AMA
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Education Program

Innovations in Dementia Care: Interdisciplinary Approaches and Clinical Management

Friday, June 5 | 4:00 – 5:00 pm CDT

Moderator

Michael A. DellaVecchia, MD, PhD
Chair-Elect, AMA Senior Physicians Section

Sponsored by the AMA's Senior Physicians Section (SPS)

Learning Objectives

Upon completion of this activity the physician will be able to:

- Describe contemporary approaches to early detection of dementia and interpret their appropriate clinical application and limitations.
- Identify practical, function-focused management strategies that emphasize mobility and preservation of independence.
- Explain the importance of addressing visual-perceptual impairment and environmental cueing in adaptive care planning.
- Select appropriate PM&R-led interdisciplinary interventions to optimize cognition, mobility, and task performance while reducing caregiver burden.

Speaker

Allan A. Anderson, MD
Delegate, American Association of Geriatric Psychiatry

Director, Banner Alzheimer's Institute in Tucson &
Clinical Associate Professor in Neurology and Psychiatry,
University of Arizona

Poll Question 1:

Which of the following tests is considered to be the most reliable and accurate blood-based biomarker for determining the presence of Alzheimer's disease?

1. P-Tau231
2. Amyloid Beta 42/40
3. P-Tau217

Prevalence: “The Future”

Nature Medicine, January 2025

Lifetime risk of developing dementia after age 55 is 42%

By 2060 new cases of dementia will double going from 514,000 to **ONE MILLION CASES PER YEAR**

Fang M, Jiaqi H, Weiss J et al. Lifetime risk and projected burden of dementia. Nature Medicine 2025

Prevalence

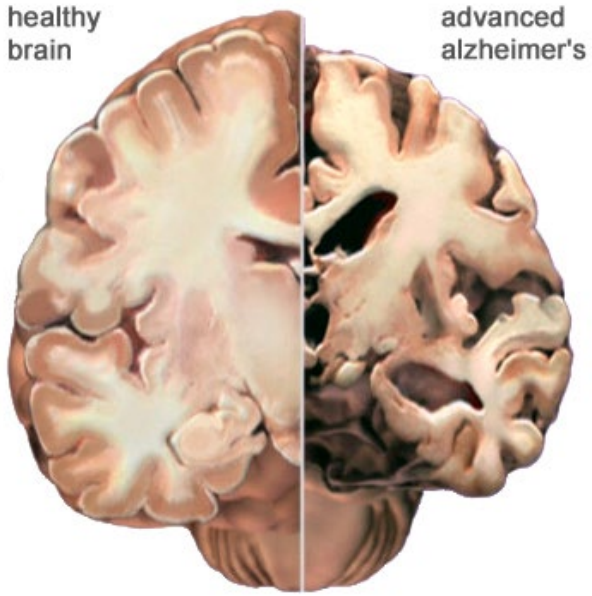
1/3

+ 1/3

= 2/3

What exactly is Alzheimer's Disease

-Amyloid plaques
-Neurofibrillary tangles (tau)
-Inflammation
-Astrocyte and synaptic dysfunction
-Shrinkage of the brain (atrophy)



