

Rx

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Volume 11

Rethinking Prescription:

**EXPLORING BEYOND
PHARMACOTHERAPY IN
GERIATRIC MEDICINE**

The National Geriatrics
Interest Group Publication



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The National Geriatrics Interest Group Publication Volume 11 | May 2024

The NGIG is a centralized medical student-led group with the goal of bringing together individual Geriatrics Interest Groups and creating Canada-wide education initiatives in the field of aging.

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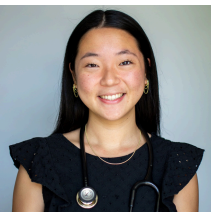
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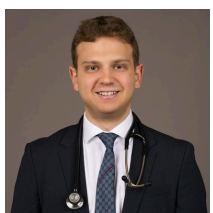
MD Candidate 2024
Western University

Aruni Jayatilaka is a fourth-year medical student at Western University. Her interest in geriatric care stemmed from her participation and subsequent leadership as co-director of the Interprofessional Seniors Outreach Program during her Master's at University of Toronto. During medical school, she was involved in Western's Student-Senior Isolation Prevention Partnership, along with serving as junior and senior executive of the Schulich Geriatrics Interest Group, and past vice president of research at National Geriatrics Interest Group. She is passionate about interprofessional collaboration in providing comprehensive geriatric care and looks forward to participating in geriatric care-related opportunities during her family medicine residency.



MD Candidate 2025
Queen's University

Angela Luan is a third-year medical student who has been interested in geriatrics since volunteering in her local Hospital Elder Life Program during high school. Since then, she has been involved with volunteering at a retirement home during her undergraduate degree, as well as leadership involvement with her local geriatric interest group and the National Geriatrics Interest Group. She has also been involved with geriatrics research for several years through the Mount Sinai/UHN Geriatrics Summer Scholars Program and as a member of the GERAS Delirium Research Group. She is excited to continue pursuing geriatrics as she progresses through her medical career!



MD Candidate 2024
McGill University

Andrew Stein is a fourth-year medical student at McGill University. He became interested in Geriatric Medicine in high school when he volunteered at a hospital where he had the privilege of listening to elderly World War II veterans. In medical school, inspired by an encounter in his General Internal Medicine rotation with an older veteran experiencing loneliness, he served as last year's McGill Medical Students' Society Geriatrics Interest Group's representative for the National Geriatrics Interest Group and this year's MGIG Co-President. He has worked locally and nationally to advocate and create meaningful events fostering knowledge and passion for geriatric care among his peers. He will be starting residency in Internal Medicine at the University of Ottawa, and looks forward to continuing to care for older adults throughout his career.

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National Geriatrics Interest Group



@NGIG1415

LETTER FROM THE NGIG CO-CHAIRS

In the constantly evolving landscape of medicine, it is imperative that we continue to explore innovative approaches and broaden our perspectives of the way care can be provided. With this in mind, it gives us great pleasure to introduce the 11th edition of the National Geriatrics Interest Group's (NGIG) publication, centered around the theme "Rethinking Prescription: Going Beyond Pharmacotherapy in Geriatric Medicine." As our population ages, the complexities of managing healthcare for older adults becomes increasingly apparent. While medications have no doubt had a significant impact on various geriatric conditions, it is essential to recognize that caring for an individual goes beyond just what a simple pill can provide. Hence, this issue delves into the realm of more holistic care, urging us to consider multiplex factors that make up an older individual's healthcare needs. By considering and adopting more holistic approaches, we can strive towards achieving better health outcomes and enhancing the quality of life for our aging population.

The NGIG is a national student-led organization that seeks to advance advocacy work for our older population. From our annual publication, to our #WhyGeriatricsWednesdays (social media posts highlighting initiatives benefiting our older population), our NGIG executives and local Geriatric Interest Group (GIG) leaders have been working hard to educate medical students and the public about the increasing care needs of our aging population. Beyond our annual publication and social media presence, we continue to highlight student geriatric researchers and their groundbreaking work. We are also preparing to host our second in-person NGIG Student Day at the Canadian Geriatric Society Annual Scientific Meeting (previously virtual during COVID-19) in Calgary, Alberta. We continue to support local GIGs in their own initiatives across Canada, from British Columbia to Newfoundland. We are also privileged to have ongoing funding for granting annual leadership and research awards to medical students who strive to advance knowledge and initiatives that benefit the individuals aging around us.

All of the aforementioned activities, including this publication, would not be possible without the immense support and effort from many individuals and organizations. We would like to kindly thank the Canadian Geriatric Society (CGS) for their ongoing funding and support from the board. We would also like to thank Dr. Tricia Woo, who has been a long-standing mentor to NGIG, and for her efforts in making past publications successful. A special thanks goes to Dr. Magda Lenartowicz as well, who makes funding our scholarships possible, as well as future initiatives in the works. Another thanks goes out to the Resident Geriatrics Interest Group, for their willingness to collaborate on a variety of projects. Lastly, a large and special thanks goes to our NGIG Co-Editors in Chief: Aruni Jayatilaka, Angela Luan, and Andrew Stein (fondly dubbed the A-team for good reason!). They have put in an incredible amount of thought and effort to make this publication successful and worth the read.

