gal), an oligosaccharide present in the cells of nonhuman mammals. Prevalence and incidence of AGS have substantially increased in recent years. Sensitization to alpha-gal occurs through tick bites, primarily through the lone star tick in the United States, though Ixodes ticks have also been implicated in AGS.[1]

Clinical presentation of AGS is characteristically delayed, occurring 3 to 7 hours following consumption of red meat.[2] While the clinical symptoms of AGS can vary, the most commonly reported symptoms include urticaria and diarrhea. Additional clinical features may include angioedema, respiratory symptoms, emesis, reflux, and abdominal pain, with rare cases progressing to anaphylaxis.[3] Although most patients present with cutaneous symptoms, isolated gastrointestinal (GI) symptoms without concurrent urticaria or systemic allergic reactions represent an atypical variant that can lead to delayed diagnosis.

CASE PRESENTATION

Chief Complaint: Diarrhea

History of Present Illness: A 44-year-old female with a past medical history of anxiety, irritable bowel syndrome (IBS), and depression presented with complaints of worsening anxiety and diarrhea.

The patient states that for the last 2 weeks she has been having increasing episodes of diarrhea, with about three loose stools per day. In the past, the patient experienced constipation-predominant IBS, with bowel movements every 3 to 7 days. Within the past year she has been experiencing more of these diarrhea episodes with nausea. She also reports daily episodes of tenesmus that include abdominal cramping before and after defecation.

She notes a potential sensitivity to red meat in particular. Specifically, she recalls episodes of diarrhea in the hours following consumption of foods such as steak and meatballs. Associated symptoms include diffuse abdominal pain, abdominal cramping, nausea, and occasional heartburn. She denied rash, angioedema, or respiratory symptoms.

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When questioned about possible tick exposure, the patient recalled a tick bite about 2 years ago, which she believed may coincide with the onset of her diarrhea episodes. She has a history of IBS that used to be more constipation-predominant before her exposure to the tick bite.

The patient's GI symptoms have negatively impacted her quality of life. Notably, she experiences "debilitating" anxiety surrounding bowel movements, particularly in social settings. Consequently, she has been avoiding meals and has lost 4 pounds over the past months.

Medications

- Sertraline 25 mg daily
- Buspirone 5 mg as needed
- Dicyclomine 10 mg as needed (ineffective for current symptoms)

Physical exam

Vital signs were within normal limits. The patient appeared to have a thin body habitus, with a body mass index (BMI) of 16.9 kg/m^2. Abdominal exam revealed a soft, nondistended, nontender abdomen with bowel sounds present and normal. Skin showed no rashes or swelling. Heart and lung exams were unremarkable.

Labs

Laboratory tests including comprehensive metabolic panel (CMP), thyroid function tests, and complete blood count (CBC) were all within normal limits.

Due to the association between red meat consumption and symptom onset, as well as the exposure to tick bite, the differential diagnosis of AGS was explored and an IgE titer was ordered.

TABLE 1: Key

Class	IgE level (kU/L)	Degree Sensitivity
0	0-0.34	Insignificant
1	0.35-0.69	Low level
2	0.70-3.49	Moderate level
3	3.50-17.4	High level
4	17.5-49.9	Very high level
5	50-100	Very high level
6	>100	Very high level

TABLE 1: Patient results

	IgE level (kU/L)	Reference Level and Sensitivity
Beef IgE	0.54	Class 1 – Low level
Pork IgE	0.18	Class 0 – Insignificant
Lamb IgE	0.52	Class 1 – Low level
Galactose-alpha-1,3-galactose	0.85	Class 2 – Moderate level

Results displayed elevated IgE levels signifying a moderate sensitivity to galactose-alpha-1,3-galactose, confirming the diagnosis of AGS.

Additionally tick-borne illness serology was ordered, and results were negative for Borrelia, Babesia, Ehrlichia, and Rickettsia.

Management and follow-up

The patient was informed of her diagnosis and advised to avoid red meat, including steak, beef, and lamb.

Follow-up at 3 weeks revealed complete resolution of her GI symptoms, noting improvements within 1 week of adhering to strict avoidance of red meat. Her bowel movements have become more firm and regular. Furthermore, she reported that her anxiety surrounding bowel movements has greatly improved. The patient also noted an unexpected improvement of menstrual cycle cramps since eliminating red meat from her diet. The patient will continue to avoid mammalian meat products and will be monitored by the office for any recurrence or evolution of symptoms.