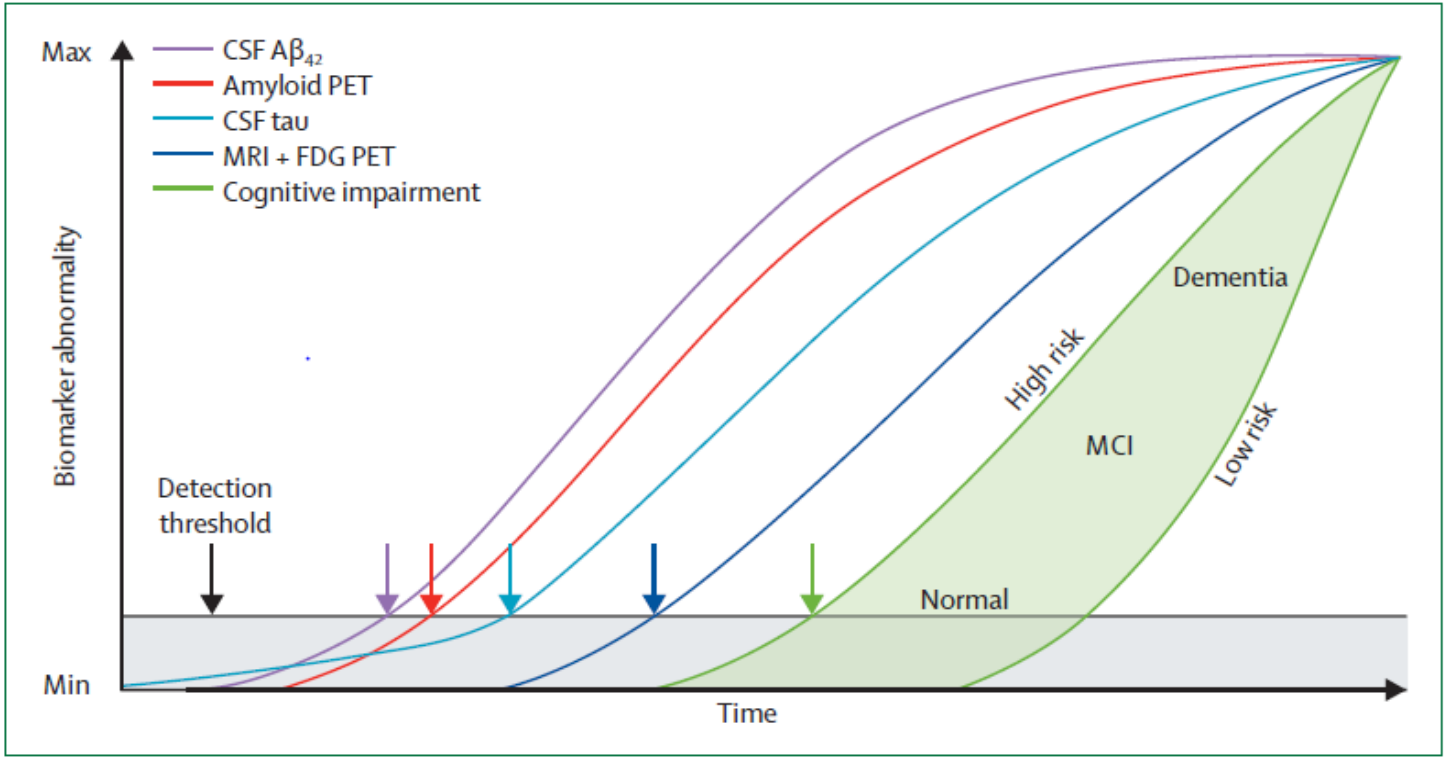


Figure 6: Model integrating Alzheimer's disease immunohistology and biomarkers

Jack et al. Alzheimer's & Dementia 2024

Some issues with diagnosis

- 85% of people living with dementia were diagnosed by providers who do not specialize in dementia
- Diagnosis of AD is delayed until moderate or advanced stages in 50% or more patients
- Greater delays among individuals from racial and ethnic minority groups
- 50% did not feel adequately prepared to care for individuals who had been diagnosed

Early Diagnosis is Important

- Early diagnosis allows for significant planning for the future
- Early diagnosis allows for early therapeutic interventions

Recent Developments in Alzheimer's Disease

- Now have reliable blood-based biomarkers - pTAU217
- Now have disease modifying treatments

Blood-based biomarkers

- Three biomarkers of interest: p-tau181, p-tau217 and p-tau231
- There is a significant correlation between CSF and blood levels of P-tau
- Levels start increasing close to amyloid positivity on PET
- Levels start to increase just after the drop in CSF Aβ42/Aβ40 ratio and prior to the cut-point for Aβ-PET positivity has been reached.

Unimpaired individuals with abnormal biomarker test results are at risk for symptoms due to AD. They are not at risk for a disease they already have.

Treatment

> **“Symptomatic” treatment:**

- Interventions that **improve cognition, defer functional decline, or ameliorate behavioral symptoms without** altering the underlying disease processes that comprise AD pathogenesis and **without** producing enduring changes that persist when the treatment is withdrawn.

> **Disease modifying treatment:**

- Interventions that **produce an enduring change** in the clinical progression of AD by **interfering in the underlying pathophysiological mechanisms of the disease process** that lead to cell death as demonstrated by biomarkers

Monoclonal Antibody Treatment

- Lecanemab – preferentially removes protfibtils and oligomers 2023

- Donanemab – preferentially removes amyloid plaque 2024

Treatment of Neuropsychiatric Symptoms

- Treatment of insomnia in Alzheimer's disease
  suvorexant (2020)

- Treatment of agitation associated with dementia due to Alzheimer's disease
  bexpriprazole (2023)

- Treatment of agitation associated with dementia due to Alzheimer's disease
  dextromethorphan/bupropion (2026)

Missing Link of Comprehensive Dementia Care

Nonpharmacological Interventions

CPT codes 96202 and 96203

Multiple-family group behavior management/modification training

nt care

owerful ally in patient care

AMA | Physicians' powerful ally in patient care

Thank you!

E-mail: Allan.Anderson@bannerhealth.com

Speaker

Renee C. Bovelle, MD

- Delegate & MedChi BOT Member
- Practicing ophthalmologist in Glenn Dale, Maryland

Poll Question 2:

What has been the most exciting change in medicine you have seen in the last five years?

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LOW VISION & DEMENTIA

The Eyes and Brain Are Deeply Connected

LOW VISION
Difficulty seeing even with glasses or treatment.

DEMENTIA
A decline in memory, thinking, and daily functioning.

COMMON CAUSES

- Age-related macular degeneration
- Glaucoma
- Diabetic retinopathy
- Cataracts
- Other eye diseases

Vision loss can increase the risk of cognitive decline and dementia. Early detection and support can improve quality of life.

POSSIBLE SIGNS

- Memory loss
- Confusion with tasks or time
- Trouble finding words
- Poor judgment
- Withdrawal from activities

THE CONNECTION

Poor vision can lead to isolation, depression, and reduced mental stimulation—factors that may increase the risk of dementia.

DID YOU KNOW?

Untreated vision loss is associated with a 2–5x higher risk of cognitive decline and dementia.[1]

References

1. Livingston G, et al. Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. Lancet. 2020;396(10248):413–446.
2. Lu PH, et al. Vision impairment and cognitive decline in older adults: A systematic review and meta-analysis. J Am Geriatr Soc. 2018;66(5):855–862.
3. Wang JJ, et al. Sensory impairment, cognitive decline, and dementia: A systematic review. JAMA Neurol. 2012;69(10):1309–1318.
4. Almeida DV, et al. Association between vision loss and Alzheimer's disease: A systematic review. Ophthalmology. 2021;128(7):1006–1016.