With that, I encourage you to immerse yourself in the diverse perspectives within these pages and to engage in critical reflection on how we can collectively redefine the paradigm of geriatric medicine. We thank you for your support and consideration of our approach to care in the older population by picking up this publication to read. Enjoy!

Sincerely,

Stephanie Cullen and Trina Gartke
NGIG Co-Chairs 2023-2024



MD Candidate 2024
Queen's University

Stephanie Cullen is one of the NGIG Co-Chairs and a fourth-year medical student at Queen's University. She became interested in Geriatric Medicine during her undergraduate degree when she spent two summers working in a long-term care home, and went on to complete a Master's Degree in Geriatric research before starting medical school. During her time at Queen's she was an executive member of the Queen's Geriatric Interest Group, spent two years as VP External of NGIG before becoming co-chair, and completed two summers with the Mount Sinai/UHN Geriatrics Summer Scholars Program. Stephanie will be continuing her passion for working with older adults with cognitive impairment as a resident in Neurology at Queen's.



MD Candidate 2024
University of Alberta

Trina Gartke is finishing up her fourth year of medical school at the University of Alberta. She has been privileged to be a part of the National Geriatrics Interest Group for all four years of her medical training in the roles of Vice President Research and Co-Chair. Trina first fell in love with caring for the older population 10 years ago over many cribbage games at her local seniors' home. Passionate about ensuring the needs of the older population are met, she plans on engaging in future healthcare policy work involving our aging population. She will be starting residency in Internal Medicine at the University of Alberta, with the ultimate goal of pursuing a fellowship in Geriatrics.



STEP BY STEP TO BETTER HEALTH: THE HEEL2TOE SOLUTION FOR CANADIAN SENIORS

Kedar K. V. Mate, Ph.D, MD candidate 2026
McGill University, Montreal, QC

Canadian seniors wish to age well and remain active even with an increasing burden of morbidity and disability. The senior population is expected to increase from 15% to 23% over the next 15 years rising from some 3.5 million to over 4 million (1, 2). Many seniors wish to age actively despite health conditions and walking is the most practical way of maintaining activity. Natural aging affects balance, strength, flexibility, and endurance (3, 4) which results in a walking pattern that is slower and requires more effort. Eventually, seniors choose to walk less and less. Illness or injury can accelerate this downward cascade and lead to permanent disability and premature mortality.

Walking is the most valued life activity with well-known physical and health benefits (5). Public health agencies around the world recommend walking as one of the most accessible ways in which people can mitigate the effects of aging and health challenges and promote wellness. Physical activity guidelines for seniors recommend 150 minutes of moderate-intensity exercise accumulated over one week in bouts of 10 minutes (6). Walking for 10 minutes at a pace of 100 steps a minute, twice a day, would meet this guideline (7). However, many people cannot walk well enough to meet recommended walking targets at an intensity of 100 steps per minute. Despite the capacity to walk at a health-promoting pace when tested clinically, in the real world, it is rare for seniors in North America to do so for more than a few minutes per day (8).

Reasons for failing to meet the recommended walking targets include fear of falling or age-related gait abnormalities (9, 10). These factors are known to cascade into a slow, unstable, shuffling pattern that increases work of walking, fatigue, risk of falls, hip fracture, and even death (11-14). There is considerable evidence that gait training is effective in improving gait patterns in seniors but its effects abate with the cessation of the training (15-20). Hence, gait training alone, will not translate into the sustained behavioural change needed for physical activity guidelines to be met.

A Health Innovation Solution

Putting the heel first while walking is a simple strategy that changes posture from stooped to upright and lengthens the stride. In the absence of continuous reminders, patients revert to an inefficient foot-flat gait. Our team have developed the Heel2Toe™ sensor (21-25; Fig. 1), a smart wearable technology that attaches to the side of the shoe and provides real-time auditory feedback for good steps, defined as a gait cycle that is initiated with a heel-strike. Auditory feedback as a reward for a “good” step stimulates the brain by targeting the dopamine system and imprints the more optimal gait pattern.

PhysioBiometrics Inc. (<https://physiobiometrics.com>) is a McGill spinoff company dedicated to developing accessible technologies so people with movement vulnerabilities can move better to move more. The pivotal technology of PhysioBiometrics Inc. targets walking BEST (Better, Faster, Longer, Stronger) using a sensing and feedback device. The Heel2Toe sensor is optimized through the Walk-BEST program which has a suite of supporting products providing instruction, in-person or remotely, on optimal walking including workshops, workouts, and videos.

Evidence of effectiveness

In addition to testing 130 persons with gait impairments (26), a pilot study supporting the feasibility of using the Heel2Toe for gait training at home was conducted with six seniors (24). Six participants, purposely selected for having a range of walking capacity from ‘very limited’ to ‘functional’, received five training sessions. All together, five participants responded to the Heel2Toe device by improving the percent of good steps, higher angular elocity, improved cadence, or longer walking bouts. The most functional walker showed no change as they had a higher score at baseline for the above parameters but enjoyed the system and appreciated how it would prevent deterioration.