DISCUSSION

This case illustrates a unique presentation of AGS characterized by isolated GI symptoms without systemic allergic manifestations. While cutaneous manifestations occur in 93% of cases, isolated GI symptoms can occur.[3] The absence of dermatologic manifestations pose diagnostic challenges, as many providers may not associate diarrhea with an IgE-mediated allergic response. A recent review implicated that patients with a history of IBS and AGS may have more GI-predominant symptoms.[4] IBS is a diagnosis based on recurrent abdominal pain with abnormal stool form or frequency, requiring one to rule out other underlying causes. A patient's IBS history may further blind the physician to the differential diagnosis of AGS, as the digestive manifestations may be attributed to the underlying diagnosis. Patients should be questioned about red-meat sensitivity and tick exposure when IBS symptoms change. IBS patients typically are categorized into subtypes of diarrhea-predominant or constipation-

predominant. It is common for IBS patients to switch from their IBS subtype to a mixed IBS over the course of 1 year. However, it is rare for a patient to change directly from constipation-predominant to diarrhea-predominant.[5,6] The change in our patient's IBS presentation from constipation-predominant to diarrhea-predominant was crucial for raising physician suspicion on an alternative diagnosis.

The delayed onset of symptoms further complicates the diagnosis, with most patients failing to identify red meat as a trigger. Thus, food diaries are an essential tool that should be used when patients struggle with consistent episodes of diarrhea and abdominal pain. It is important to note that the level of alpha-gal–specific IgE does not necessarily correlate with the severity of symptoms.[7] This disconnect between antibody levels and clinical presentation further highlights the complexity of AGS and emphasizes that diagnosis and management should be based on clinical history and response to dietary avoidance rather than relying solely on IgE antibody titers.

Diagnostic delay remains a significant challenge for AGS. A study in 2017 showed that the mean time between onset of symptoms and AGS diagnosis was 7.1 years, with a more recent study in 2025 showing the median time to diagnosis has improved to 21 months.[8,9] While the mean time to diagnosis has improved, there is still significant delay, emphasizing the need for further awareness of the various clinical manifestations of AGS in order to decrease diagnostic latency.

The patient showed dramatic improvement following avoidance of red meat, confirming the diagnosis of AGS. First-line management is avoidance of mammalian meat products (80% effective), with resolution increasing to 95% when avoiding dairy and gelatin.[10] Furthermore, patient education on skin products and medications containing gelatin and animal derivatives is important. For example, heparin is commonly derived from porcine or pig intestines and can cause reactions in patients with AGS.[11]

Additionally, studies have linked IgE antibodies to alpha-gal with accelerated atherosclerosis and coronary artery disease. The mechanism of accelerated atherosclerosis may be linked to alpha-gal being absorbed via lipids and chylomicrons, hence, once entering the bloodstream, there is greater potential for inflammatory response from the antibodies.[12] It will be worthwhile to monitor the patient closely for any early development of coronary artery disease or peripheral atherosclerosis.

A key takeaway is that AGS should be considered as a differential diagnosis in the setting of new-onset or worsening GI symptoms, especially for patients with possible tick exposure. Clinical suspicion of AGS warrants specific IgE testing for an earlier diagnosis, which may reduce future risk of cardiac manifestations, prevent progression of symptoms, and reduce long-term complications.

CONCLUSION

This case demonstrated an atypical presentation of AGS characterized by isolated GI symptoms without cutaneous or systemic allergic manifestations. Through thorough history taking, there was some clinical suspicion leading to IgE testing for an alpha-gal allergy. The positive titer, along with complete resolution of symptoms following dietary avoidance of mammalian meat products confirmed the diagnosis.

As the incidence of AGS continues to rise, clinicians must maintain a high level of suspicion for this diagnosis, particularly in regions endemic to lone star and Ixodes ticks. Moving forward, increased awareness leading to quicker recognition of AGS will improve patient outcomes and quality of life.

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CASE REPORT

Consumer Wearable Device Leads to Expedited Diagnosis and Treatment of Paroxysmal Atrial Fibrillation

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KEYWORDS

Paroxysmal atrial fibrillation

Device

Wearable

Accessibility

Cost-effective

ABSTRACT

Paroxysmal atrial fibrillation (AF) is typically characterized by intermittent episodes of disorganized electrical activity that frequently go undetected due to their brief duration and sporadic nature. Conventional diagnostic methods often fail to identify these episodes, especially when asymptomatic and infrequent, contributing to delayed diagnosis and increased stroke risk. The emergence of consumer-wearable devices has enabled continuous real-time monitoring and self-recording of arrhythmic events, helping to bridge gaps between symptom onset, clinical diagnosis, and management. This case report describes a 59-year-old male who used his consumer-wearable device to document symptomatic episodes of paroxysmal AF, which led to expedited diagnosis and management, including pulmonary vein isolation ablation. Increased recognition of the transformative potential of wearable monitors may optimize patient-centered outcomes in AF diagnosis and management by enhancing both patient autonomy and accessibility in cardiovascular care.