KEY STATISTICS

3×

Dementia risk: combined sensory impairment
(Lin & Bhatt, 2020)

48%

Cognitive decline reduction — hearing intervention (ACHIEVE, 2023)

8%

Global dementia risk attributable to sensory loss (Lancet 2020)

38M

Americans living with vision impairment
(CDC, 2023)

What is Oculomics?

Oculomics is the study of ocular biomarkers that reflect systemic disease — using AI and retinal imaging to detect early signs of cardiovascular, renal, and neurodegenerative disorders non-invasively.

Non-Invasive

Uses standard retinal imaging — no needles, scans, or biopsies required

AI-Powered

Deep learning detects patterns invisible to the human eye

Early Detection

Identifies disease markers years before clinical symptoms appear

Yadav S et al. Ocular changes as potential biomarkers for early diagnosis of Alzheimer's disease. Alzheimer's & Dementia 2025 (open access). doi:10.1002/alz.70052 | Rastmanesh R. Early prediction of CNS problems by combined ocular markers. Front Integr Neurosci 2024. doi:10.3389/fnint.2024.1394254

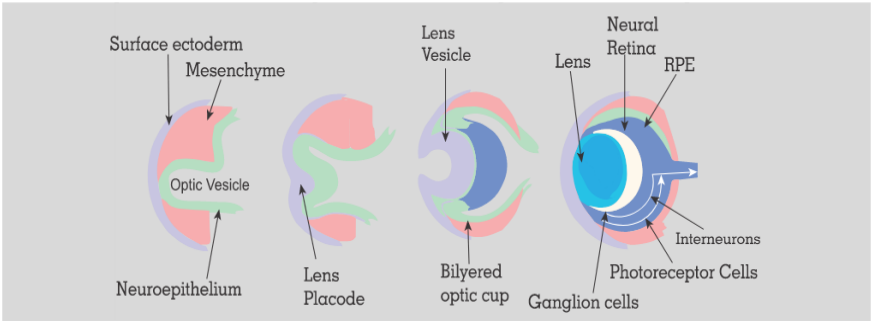
The Eye: A Window to the Brain

The retina is embryologically derived from neural ectoderm — it is, literally, central nervous system tissue.

EMBRYOLOGIC DEVELOPMENT OF THE EYE - MNEMONIC

WWW.OPENMED.CO.IN

EMBRYONIC TISSUE	SURFACE ECTODERM	NEURO ECTODERM	MESODERM	NEURAL CREST
MNEMONIC	LEVEL	ROMES	MESO	*(All other stuctures)*
DERIVATIVES	• Lens • Eyelid's Skin • Vitreous • Epithelium of cornea • Lacrimal gland WWW.OPENMED.CO.IN	• Retina • Optic Stalk/Nerve • Muscles of Iris • Epithelium of Iris & Ciliary body • Secondary & Tertiary vitreous	• Muscles (Extra ocular) • Endothelium of Blood Vessels • Sclera (Temporal) • Occular Primary Vitreous	• Cornea (stroma and endothelium) • Sclera • Trabecular meshwork • Vitreous • Melanocytes • Ciliary muscles • Ciliary ganglion



Shared Amyloid & Tau Pathology

- Amyloid-β plaques deposit in the retina BEFORE symptomatic Alzheimer's disease — detectable 3–5 yrs prior (Koronyo et al., JCI Insight 2017)
- Tau neurofibrillary tangles identified in retinal neurons in post-mortem AD (den Haan et al., Acta Neuropathol. 2018)
- TDP-43 pathology (FTD/ALS) expressed in inner nuclear layer

Vascular Biomarkers

- Retinal arteriolar narrowing correlates with cerebral white-matter lesion burden and predicts cognitive decline (Wong et al., JAMA 2002)
- Fractal dimension of retinal vasculature tracks with brain atrophy and dementia severity
- Arteriovenous ratio predicts stroke risk — validated on UK Biobank (Cheung et al., Ophthalmology 2014)

London A et al. Brain. 2013;136(Pt 7):2005-2016. | Koronyo Y et al. JCI Insight. 2017;2(16):e93621. | den Haan J et al. Acta Neuropathol Commun. 2018;6(1):147. | Wong TY et al. JAMA. 2002;287(9):1153-1159. | Cheung N et al. Ophthalmology. 2014;121(9):1772-1778.

The Eye as a Window to the Brain

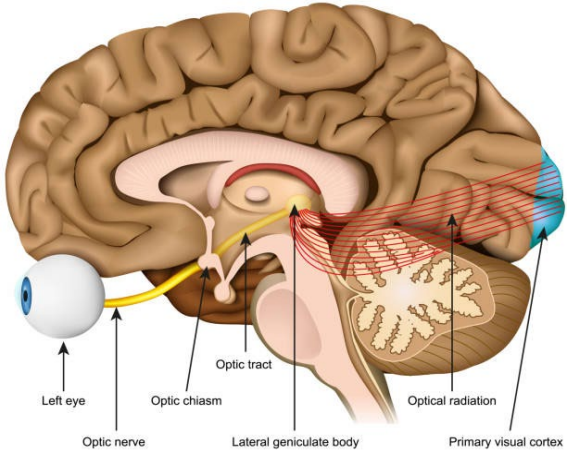
Clinical Insight: Non-invasive retinal imaging may serve as an accessible CNS biopsy surrogate for early detection of neurodegenerative disease

Similar neuronal and microvascular alterations are found in the eye AND the brain in patients with cognitive impairment or dementia.