Figure 1. The Test Model of the Heel2Toe Device Positioned with a Clip

Table 1. Immediate response to auditory feedback at baseline

ID	Percentage of good steps recorded over a two minute period (%)		Angular velocity (deg/sec)		Cadence (steps per minute)	
	Without feedback	With feedback	Without feedback	With feedback	Without feedback	With feedback
5	0	56	-48	-102	70	69
1	43	82	-97	-128	95	102
6	80	83	-147	-157	97	95
2	84	97	-145	-186	110	95
4	92	92	-165	-173	113	110
3	93	99	-163	-213	96	95

Table 2. Distribution of time (minutes) walked during each training day and duration of longest walking bout (min) during the training sessions.

ID	Total time walked during training days ^a (min)					Longest walking bouts during training days (min)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
5	8	6	20	11	8	2.2	3.7	3.5	4.3	3.3
1	7	6	8	9	11	2.9	2.6	2.8	3.5	4.2
6	17	17	11	18	15	9.4	17.5	11.6	18.2	8.3
2	13	20	30	18	32	7.1	8.6	19.3	18.0	17.4
4	15	16	16	16	12	9.7	7.5	11.7	16.2	5.1
3	11	4	17	19	22	8.6	4.3	17.4	15.3	15.7

^aRounded to integers

Table 3. Carry over effects of 5 days of training with Heel2Toe device on gait parameters measured without feedback.

ID	Percentage of good steps recorded over a two minute period (%)		Angular velocity (deg/sec)	Cadence (steps per minute)	
	Starting	Change	Change	Starting	Change
5	0	28	32	70	6
1	42	37	28	95	8
6	79	9	15	97	3
2	84	13	82	110	10
4	92	2	10	113	-8
3	93	5	86	96	13

Table 4. Response to 5 days of training with auditory feedback from Heel2Toe Device.

ID	Percentage of good steps recorded over a two minute period (%)		Angular velocity (deg/sec)		Cadence (steps per minute)	
	Baseline without feedback	Final with feedback	Baseline without feedback	Final with feedback	Baseline without feedback	Final with feedback
5	0	66	-48	-101	70	84
1	43	90	-97	-147	95	96
6	80	92	-147	-159	97	99
2	84	94	-145	-209	110	121
4	92	93	-165	-173	113	111
3	93	100	-163	-264	96	109

Results

There was an immediate response to having positive feedback on % good steps among the 3 of 4 people with less than 90% good steps from the study start (Table 1). However, there was an immediate large response on angular velocity of the ankle which indicates the angle of heel strike and the rapidity of foot descent owing to the greater angle at contact. These changes occurred while maintaining usual cadence.

The results of using the Heel2Toe device on the duration of walking. On each training day, participants were instructed to walk for at least 15 minutes with the device at a comfortable pace and taking rests when needed. These data show that of the 24 person-days of training following the initial experience (day 1) half were for 15 minutes or more. However, the most dramatic effect was seen for the duration of walking bouts which frequently exceeded 10 minutes for four of the six participants when only one person approached this at baseline (Table 2).

After five days of training people were able to transfer the gains made using real time feedback on stepping patterns into their usual walking pattern without feedback (Table 3). Five of the six participants achieved 90% of good steps without slowing cadence, in fact, cadence increased by more than 10% in half of the subjects (Table 4). Angular velocity was increased in all showing an increased gait quality (Table 3). Subject 5 was essentially home bound.

How It Works?

Fear of falling and age or illness-related changes co-occur in the majority of seniors and can induce an inefficient and dangerous gait pattern (9, 10). To normalize walking, people must relearn motor sequences of good walking and develop needed adjuncts to efficient walking; flexibility, strength, power, core stability, balance, and arm swing. Therapy targets elements of walking mentioned above but motor learning requires instruction, practice, and feedback. Motor learning is framed as a lasting change of performance occurring with training in which parameters of a "motor program" are developed and consolidated. Early on, forming the motor program of the "to-be-learned task" can occur rapidly but is very attention-demanding. Later, the motor program is refined with feedback error correction mechanisms and reducing movement variability.



Photo taken by: Argelia Luari

The phenomenon underlying motor learning is mostly due to neural plasticity 29-31. A review of neural plasticity by Cai L. and colleagues (28) indicates that motor learning takes place with an active practice of a skill and that this activity-dependent neural plasticity can be induced by both lengthy-extensive and brief-intensive practice. The authors of this review state: "To maximize human brain fitness and motor functions signalled by the quality of life and independence in daily activity, habitual cognitive and motor learning or practice is required across the lifespan, particularly for older adults."

The literature supports the benefit of augmented feedback for motor learning (29-32). In particular, sonification for correct movement sequences has been shown to enhance motor learning in elite athletes (31); but is less useful for novices who have no idea of the correct movement. Walking is a natural way to get about (8) and older persons are not novices to walking but have lost the expertise with age. Hence, it can be optimized using auditory feedback through the sensor.

This is a completely novel and original approach to gait enhancement.