INTRODUCTION

Atrial fibrillation (AF) is the most common arrhythmia encountered in clinical practice and is projected to affect 6 to 12 million Americans by 2050.[1] More than 37 million people worldwide currently have AF, and its prevalence is expected to double within the next 30 years.[2] AF is defined by its paroxysmal nature as patients may experience episodes of disorganized atrial electrical activity that begin and end spontaneously, often lasting less than 48 hours but sometimes persisting for up to 7 days.[3] These intermittent and unpredictable episodes can manifest with symptoms such as palpitations, irregular heartbeats, fatigue, or lightheadedness. However, episodes can go undetected in individuals who do not experience symptoms.[3] The sporadic presentation of AF poses significant diagnostic challenges for both patients and clinicians, as the arrhythmic events may be infrequent and asymptomatic. Paroxysmal AF affects a broad spectrum of patients, presenting as recurrent self-terminating episodes that may occur multiple times per week or per year, with some cases progressing to persistent forms over time.[4] Because conventional short-term diagnostic tests often fail to capture the arrhythmia, especially in patients with infrequent or silent episodes, long-term monitoring becomes essential.[5] The economic and clinical burden of AF is substantial, with annual costs in the United States (US) alone reaching up to $26 billion (US).[6] Estimated prevalence in the US is approximately 4.48%, though this almost certainly underestimates the actual disease prevalence due to difficulties in detecting paroxysmal and asymptomatic cases.[7]

Diagnosis of paroxysmal AF conventionally relies on capturing the temporal pattern of the arrhythmia episode, which is identified by irregularly irregular RR intervals and absent P waves on a 12-lead electrocardiogram (ECG) or rhythm strip.[8] Conventional modalities such as short-duration ECGs and Holter monitoring frequently fail to detect paroxysmal or asymptomatic AF, especially in those with infrequent symptoms.[6] Although devices such as an implantable loop recorder (ILR) can provide greater sensitivity, their use is limited by high cost, invasiveness of the procedure, and the fact that it is often restricted to individuals at the highest risk for adverse events.[9]

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Emergence of mobile and consumer-wearable-driven technology has dramatically expanded the landscape of arrhythmia detection. Devices such as smartwatches and smartphone-enabled ECG platforms allow individuals to record their own rhythm in real-time and employ automated algorithms for arrhythmia analysis.[10] The Apple Heart Study, which included over 400,000 participants, found that 34% of those who received an irregular pulse notification were confirmed to have AF via ECG patch monitoring, and the algorithm demonstrated a positive predictive value of 84% for concurrent AF.[11] The Fitbit Heart Study enrolled more than 450,000 participants and reported that approximately 1% experienced irregular heart-rhythm detections.[12] With about one-third of those participants having confirmed AF using an ECG patch, this led to a positive predictive value of approximately 98% for irregular rhythm notifications.[12] Another study of 346 participants using various consumer-wearable algorithms reported detection sensitivities for simulated AF burden of 64.4% for Fitbit and up to 82.2% for the Apple Watch.[13] These values outperformed conventional Holter and patch monitors when users ensured sustained device wear.[13] The clinical impact is substantial, as real-time notifications can help improve patient adherence to monitoring, expedite confirmation, and facilitate earlier evidence-based arrhythmia management.

Long-term accessible monitoring provided by these devices expands arrhythmia surveillance, increasing detection of asymptomatic or intermittent AF in community and primary care settings, and reduces AF morbidity through timely intervention. Management of paroxysmal AF focuses on stroke prevention, symptom control through medication or ablation therapy, and modification of risk factors such as hypertension, obesity, sleep apnea, diabetes, and alcohol use.[1,7] Integrating wearable device data into electronic health records and care workflows creates new opportunities for remote and hybrid management, further supporting expedited clinical decision-making.