Visual impairment has been proposed as one of the earliest symptoms of dementia — sharing risk factors including age, vascular disease, and physical inactivity.

Shared Risk Factors

- Advancing age



- Vascular & metabolic disease
- Physical inactivity
- Cognitive impairment

Shared Outcomes

Falls · Functional decline · Reduced quality of life · Increased mortality

Rastmanesh R. Early prediction of CNS problems combined ocular markers. Front Integr Neurosci 2024. doi:10.3389/fnint.2024.1394254 | Yadav S et al. Ocular changes as potential biomarkers for early diagnosis of Alzheimer's disease. Alzheimer's & Dementia 2025 (open access). doi:10.1002/alz.70052 | Ponirakis G et al. Association of corneal nerve fiber measures with cognitive function in dementia. Ann Clin Transl Neurol 2019;6:689–697. doi:10.1002/acn3.746

Oculomics & Dementia

Retinal Vasculature Mapping

Fractal dimension, vessel tortuosity, and caliber asymmetry quantified from fundus photos correlate with white-matter hyperintensity volume and MMSE decline (Cheung CY et al., Nature Biomed Eng 2022

Retinal Deep Phenotyping

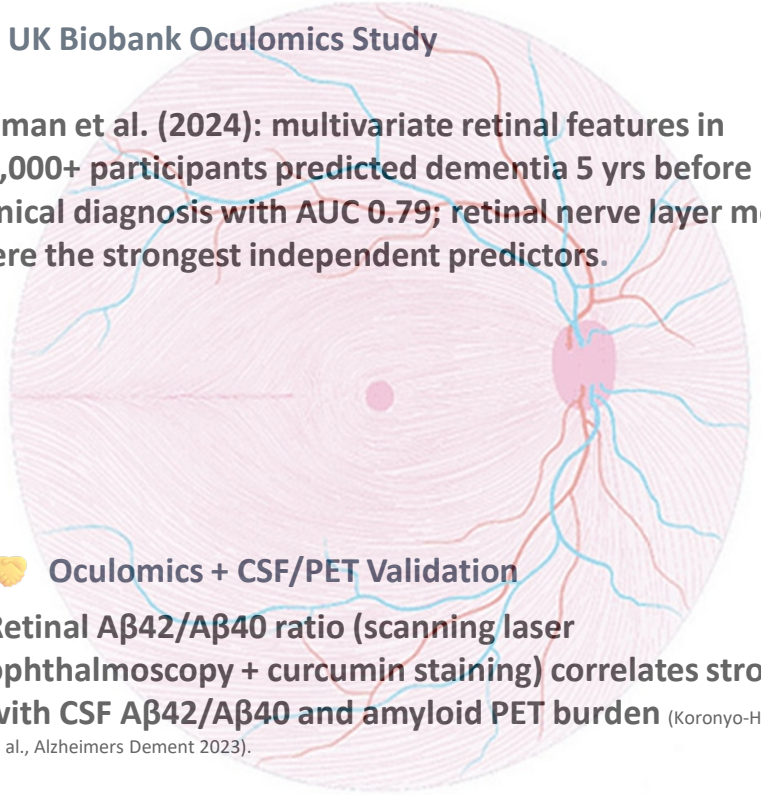
Fundus photography + AI identifies 'RetinalAge gap' — difference between retinal apparent age and chronological age predicts dementia incidence (HR 1.49 per 5 yr gap). Tian et al., Br J Ophthalmol 2023.

Multi-Disease Oculomics

Single retinal scan predicts: age, sex, BMI, BP, HbA1c, smoking, renal function, and neurological risk with AUC >0.70 (Poplin et al., Nature Biomed Eng 2018). **Enables population-level screening.**

UK Biobank Oculomics Study

Raman et al. (2024): multivariate retinal features in 40,000+ participants predicted dementia 5 yrs before clinical diagnosis with AUC 0.79; retinal nerve layer metrics were the strongest independent predictors.



Oculomics + CSF/PET Validation

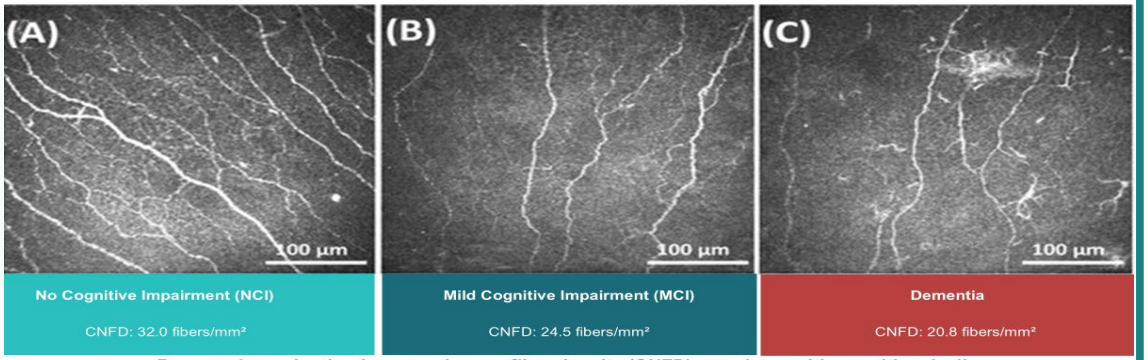
Retinal Aβ42/Aβ40 ratio (scanning laser ophthalmoscopy + curcumin staining) correlates strongly with CSF Aβ42/Aβ40 and amyloid PET burden (Koronyo-Hamaoui et al., Alzheimers Dement 2023).