References

1. Bray G, Strachan D, Tomlinson M, Bienek A, Pelletier C. Mapping Connections: an understanding of neurological conditions in Canada. Ottawa: Public Health Agency of Canada. 2014.
2. Turcotte M, Schellenberg G. A portrait of seniors in Canada [Catalogue no. 89-519-XIE]. Ottawa, Ontario: Statistics Canada. 2006.
3. Aboumoradi A, Arazpour M, Bahramizadeh M, Hutchins SW, Fadzayevatan R. The effect of aging on gait parameters in able-bodied older subjects: a literature review. *Aging Clin Exp Res*. 2016;28:393-405.
4. Hunter SK, Pereira HM, Keenan KG. The aging neuromuscular system and motor performance. *J Appl Physiol*. 2016;121(4):982-995.
5. Hart J. The health benefits of walking. *Alternative and Complementary Therapies*. 2009;15(1):7-10.
6. Tremblay MS, Warburton DE, Janssen I, Paterson DH, Latimer AE, Rhodes RE, et al. New Canadian physical activity guidelines. *Appl Physiol Nutr Metab*. 2011;36(1):56-64.
7. Paterson DH, Warburton DE. Physical activity and functional limitations in older adults: a systematic review related to Canada's Physical Activity Guidelines. *IJBNPA*. 2010;7(1):1-22.
8. Tudor-Locke C, Combi SM, Leonardi C, Johnson WD, Katzmarzyk PT, Earnest CP, et al. Patterns of adult stepping cadence in the 2005-2006 NHANES. *Prev Med*. 2011;53(3):178-81.
9. Ayoubi F, Louney CP, Annweiler C, Beauchet O. Fear of falling and gait variability in older adults: a systematic review and meta-analysis. *J Am Med Dir Assoc*. 2015;16(1):14-9.
10. Jankovic J. Gait disorders. *Neural Clin*. 2015;53(1):249-68.
11. Johansson C, Mellström D, Nilsson I, Rundgren Å, Ekelund P. Prevalence of fractures among 10 000 women from the 1900 to 1940 birth cohorts resident in Gothenburg. *Maturitas*. 1991;14(1):65-74.
12. O'Loughlin JL, Robitaille Y, Boivin J-F, Suissa S. Incidence of and risk factors for falls and injurious falls among the community-dwelling elderly. *Am J Epidemiol*. 1993;137(5):542-54.
13. Collet F, Klemm S, Ducher M, Aussen A, Schott A-M. Hip fracture in the elderly: a re-analysis of the EPIROS study with causal Bayesian networks. *PLoS One*. 2015;10(5):e0120125.
14. Middleton A, Fritz SL, Lusardi M. Walking speed: the functional vital sign. *J Aging Phys Act*. 2015;23(2):314-22.
15. Solbach N, Mayo N, Wood-Dauphinee S, Hanley J, Richards C, Cote R. A task-orientated intervention enhances walking distance and speed in the first year post stroke: a randomized controlled trial. *Clin Rehabil*. 2004;18(5):509-19.
16. Cadore EL, Rodríguez-Mañas L, Sinclair A, Izquierdo M. Effects of different exercise interventions on risk of falls, gait ability, and balance in physically frail older adults: a systematic review. *Rejuvenation Res*. 2015;16(2):105-14.
17. Granacher U, Gollhofer A, Hortobágyi T, Kressig RW, Muehlbauer T. The importance of trunk muscle strength for balance, functional performance, and fall prevention in seniors: a systematic review. *Sports Medicine*. 2015;45:627-41.
18. Giné-Garriga M, Raouf-Figueroa M, Coll-Planas L, Sirjo-Robert M, Salva A. Physical exercise interventions for improving performance-based measures of physical function in community-dwelling, frail older adults: a systematic review and meta-analysis. *Arch Phys Med Rehabil*. 2014;95(4):753-69.
19. Gandolfi M, Dimitrova E, Nicolli F, Modenese A, Serino A, Waldner A, et al. Rehabilitation procedures in the management of gait disorders in the elderly. *Minerva Medica*. 2015;106(5):287-307.
20. Baker MK, Atlantis E, Fiatarone Singh MA. Multi-modal exercise programs for older adults. *Age Ageing*. 2007;36(4):375-81.
21. Vadnaker A, Figueiredo S, Mayo NE, Kearney RE. Classification of gait quality for biofeedback to improve heel-to-toe gait. *Annu Int Conf IEEE Eng Med Biol Soc*. 2014;2014:5626-9.
22. Vadnaker A, Figueiredo S, Mayo NE, Kearney RE. Design and Validation of a Biofeedback Device to Improve Heel-to-Toe Gait in Seniors. *IEEE J Biomed Health Inform*. 2018;22(1):140-6.
23. Mate KKV, Abou-Sharek A, Morais JA, Mayo NE. Putting the best foot forward: Relationships between indicators of step quality and cadence in three gait vulnerable populations. *NeuroRehabilitation*. 2019;44(2):295-301.
24. Mate KKV, Abou-Sharek A, Morais JA, Mayo NE. Real-Time Auditory Feedback-Induced Adaptation to Walking Among Seniors Using the Heel2Toe Sensor: Proof-of-Concept Study. *JMIR Rehabil Assist Technol*. 2019;6(2):e15889.
25. Cavallho LP, Mate KKV, Cinar E, Abou-Sharek A, Lafontaine AL, Mayo NE. A new approach toward gait training in patients with Parkinson's Disease. *Gait Posture*. 2020;81:14-20.
26. Mate KKV, Abou-Sharek A, Morais JA, Mayo NE. Putting the best foot forward: Relationships between indicators of step quality and cadence in three gait vulnerable populations. *NeuroRehabilitation*. 2019;44:295-301.
27. Mate KKV, Abou-Sharek A, Mansoubi M, Alsaami A, Dawes H, Michael W, et al. Evidence for the Efficacy of Commercially Available Wearable Biofeedback Gait Devices: Consumer-Centered Review. *JMIR Rehabil Assist Technol*. 2025;10:e40680.
28. Cai L, Chan JS, Yan JH, Peng K. Brain plasticity and motor practice in cognitive aging. *Front aging neurosci*. 2013;5:11.
29. Rosati G, Rodà A, Avanzini F, Masiero S. On the role of auditory feedback in robot-assisted movement training after stroke: review of the literature. *Comput Intell Neurosci*. 2013;2013:11.
30. Sigrist R, Rauter G, Riener R, Wolf P. Augmented visual, auditory, haptic, and multimodal feedback in motor learning: a review. *Psychon Bull Rev*. 2015;20:21-55.
31. Leuber B, Keller M. Improving motor performance: Selected aspects of augmented feedback in exercise and health. *Eur J Sport Sci*. 2014;14(1):36-45.
32. Van Vliet PM, Wolf P. Extrinsic feedback for motor learning after stroke: what is the evidence? *Disabil Rehabil*. 2006;28(13-14):831-40.