CASE PRESENTATION

A 59-year-old male presented with a 2-year history of recurrent episodes characterized by increased heart rate, palpitations, fatigue, and occasional shortness of breath. These episodes occurred once or twice weekly and gradually increased in both duration and severity, with some lasting up to 24 hours. He reported that his symptoms began insidiously and were not associated with any specific exertion or time of day, despite a regular exercise routine involving running. The patient documented several episodes through his smartphone using a consumer-wearable device, which were subsequently determined to be paroxysmal AF by a cardiologist friend outside the clinical setting. Despite the persistence of his symptoms, he had not previously sought a formal cardiology evaluation.

The patient's past medical history was notable for atopic rhinitis, actinic keratosis, longstanding left ear fullness and tinnitus, and asymmetrical sensorineural hearing loss. His surgical history included a hernia repair. The patient denied tobacco or vaping product use and reported moderate alcohol consumption consisting of approximately eight standard drinks per week. There was no history of illicit drug use. Family history revealed lung cancer, hypertension, and kidney failure.

On presentation at the family medicine clinic, his vital signs were stable with blood pressure of 132/80 mmHg and a resting rate of 50 beats per minute. Physical examination demonstrated a normal cardiac rate and regular rhythm with intact heart sounds (S1, S2), normal peripheral pulses, and normal respiratory effort with clear breath sounds. Review of systems was significant for malaise, fatigue, palpitations, and intermittent numbness/weakness. Initial laboratory evaluation was overall within normal range, with a blood urea nitrogen of 16 mg/dL, creatinine 0.92 mg/dL, potassium level 5.0 mmol/L, hemoglobin 14.7 g/dL, total cholesterol 200 mg/dL, LDL 130 mg/dL, HDL 44 mg/dL, triglycerides 146 mg/dL, and HbA1c 5.5%.

Initial management focused on ambulatory rhythm monitoring using a consumer-wearable device for patient convenience to differentiate AF from premature beats. A confirmed episode of AF lasting several hours prompted a comprehensive laboratory workup, including thyroid function testing, and referral to cardiology. Transthoracic echocardiography revealed a dilated aortic root and ascending aorta, each measuring 4.1 cm, with mildly increased left atrial volume. Left ventricular size, wall thickness, and systolic function (ejection fraction 60%) were normal.

Given continued symptomatic episodes, it was recommended that the patient undergo continued cardiac monitoring for 30 days to attempt to document the arrhythmia. However, given the patient had documented paroxysmal AF from the rhythm strips produced by his consumer-wearable device, his care was able to be expedited straight to discussing treatment options. These included pharmacologic therapy with flecainide or a more definitive catheter-based ablation procedure. The patient decided to undergo the pulmonary vein isolation ablation procedure. Postablation, the patient reported a dramatic improvement in symptoms. He had one rare recurrence during skiing that quickly responded to flecainide.

At follow-up, the patient remained asymptomatic and free from AF without ongoing antiarrhythmic therapy. Serial home blood pressure monitoring demonstrated well-controlled systolic pressures (<130 mmHg). Although his

TABLE 1: A clinician's ABCD guide to wearable device use in clinical practice.

Letter	Component	Practical Considerations for Clinicians Using Wearables in Cardiovascular Care	Reference
A	Assess	Assess the clinical need and appropriateness for wearable use (e.g., arrhythmia detection, risk stratification). Evaluate device accuracy, regulatory status, and patient characteristics.	[14]
B	Be aware	Be aware of device limitations, potential sources of error (motion artifacts, skin tone, comorbidities), and data privacy concerns. Stay updated on device validation studies and regulatory changes.	[14]
C	Communicate	Communicate clearly with patients about device capabilities, limitations, and expectations. Educate on proper use, data interpretation, and when to seek medical attention.	[14]
D	Document/decide	Document device findings in the medical record. Decide on clinical action based on wearable data, integrating with standard diagnostic pathways, and confirming findings with gold-standard tests as needed.	[14]

CHA_2DS_2-VASc score was 1, the patient preferred to remain off anticoagulation after a thorough discussion of risks and benefits. Ongoing surveillance was recommended due to his aortic root dilation, with repeat imaging scheduled. The patient's counseling emphasized that the pulmonary vein isolation is not curative, and there is still a risk of recurrent symptoms in the years following the procedure. The patient expressed understanding of his condition and agreed to continue symptom monitoring, promptly report any changes, and follow up as directed in the clinic.