Tian J et al. Br J Ophthalmol. 2023;107(11):1663-1669. | Cheung CY et al. Nature Biomed Eng. 2022;6:1394-1406. | Poplin R et al. Nature Biomed Eng. 2018;2:158-164. | Koronyo-Hamaoui M et al. Alzheimers Dement. 2023;19(5):1900-1915. | Hadoux X et al. Sci Transl Med. 2019;11(503):eaaw5843.

Corneal Imaging for Diagnosis

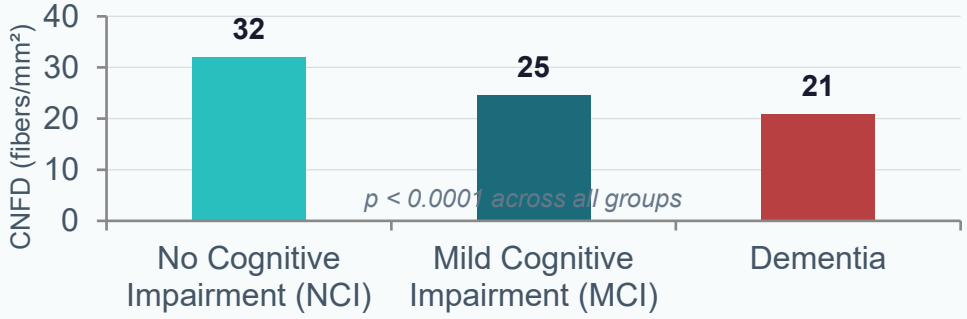
Corneal Confocal Microscopy Images

Representative CCM images showing corneal nerve fiber density across the dementia spectrum



Progressive reduction in corneal nerve fiber density (CNFD) correlates with cognitive decline.
Images captured using corneal confocal microscopy (CCM) at the sub-basal nerve plexus. Scale bar = 100 µm.

Corneal confocal microscopy (CCM) measures corneal nerve fiber density, showing progressive loss across the dementia spectrum:



Key Diagnostic Findings

Superior to MRI for MCI

CCM diagnostic accuracy exceeded medial temporal lobe atrophy (MTA) rating on MRI for detecting mild cognitive impairment.

Comparable to MRI for Dementia

CCM performance matched MRI brain volumetry for distinguishing dementia from no cognitive impairment.

Associated with Cognitive Decline

After adjusting for confounders, corneal nerve fiber loss was significantly linked to lower cognitive function and reduced independence.

Ponirakis G et al. Association of corneal nerve fiber measures with cognitive function in dementia. Ann Clin Transl Neurol 2019;6:689–697. | Al-Janahi E et al. Corneal nerve fiber density and its association with mild cognitive impairment in diabetic neuropathy. J Alzheimers Dis 2020;77(3):1533–1543. | Ponirakis G et al. Loss of corneal nerves and brain volume in mild cognitive impairment and dementia. Alzheimers Dement Transl Res 2022;8:e12269.

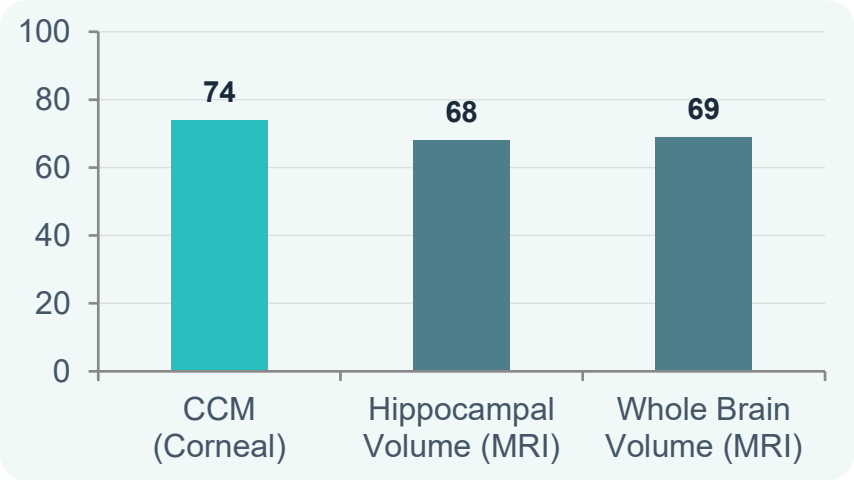
Corneal Imaging for Prediction

30.8%

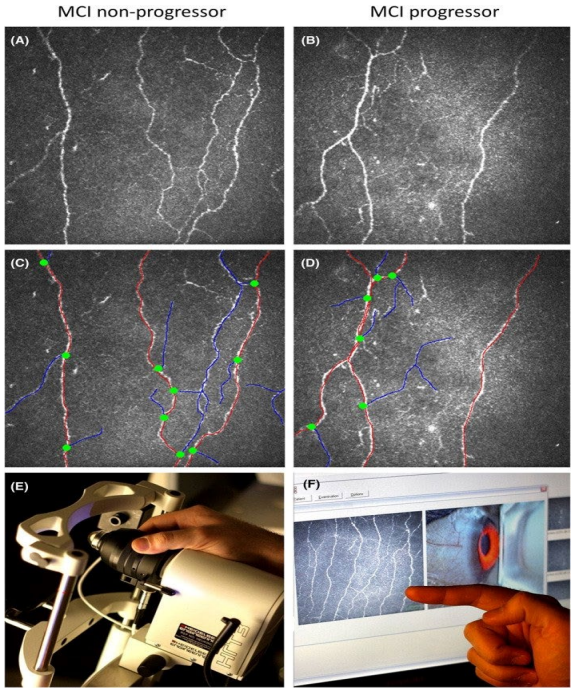
of MCI patients progressed to dementia over 2.6 years

n = 107 MCI patients followed over 2.6 years (33 progressed to dementia)