A scenic landscape photograph of a mountain range. In the foreground, several tall, dark green evergreen trees are visible. The middle ground shows a range of mountains partially obscured by a thick layer of white mist or low clouds. The sky above is a clear, bright blue with some light, wispy clouds near the horizon.

About the Author

Kedar K. V. Mate is a M.D., C.M. student at McGill University, Canada. He is a health outcomes researcher and has a Ph.D. from McGill University. He is also a co-founder and Vice-President of Physiobiometrics Inc. He is interested in measuring function and disability, specifically developing and testing measures of quality of life and patient experiences with health services and health care delivery. His research is focused on gait, vulnerable populations, older adults, and people with neurological conditions. To his credit, he has several publications and book chapters, regularly presents his works at scientific events, and actively participates in various committees and organizations.

BONE HEALTH

This is a one-page infographic outlining an approach to Bone Health in older adults, mainly aimed to assist medical learners. Despite the high likelihood of encountering geriatric patients in most medical specialties, the exposure that medical students get to high yield Geriatric Medicine concepts may be infrequent and inconsistent. This infographic aims to break down a so-called 'Geriatric Giant' and provide access to more evidence-based information and recommendations. Many of these recommendations have nothing to do with medication; rather, evidence demonstrates the importance of a holistic and preventative approach to bone health and falls in older adults.

Julia Simone, MD candidate 2025
McMaster University, Hamilton, ON

About the Author
Julia is a second-year medical student at the McMaster University.



Bone Health

Osteoporosis is defined as a bone mineral density ≥ 2.5 standard deviations of peak bone mass (**T-score**), and is a major risk factor for falls and fractures. More than **2 million** people live with osteoporosis in Canada.

★ We can assess fall and fracture **risk**, make evidence-based **recommendations**, and strategize fall **prevention**

FRAX FRACTURE RISK TOOL



- ✓ BMI $< 20 \text{ kg/m}^2$
- ✓ Previous Fracture
- ✓ Parent hip fracture
- ✓ Rheumatoid arthritis
- ✓ Secondary conditions contributing to bone loss
- ✓ Current smoking
- ✓ ≥ 3 alcoholic drinks per day

Age 50-64 with previous fracture or ≥ 2 risk factors

Age 65-69 with 1 risk factor

Age ≥ 70

Bone mineral density scan and FRAX score

EVIDENCE BASED RECOMMENDATIONS

1. Nutrition

- 🍏 **Calcium supplementation is not** recommended if meeting dietary allowance of calcium
- 🍏 **Vitamin D** according to Health Canada **is** recommended at 600 IU/day age 51-70 years, and 800 IU/day age > 70 years

2. Exercise

- 🏃 **Functional and balance training** $\geq 2 \text{ x/week}$ **can** reduce falls
- 🏃 **Progressive resistance training** $\geq 2 \text{ x/week}$ including abdominal and back extensor muscles **may** reduce mortality and improve quality of life, bone mineral density, and function

3. Pharmacotherapy

- 💊 **FRAX $\geq 20\%$ or T-score ≤ -2.5 & ≥ 70 years** pharmacotherapy is **strongly** recommended
- 💊 **FRAX 15-19.9% or T-score ≤ -2.5 & < 70 years** pharmacotherapy is **conditionally** recommended