DISCUSSION

This case raises important considerations regarding the expanding and transformative role of consumer-wearable devices in diagnosing and managing paroxysmal AF, particularly for individuals in low-resource and medically underserved settings. Wearable devices uniquely bridge the gap between symptom onset and clinical confirmation by enabling continuous real-time monitoring and rhythm strip capture during symptomatic episodes without the need for scheduled clinic visits or invasive device placement.

Increasing availability of wearable technology reflects a broader shift toward enhanced patient autonomy in cardiac arrhythmia monitoring. This case is notable for the patient's use of a personal smartphone-linked wearable device to document symptomatic arrhythmia episodes outside of the clinical setting. As a result, the patient was able to bypass delays and logistical obstacles associated with traditional ambulatory monitoring and go directly to treatment. Upon presentation, this patient was able to forego repeat 30-day ambulatory monitoring and instead immediately proceed to a management strategy discussion and timely referral for pulmonary vein isolation ablation. This expedited approach minimized the burden and costs of redundant diagnostic processes, reduced time to definitive therapy, and potentially lowered the patient's risk of arrhythmia-related complications. Furthermore, this case demonstrates how wearable technology can empower patients to independently bridge critical diagnostic gaps, providing longitudinal data that support early diagnosis and accelerate access to definitive care in settings where formal cardiology evaluation and resources may be limited.

From a systems perspective, this case highlights how the surge in wearable-device adoption has pushed the cardiovascular management field toward a more decentralized and personalized care model. This may allow clinicians to offer wearable devices to patients in rural and low-resource settings to facilitate arrhythmia diagnosis. Guidelines such as the practical "ABCD" guide for clinicians, corroborated by Elshazly and colleagues (Table 1), could be further investigated to help evaluate a device's accuracy, clinical utility, cost, and alignment with established best-practice guidelines.[14]

Table 1 provides clinicians with a practical framework to integrate wearable devices into cardiovascular care by emphasizing the need to assess clinical appropriateness of wearable devices on an individualized basis.[14]

Although wearable technologies may expand arrhythmia surveillance and improve detection sensitivity, they unfortunately can pose risks and barriers to patients. Many wearable devices exhibit high sensitivity but lower specificity, which can lead to false positives, especially among younger healthier users.[15] This can contribute to potential overdiagnosis of arrhythmic episodes and unnecessary patient anxiety.[15] Conversely, older and high-risk populations, who may have the most benefit from consumer-wearable devices, may be less likely to use them. Additionally, potential barriers such as the need for electronic-device skills, software familiarity, and adequate financial support could exacerbate existing health disparities. A cost analysis of current arrhythmia-monitoring options is provided in Table 2.[14]

For osteopathic physicians and other healthcare clinicians, the implementation of wearable devices for AF monitoring aligns closely with the tenets of osteopathy and reinforces the importance of a holistic multidisciplinary approach to patient care. Wearable technologies enable patients to take an active role in their health management and allow clinicians to develop individualized care plans that consider both physiologic and psychosocial factors. This approach facilitates the integration of wearable data

TABLE 2: Cost analysis of current arrhythmia monitoring options.

Device Type	Monitoring Modality	Upfront/Per-Use Cost (USD)	Replacement Interval	FDA Clearance for AF Detection	Key Limitations/Notes	Reference
Smartwatch	Photoplethysmography ± single-lead ECG	$250-$400	~5 years	Yes (irregular pulse only)	Requires confirmatory ECG for diagnosis; sensitivity lower in some populations	[14]
Handheld ECG	Single-lead ECG	$99-$149	~5 years	Yes	User-activated; 2%-15% tracings uninterpretable; accuracy improved with clinician read	[14]
Ambulatory ECG patch	Continuous multiday ECG	$300-$400	Single use	Yes	Prescription only; highest sensitivity; higher per-episode cost	[14]

into comprehensive preventive care strategies, while maintaining awareness of barriers such as health literacy and equitable access. By adopting these technologies, physicians can reinforce therapeutic partnerships focused on education and patient autonomy, ultimately advancing whole-person health and optimizing cardiovascular outcomes.

This case underscores the clinical significance of consumer-wearable devices in expediting the diagnosis and management of paroxysmal AF. Future research should focus on defining optimal monitoring durations, establishing thresholds of clinical significance for device-detected AF, and evaluating the cost-effectiveness of consumer wearable-driven screening and management strategies.