Prognostic Accuracy: CCM vs MRI



CCM: MCI Non-Progressor vs Progressor



CCM outperformed both MRI volumetry measures for predicting MCI→dementia conversion

Corneal nerve fiber morphology in a patient with MCI with and without progression to dementia. Corneal confocal microscopy (CCM) images of the sub-basal nerve plexus (A and B) and analyzed CCM images (C and D) from a patient with MCI without (A and C) and with (B and D) progression to dementia. The Heidelberg Retinal Tomograph 3 device with the Rostock Cornea Module (E) that captures the corneal nerve fiber images (F).

Ponirakis G et al. Ann Clin Transl Neurol 2023;10:737–748. doi:10.1002/acn3.5174 | Oculomotor eye tracking data. Alzheimer's & Dementia 2025 (open access). doi:10.1002/alz.70052

Beyond Nerve Fibers: Endothelial Cells

Corneal endothelial cell (CEC) morphology offers an additional layer of neurovascular biomarker information:

Key Finding

Corneal endothelial cell density (CECD) was significantly reduced in dementia patients versus no-cognitive-impairment controls
(1971 vs 2316 cells/mm², $p < 0.05$)

CECD was comparable between MCI and NCI groups — suggesting endothelial changes emerge later, at the dementia stage.

Neurovascular Biomarker

Corneal nerve AND endothelial cell abnormalities together reflect vascular pathology in dementia — capturing different aspects of disease.

Mediation Effect

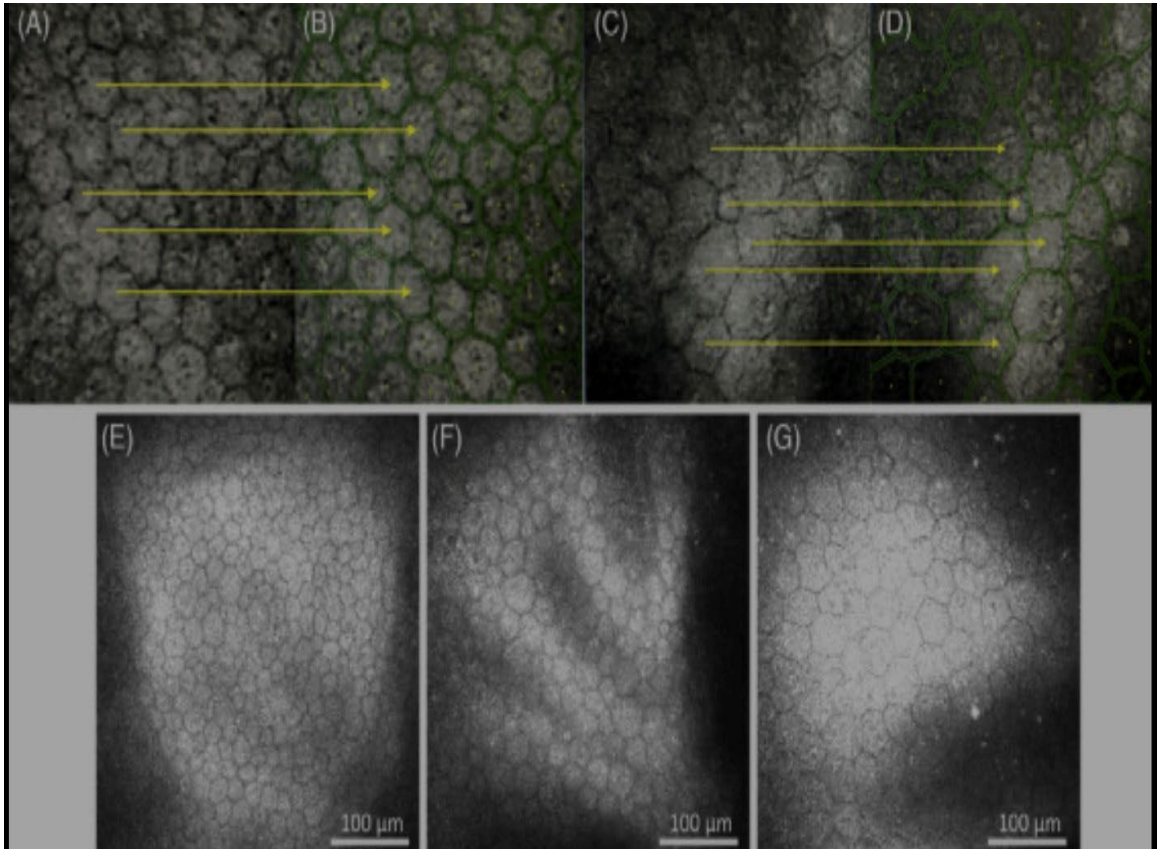
Reduced CECD partially mediates the effects of age and diabetes on corneal nerve fiber loss — linking systemic risk factors to neurodegeneration.