PHONE A FRIEND

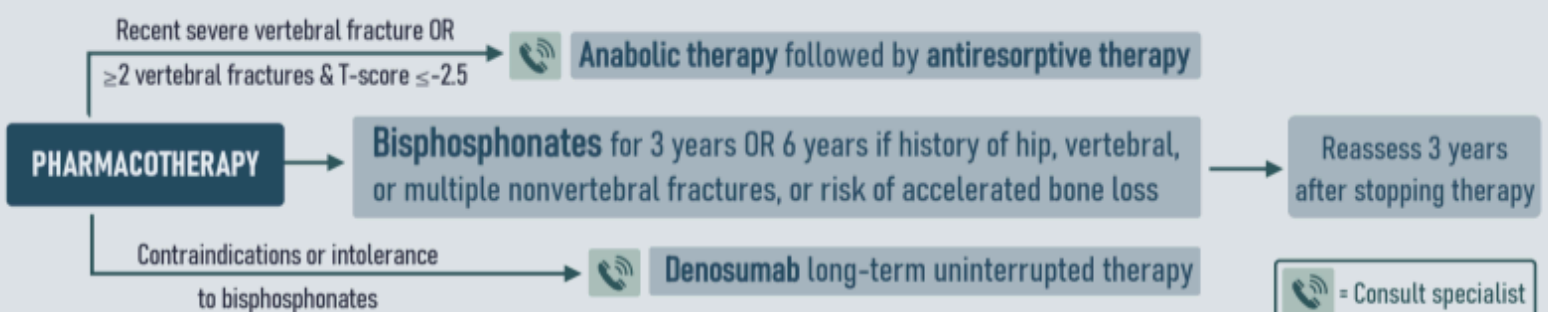
Secondary Osteoporosis due to conditions such as multiple myeloma or hyperparathyroidism may be better assessed by specialists including geriatricians and/or endocrinologists.

FALL PREVENTION

- ✓ Physicians should routinely inquire about falls, gait & balance, especially before starting new medication
- ✓ Use Gait Speed for fall risk prediction
- ✓ Assess perceptions about falls (FES-I)
- ✓ Multi-professional & multi-factorial assessments for high fall risk patients

👉 Learn more at [World Guidelines for Falls Prevention and Management](#)

👉 Learn more at [Guideline for Management Osteoporosis and Fracture Prevention Canada \(2023\)](#)



Nicholas Dietrich, MD candidate 2026
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NAVIGATING THE AGING HORIZON:

CHALLENGES AND
CONSIDERATIONS IN MEDICAL
IMAGING FOR OLDER CANADIANS



The population of older adults in Canada is increasing and will continue to rise. In 2022, there were approximately 7.3 million people aged 65 years and older, with the share of older Canadians expected to grow by around 20% by 2030 (1,2). Furthermore, the number of the 'oldest-old', defined as individuals aged 85 years and over, is growing the fastest, expecting to triple in population by 2046 (3).

This demographic shift brings about a myriad of challenges, particularly in the realm of geriatric medicine, where older adults use more healthcare services than younger people and account for approximately half of Canada's healthcare spending (4). Their frailty, a complex condition characterized by diminished physiological reserve and increased vulnerability to stressors, adds a layer of intricacy to medical care and diagnostic practices (5).

As Canada's older population and its associated healthcare costs grow, so does the demand for medical imaging procedures. It is estimated that 47%, 22%, and 46% of all exams for CT, MRI, and nuclear medicine, respectively, are performed for older adults, with rates increasing (6). Other research has shown that almost half of emergency room visits by older adults involve diagnostic imaging, highlighting the disproportionate reliance on medical imaging in this population (7).

At the same time, Canadian radiology departments are facing high wait-times and imaging backlogs. This is compounded by shortages of medical imaging equipment and a lack of sufficient health human resources. Notably, Canada has some of the oldest medical imaging equipment compared to other high-income countries, with 35.5% of all available equipment at least 10 years old (8). Not to mention that radiology departments are still working to catch up to delays from the COVID-19 pandemic.

In response, the Canadian Association of Radiologists put forward a list of recommendations to address patient needs (8,9).

Their recommendations included providing greater Government funding to distribute new medical imaging equipment to provinces, implementing national clinical decision support programs to equip healthcare professionals with better access to imaging guidelines, and harnessing homegrown artificial intelligence applications to prioritize resources.

Other national organizations have put forward similar recommendations, emphasizing the need to incorporate better resource stewardship practices and promote innovation (10).

While patient age is not, and should not be, a contraindication to radiological investigation, older patients tend to be immobile and frail. Specifically, it is challenging to get older adults into radiological departments, positioned correctly for imaging, and ensure they remain still for images to be adequately captured. As a result, conducting radiological investigations can take much longer and require more resources.

In addition, older adults often have multiple comorbidities, such as renal impairment, cardiovascular disease, and diabetes, which make administration of oral or intravenous contrast agents more dangerous. Moreover, patients with neurocognitive disorders like dementia may suffer from increased anxiety and distress while undergoing scans, leading to motion artifacts and repeat imaging (11). While early lifestyle modifications may prevent the onset of disease and the need for imaging, they are often implemented too late or inadequately.