CONCLUSION

This case demonstrates the transformative potential of consumer-wearable-driven technology in the early detection and management of paroxysmal AF. It emphasizes the value of integrating patient-driven monitoring with clinical care to bridge diagnostic gaps, particularly in settings with limited access to specialized cardiology resources. Consumer-wearable devices can facilitate timely diagnosis, support personalized treatment plans, and reduce the burden of prolonged or redundant monitoring. Additionally, the shift towards continuous real-time arrhythmia surveillance aligns with holistic care principles by promoting patient autonomy and supporting shared decision-making.

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CASE REPORT

Identifying and Treating Concurrent Referred and Musculoskeletal Back Pain Using an Osteopathic Approach

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KEYWORDS

Osteopathic manipulative treatment

Referred pain

OMT

Viscerosomatic reflex

Chronic back pain

ABSTRACT

OMT is often used to treat musculoskeletal pain complaints. OMT can also help reveal and treat referred pain from visceral dysfunctions. This case illustrates the evaluation and treatment of both local tissue dysfunction and visceral sources of a single patient's pain.

A 44-year-old female presented with 10 years of thoracic pain medial to the inferior angle of the right scapula and 2 to 3 years of right-sided lumbar back pain near L4. Physical therapy, chiropractic, and massage therapy briefly reduced both, but failed to provide resolution. Imaging was reported as unremarkable. Medical history included gallstones with subsequent cholecystectomy, and multiple renal calculi requiring stent placement. Examination revealed rib and thoracic dysfunctions that reproduced the patient's symptoms. They were successfully treated with OMT but failed to significantly reduce her pain. Given the cholecystectomy, a referred pain pattern was then considered. Tissues at the former base of the gallbladder were restricted, which was treated with myofascial release, resulting in immediate resolution of her thoracic back pain. Two weeks later, a viscerosomatic cause for her lumbar back pain was sought, given the history of renal lithiasis, but there were no transabdominal visceral findings. The local lumbar dysfunction was successfully treated with OMT, showing it to be effective in complete and longstanding symptom resolution.

This case illustrates the benefit of seeking a visceral cause despite the appearance of local mechanical/tissue dysfunction pain. Similarly, despite a high likelihood of a viscerosomatic cause, local somatic dysfunction may still be causative, despite the prior failure to resolve with similar musculoskeletal treatments.

INTRODUCTION

Osteopathic manipulative medicine (OMM) is a treatment modality taught in osteopathic medical schools and used primarily by osteopathic physicians. It is often, but not solely, used to treat musculoskeletal pain. OMT has shown to be effective in helping treat other medical conditions related to the viscera, such as pneumonia[1,2] and sinusitis.[3] Visceral irritation has the potential to cause predictable referred pain patterns[4] as well as palpable somatic changes due to viscerosomatic reflexes.[5] These viscerosomatic changes can occur due to irritation or inflammation of the organ itself, the organ's capsule, or the surrounding fascia.[5] This is the case of a 44-year-old female who presented with chronic thoracic and lumbar back pain, both of which had potential for visceral source. It was considered that both her thoracic and lumbar back pain may have been referred pain, given the long duration of symptoms, previous cholecystectomy surgery, multiple renal lithiasis episodes, and failure to resolve with other musculoskeletal treatments.

CASE PRESENTATION

A 44-year-old female presented to the OMM clinic with 10 years of continuous dull, achy, right midthoracic pain inferior and medial to the scapular border, and 2 to 3 years of continuous dull, achy right low lumbar pain at the level of L4, 2 inches lateral to spinous process. Neither had pain radiation or an inciting event.

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She had tried physical therapy, chiropractic, and massage therapy, which only reduced but never resolved either pain, and improvements in both only ever lasted a few days. She denied numbness, tingling, loss of strength or coordination, or loss of bowel or bladder control. The patient reported having X-ray, magnetic resonance imaging (MRI), and computed tomography (CT) scans of both thoracic and lumbar spine. While these images were not accessible, the patient reported that various practitioners identified "no significant findings that would explain [her] pain." Past medical history included passing approximately 20 kidney stones between 2022 and 2024 with the assistance of stent placement, gallstones with subsequent cholecystectomy, and four pregnancies. She also had a tonsillectomy and right plantar fascia surgery. Her medications were prescription cholestyramine and semaglutide, as well as vitamin B_{12}, vitamin D, and iron supplements. She walked two times per week for exercise and worked on a computer all day. Examination showed two+ pulses in all distal extremities and two+ deep tendon reflexes in the biceps, brachioradialis, patellar and Achilles tendons bilaterally. Bilateral strength was 5/5 in elbow flexion and extension, shoulder abduction, knee flexion and extension, and hip flexion. Sensation was intact to light touch in the C6-C8 and L4-S1 dermatomes bilaterally, except for diminished sensations in the lateral third of both the dorsal and plantar aspects of the right foot, which the patient attributed to her previous plantar fascia surgery. The hip drop test was negative. T7 was F RR SR, T8 was E RL SL, and the right rib 7 was posteriorly translated. Lumbar evaluation and treatment were deferred for the second visit.