Clinical Potential

Combining CCM nerve metrics with endothelial cell density may improve diagnostic specificity for dementia staging.

Ponirakis G et al. Association of corneal endothelial cell loss and pathology with neurodegeneration in MCI and dementia. Alzheimers Dement Transl Res 2025;11:e70078. doi:10.1002/trc2.70078 | Ponirakis G et al. Association of corneal endothelial cell loss with cognitive impairment and dementia. Alzheimers Dement Transl Res 2022;8:e12269. doi:10.1002/trc2.12269 | Li H et al. Potential ocular biomarkers for early detection of Alzheimer's disease and their roles in AI studies. Eye 2023;37:2999–3016. doi:10.1038/s41433-022-01244-9

Corneal Endothelial Cell Layer Imaging



Images A–D: Endothelial Cell Analysis

A & C — Original images of the corneal endothelial cell layer.
B & D — Analyzed images with automated segmentation (green outlines).

The automated software accurately segments endothelial cells and quantifies:
- Cell density (cells/mm²)
- Average surface area (µm²)

Images E–G: CCM by Cognitive Stage

E	F	G
No Cognitive Impairment	Mild Cognitive Impairment	Dementia

Endothelial cells appeared larger with increasing disease severity, but the difference was not statistically significant.

CCM = corneal confocal microscopy. Scale bar = 100 µm. Automated segmentation software quantifies endothelial cell density (cells/mm²) and average surface area (µm²).

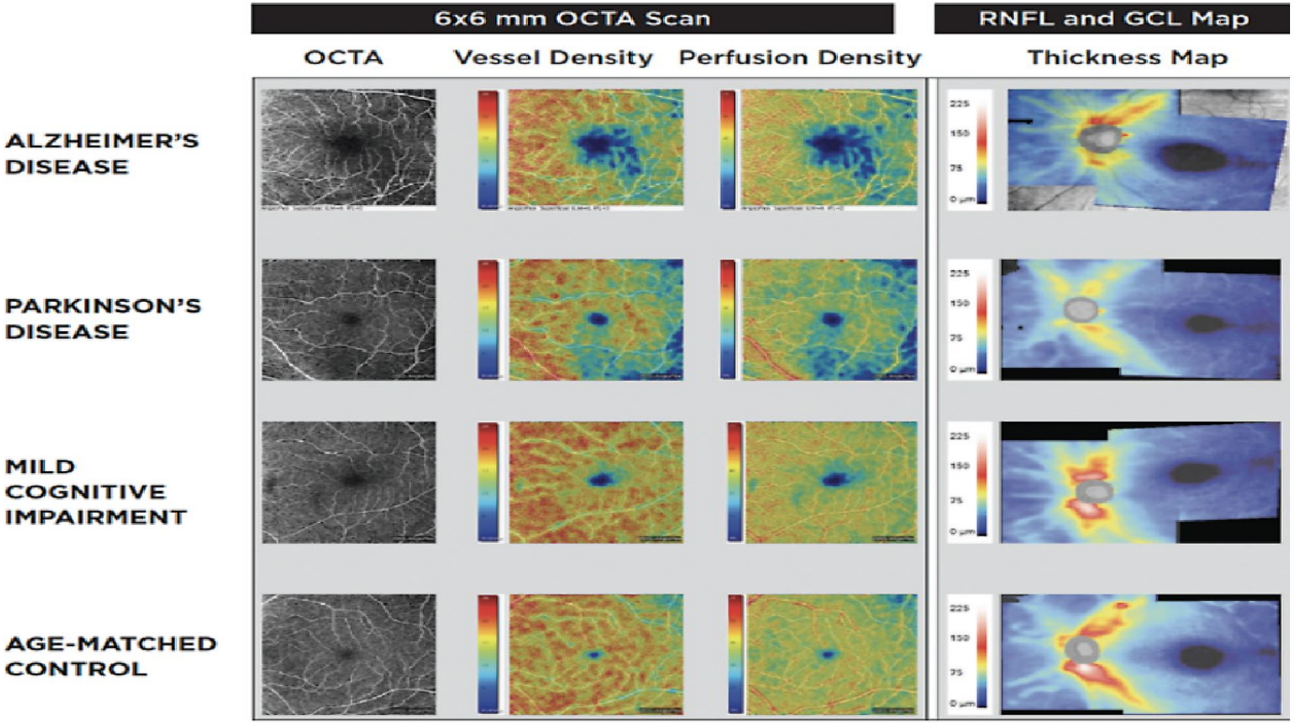
OCT/A in Alzheimer's Disease

Retinal Nerve Fiber Thinning

OCT imaging reveals significant thinning of the RNFL and ganglion cell inner plexiform layer (GCIPL) — mirroring cerebral atrophy seen in Alzheimer's patients.