Photo taken by: Angela Luan

References

1. Government of Canada. Population estimates on July 1st, by age and sex. Statistics Canada. 2022. Available from: <https://doi.org/10.25318/1710000501-eng>
2. Government of Canada. Population Projections for Canada (2021 to 2068), Provinces and Territories (2021 to 2045). Statistics Canada. 2022. Available from: <https://www150.statcan.gc.ca/n1/pub/91-520-x/91-520-x2022001-eng.htm>
3. Government of Canada. A portrait of Canada's growing population aged 85 and older from the 2021 Census. Statistics Canada. 2022. Available from: <https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-x/2021004/98-200-X2021004-eng.cfm>
4. Gibbard, R. Meeting the Care Needs of Canada's Aging Population- July 2018. Ottawa: The Conference Board of Canada. 2018.
5. Xue Q-L. The frailty syndrome: Definition and natural history. Clin Geriatr Med. 2011 Feb;27(1):1-15. doi:10.1016/j.cger.2010.08.009
6. Canadian Medical Imaging Inventory. Advanced Medical Imaging Equipment for Older Adults Across Canada. CADTH. 2022. Available from: https://www.cadth.ca/sites/default/files/attachments/2022-10/advanced_medical_imaging_equipment_for_older_adults_across_canada_email_service_report.pdf
7. Latham LP, Ackroyd-Stolarz S. Emergency department utilization by older adults: a descriptive study. Can Geriatr J. 2014 Dec;17(4):318.
8. Canadian Association of Radiologists. Canadians Need Better Access to Medical Imaging: Addressing the Diagnostic Backlog. 2022. Available from: <https://car.ca/wp-content/uploads/2022/09/CAR-PreBudgetSubmission-2023-FINAL.pdf>
9. Canadian Association of Radiologists. Addressing the Medical Imaging Dilemma in Canada: Restoring Timely Access for Patients Post-Pandemic. 2022. Available from: https://car.ca/wp-content/uploads/2022/02/CAR-PreBudgetSubmission-2022-e-web-FINAL_edited_Feb.pdf
10. Choosing Wisely Canada. Five Tests and Treatments to Question. 2022. Available from: <https://choosingwiselycanada.org/recommendation/radiology/>
11. Wolf LK, Gunderman RB. Dementia care in radiology. AJR Am J Roentgenol. 2020 Jan;214(1):34-6.
12. Fawcett R, McCoubrie P. Pitfalls in imaging the frail elderly. Brit J Radiol. 2015 Jan;88(1045):20140699.

A major takeaway from Canada's current imaging landscape is that now, more than ever, is the time to be mindful when conducting diagnostic procedures and investigations on older populations. The exponential growth in the older adult demographic, coupled with increased demand, underscores the importance of adopting thoughtful and targeted approaches, especially for frail older adults. The term "palliative radiology" has been coined in this context, urging the reduction of minimally invasive interventions for the frailest individuals with the aim of improving quality of life (12).

If current paradigms are not optimized, wait-times, backlogs, and staff burnout rates will only get worse, reducing access to medical imaging not only for older adults, but for all patients. These detrimental consequences will only be amplified in rural and underserved communities, where health and long-term care shortages are already prevalent.

Thus, a crucial objective in the medical imaging of older populations is to achieve a balance between safely investigating treatable conditions and avoiding unnecessary distress and costs. It is imperative to foster an environment of collective responsibility among healthcare stakeholders, including the upcoming generation of physicians, to maintain this equilibrium. By doing so, the landscape of medical imaging will be strategically positioned to meet the evolving needs of Canada's aging population.



Photo taken by: Angela Luan

About the Authors

Nicholas Dietrich is a second-year medical student at the University of Toronto where he is concurrently completing a Master's degree in biomedical engineering. Nicholas is interested in medical imaging and the development of innovative technologies to better detect disease in older populations.

Jack Lott is a first-year medical student at Queen's University, where he also completed a Master's degree in neuroscience. Jack is passionate about finding ways to enhance older adult function and address age-related brain changes with the creation of new rehabilitation tools.

THERAPEUTIC HUMAN CONNECTION

Alexa Gruber, MD candidate 2026
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A few years ago, when I entered a seniors' long term care home and we played bingo, listened to music, and reminisced on their lives, **I noticed their faces light up.**

During COVID-19, when I telephoned seniors in my community and checked in on how they were doing, **I noticed their voices light up.**

When I visited a senior with other students and we sat and listened to their advice, life lessons, and stories, **I noticed their mood light up.**

From these experiences, I learned the impact that therapeutic human connection can have on seniors' health, especially those that are socially isolated.