Initial assessment suggested that the rib and thoracic somatic dysfunctions were likely causing her symptoms. Successful treatment with OMT utilizing high-velocity low-amplitude (HVLA) to the thoracic spine and rib balance ligamentous tension (BLT) techniques only mildly reduced the patient's pain. The history, findings, and lack of response to initial treatment led us to consider a referred pain pattern with viscerosomatic reflexive tissue dysfunction. Palpation of the fascia of the hepatoduodenal ligament and the region of the former base of the gallbladder found them to be both restricted and congested, and palpation reproduced her thoracic back pain. These tissues were then successfully treated with direct myofascial release. While monitoring the location of thoracic pain, significant warmth was palpated during the release of the abdominal fascial tissue restrictions. Immediately thereafter, the patient reported significant reduction of thoracic back pain and tenderness. Posttreatment assessment was that intraabdominal soft tissue dysfunction was causing referred pain to the posterior midthoracic region medial to the right scapula and reflexively inducing the rib and vertebral dysfunctions.

The patient returned for reevaluation 2 weeks later, upon which she reported, "I have had constant [posterior thoracic] pain for 10 years; it is now completely gone."

The patient's low back pain persisted unchanged from the first visit: around L4, worse at night, and improved by sleeping on her left side with occasional "muscle spasms" in the area. The history of the stent placement and kidney stones, and prior viscerosomatic dysfunction, gave us a high level of suspicion of—and prompted an immediate search for—a similar viscerosomatic cause. Osteopathic examination found L2 to be F RR SR, right posteriorly rotated innominate, a left on right sacral torsion, and fascia bogginess 1 cm superior to right posterior superior iliac spine (PSIS). There was, however, no somatic dysfunction found of the kidneys, ureter, or bladder, or the deep abdominal fascia along their path. Assessment was somatic dysfunction of lumbar, pelvic, and sacral regions but not referred pain or viscerosomatic reflexive changes.

The patient was successfully treated with muscle energy to the lumbar, pelvis, and sacrum, and counterstrain technique to the posterior iliolumbar fascia, with significantly improved symptoms at the end of the visit. The patient was not seen for a follow-up evaluation but during a social encounter several weeks later, the patient reported persistent total resolution of all symptoms.

DISCUSSION

The patient reported that neither multiple practitioner evaluations, nor X-ray, MRI, or CT scans of both thoracic and lumbar spine found "anything that would explain [her] pain." (These images were unavailable.) With response to treatment of the intraabdominal fascia, we conclude that her midthoracic back pain was referred pain from fascial restrictions due to a previous cholecystectomy surgery. The pattern of referred pain from gallbladder to the scapular region is documented in the literature and textbooks.[4,6-8] As the gallbladder is sympathetically innervated by spinal roots of T5-T9, it can cause viscerosomatic dysfunctions anywhere within this spinal level range.[5] This patient's pain pattern appeared to be present, despite the removal of the gallbladder, and was likely due to postsurgical fascial restrictions.

The organs sympathetically innervated by spinal roots of T10-L2 include the kidney, ureter, and bladder[5]—locations consistent with affected organs within the patient's history and the found L2 dysfunction. Following a similar thought process from the last visit and considering the patient's similar failure to respond to prior outside treatments, a search for visceral dysfunction was undertaken. No significant visceral source was found to relate to her lumbar back pain and palpation of the intraabdominal tissues failed to reproduce lumbar symptoms. Her lumbar

pain resolved with local musculoskeletal treatments of the lumbar spine, pelvis, and sacrum.

This case is an interesting example where both local musculoskeletal and distant referred pain were present at the same time and each pain had significant potential for having either a visceral or a direct musculoskeletal source. This case highlights the need to keep suspicions high and pursue alternative sources for musculoskeletal pain.

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PATIENT EDUCATION HANDOUT

GERIATRICS

Preventing Injuries From Mobility and Disability Aids

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WHAT ARE MOBILITY AIDS?

Mobility aids include canes, walkers, wheelchairs, and patient lifts. These devices help older adults move safely and maintain independence.[1] While they reduce fall risk during movement, injuries can still happen–especially during transfers like moving from a bed to a chair, toilet, or wheelchair.

Research shows that transfers involving mobility devices can carry a significant fracture risk in elderly women and all adults over the age of 85 years.

WHY ARE LIFT-RELATED FALLS SERIOUS?

Falls during transfers are different than typical walking falls. When being moved during a transfer or with a patient lift, there can be a sudden drop or fall backwards, increasing the risk of serious injury to the head or neck.

HOW CAN YOU REDUCE YOUR RISK?

At home:

- Ensure lifts are properly fitted and maintained.
- Have a trained caregiver to assist with transfers.
- Remove clutter and improve lighting.
- Use nonslip footwear.
- Stay physically active to improve balance.

Improve Strength and Balance

Exercises that improve balance and coordination may lower fall risk. Your doctor may recommend physical therapy or osteopathic manipulative therapy (OMT), which has been shown to improve balance in older adults.

MEDICATIONS AND BONE HEALTH

Your doctor may prescribe calcium, vitamin D, or other osteoporosis medication (bisphosphonates) to help strengthen bones and reduce fracture risk.

WHEN SHOULD YOU CALL YOUR DOCTOR?

Call your doctor if you:

- Fall, even if you feel fine afterward.
- Hit your head.
- Feel dizzy or unsteady.
- Notice new weakness or balance problems.

HELPFUL RESOURCES

CDC Fall Prevention: https://www.cdc.gov/falls/about/index.html

National Council of Aging Fall Prevention: https://www.ncoa.org/older-adults/health/prevention/falls-prevention/

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PATIENT EDUCATION HANDOUT

MEN'S HEALTH

Prostate Health: Screening and Management

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WHAT IS THE PROSTATE

The prostate is a small gland found in biological males, located just below the bladder, and it is about the size of walnut. Its main function is to help with reproduction by producing fluid that nourishes and transports sperm. As men get older, the prostate can enlarge. This is common but may lead to health issues that affect daily quality of life, such as difficulty urinating, frequent urination (especially at night), or a weak urine stream.

COMMON PROSTATE PROBLEMS

- **Benign Prostatic Hyperplasia (BPH)**: A noncancerous enlargement of the prostate that can make it hard to urinate.
- **Prostate Cancer:** The most common type of cancer in men in the United States.
- **Prostatitis**: Swelling or infection of the prostate that can cause pain, fever, or burning when urinating.

SYMPTOMS TO WATCH FOR

See your doctor if you notice any of the following:

- A strong or frequent urge to urinate.
- Waking up often at night to urinate.
- Blood in your urine or semen.
- Dribbling urine or a weak stream.
- Painful ejaculation.
- Fever and chills (which may be a sign of infection).

UNDERSTANDING SCREENING

Deciding whether to screen for prostate cancer is a decision you and your doctor make together.

- **Prostate-Specific Antigen (PSA) Test**: A simple blood test. A high PSA does not always mean cancer. It can also be high due to age or infection.
- **Digital Rectal Exam (DRE)**: A quick exam where the doctor gently feels the prostate to check for lumps or changes.

Who Should be Screened?

- **Average Risk**: Men ages 55 to 69 years old should talk with their doctor about prostate cancer screening.
- **Higher Risk**: Men who are African American or who have a family history of prostate cancer should discuss screening between ages 40 and 45 years.

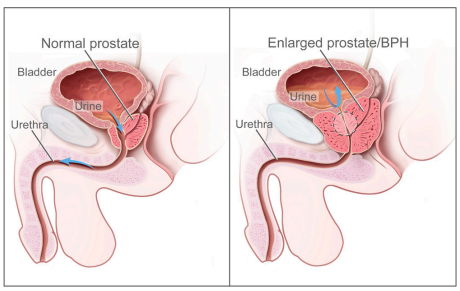
MEDICAL MANAGEMENT

- **BPH**: Doctors may use medications to relax the muscles around the bladder or shrink the prostate. If medicine does not help, a specialist may discuss surgical options.
- **Prostatitis**: Usually treated with antibiotics.
- **Cancer**: A specialist may use imaging tests, magnetic resonance imaging (MRI), or a biopsy (removing a small sample of tissue) to decide on the best treatment.

WHAT CAN I DO NOW?

- Drink less fluid before bed.
- Limit caffeine and alcohol.
- Maintain a healthy weight.
- Engage in regular physical activity.

FIGURE 1: Image showing enlargement of prostate.[5]



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