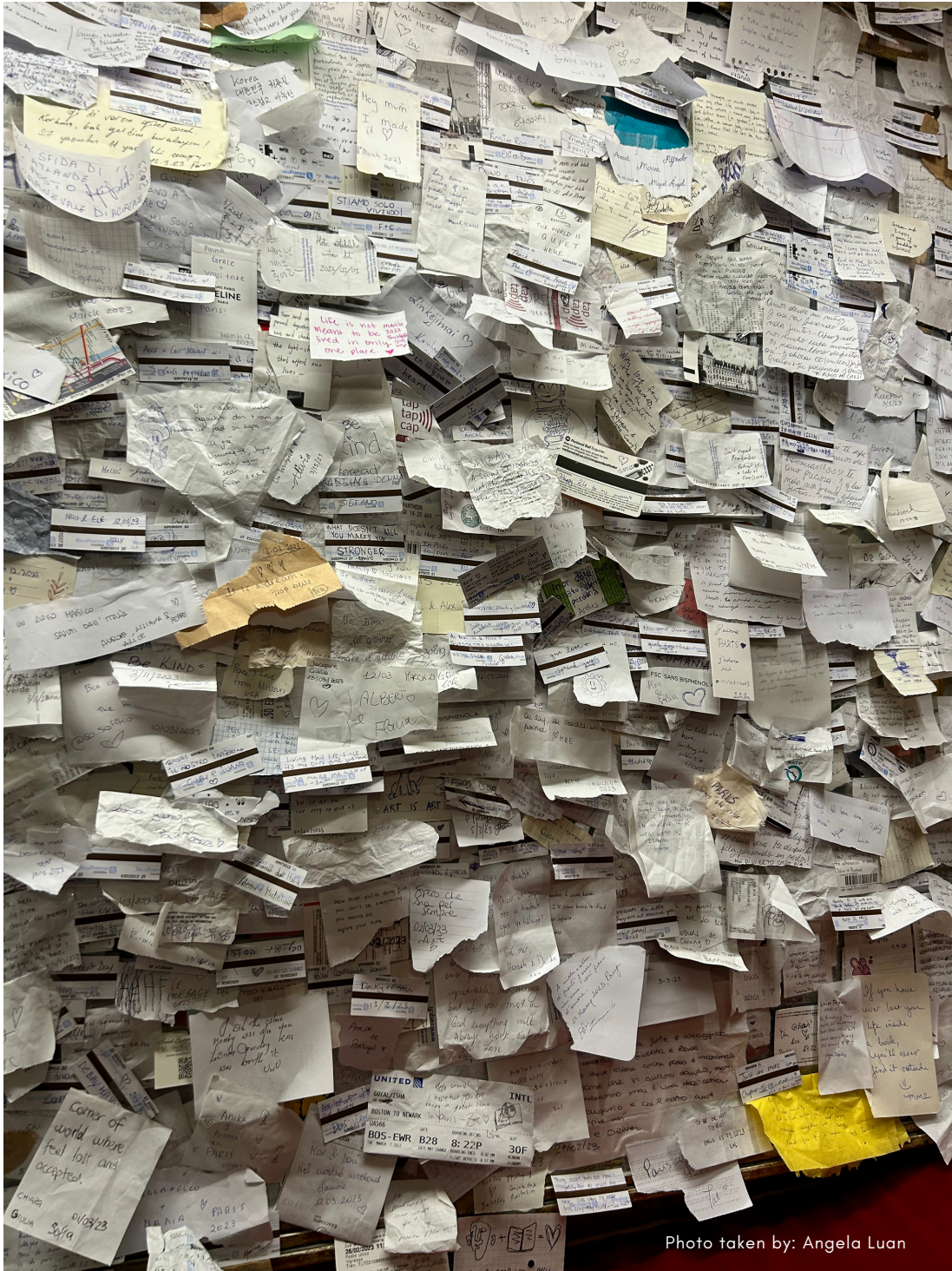


Photo taken by: Angela Luan

About the Author
Alexa is a second-year medical student
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References

1. Donovan NJ, Blazer D. Social isolation and loneliness in older adults: review and commentary of a national academies report. *Am J Geriatr Psychiatry*. 2020 Dec;28(12):1253-44.
2. Domenech-Abella J, Mundo J, Haro JM, Rubio-Valera M. Anxiety, depression, loneliness and social network in the elderly: Longitudinal associations from The Irish Longitudinal Study on Ageing (TILDA). *J Affect Disord*. 2019 Mar;246:82-8.
3. Luo Y, Hawley LC, Waite LJ, Ciccioppo JT. Loneliness, health, and mortality in old age: A national longitudinal study. *Soc Sci Med*. 2012 Mar;74(6):907-14.
4. Valtorta NK, Kanaan M, Gilbody S, Ronzi S, Hanratty B. Loneliness and social isolation as risk factors for coronary heart disease and stroke: systematic review and meta-analysis of longitudinal observational studies. *Heart*. 2016 Jul;102(13):1009-16.
5. Hakulinen C, Pukki-Röback L, Virtanen M, Jokela M, Kivimäki M, Elovainio M. Social isolation and loneliness as risk factors for myocardial infarction, stroke and mortality: UK Biobank cohort study of 479 054 men and women. *Heart*. 2018 Sep;104(18):1556-62.
6. Freedman A, Nicolle J. Social isolation and loneliness: The new geriatric giants: Approach for primary care. *Can Fam Physician*. 2020 Mar;66(5):176-82.

A HELPING HAND



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ABOUT THE ART

People often forget that the most important member of the healthcare team is the patient themselves! By including patients, healthcare professionals (HCPs) identify what goals of care are important. The resulting individualized care plans are represented by the different strands falling from the intertwined hands. The golden hand represents the wealth of knowledge, skills and experience the senior has in guiding their own care. While highlighting the nursing perspective, the patient-HCP relationship can be incorporated to the patient's healthcare plan by any interprofessional colleague as each member offers new and insightful perspectives of what "care" can mean.

About the Author

Ruvini Jayatilaka is a registered nurse who graduated from Western University's Compressed Time Frame Program in Nursing in 2022. She has experience in both inpatient and outpatient settings and is passionate about geriatric care, especially in the context of interprofessional collaboration.



Photo taken by: Angela Luan



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