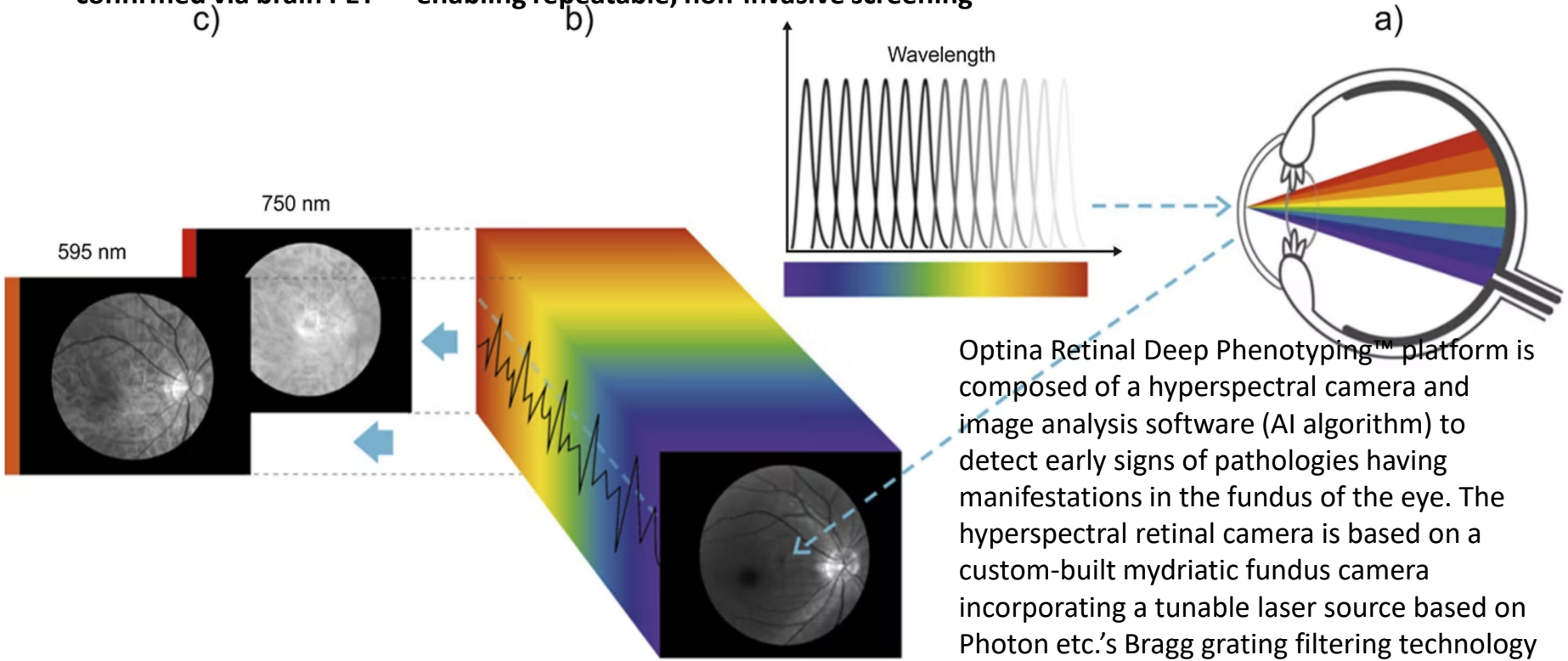
Microvascular Changes

OCTA imaging shows decreased retinal perfusion density, reduced vessel density, enlarged foveal avascular zone. AD has a significant vascular component.



Shi et al. Retinal vascular alterations in cognitive impairment. Alzheimer's & Dementia 2025. doi:10.1002/alz.14593 | Hao et al. EyeAD: A novel model for retinal imaging in the diagnosis of Alzheimer's disease. npj Digital Med 2025;8:19. doi:10.1038/s41746-025-01437-0 | Ponirakis G et al. Association of corneal nerve fiber measures with cognitive function in dementia. Ann Clin Transl Neurol 2019;6:689–697. doi:10.1002/acn3.744 | Al-Jassasi E et al. Corneal nerve and brain imaging in mild cognitive impairment and dementia. Alzheimer's & Dementia 2025;21:e70233. doi:10.1002/alz.70233 | Yadav S et al. Ocular changes as potential biomarkers for early diagnosis of Alzheimer's disease. Alzheimer's & Dementia 2025;21:e70254. doi:10.1002/alz.70254 | Yadav S et al. Ocular changes as potential biomarkers for early diagnosis of Alzheimer's disease. Alzheimer's & Dementia 2025;21:e70254. doi:10.1002/alz.70254 | Yadav S et al. Potential ocular biomarkers for early detection of Alzheimer's disease and their roles in AI studies. Eye 2023;37:2999–3016. doi:10.1038/s41433-022-01244-9

Hyperspectral imaging identifies a spectral signature for amyloid-β in early AD patients confirmed via brain PET — enabling repeatable, non-invasive screening



Optina Retinal Deep Phenotyping™ platform is composed of a hyperspectral camera and image analysis software (AI algorithm) to detect early signs of pathologies having manifestations in the fundus of the eye. The hyperspectral retinal camera is based on a custom-built mydriatic fundus camera incorporating a tunable laser source based on Photon etc.'s Bragg grating filtering technology (see Figure 1).

Fig. 1 - Schematic of Optina hyperspectral imaging system based on Photon etc.'s Bragg tunable filter technology. a) First the light from the tunable source illuminates a broad retina's field of view, b) then the light reflected from the retina is captured by the hyperspectral camera resulting in a spatial and spectral rich dataset. c) Two examples of specific wavelength retinal images, each wavelength detects different retinal features.

Landmark Research: The AlzEye Project

24M+
Retinal images linked

350K+
Patients at Moorfields

7 yrs
Parkinson's detected before diagnosis

400+
International news sources

- **Links retinal images with NHS Hospital Episode Statistics covering MI, stroke, and all-cause dementia**
- **Parkinson's Disease detected up to 7 years before clinical diagnosis using retinal biomarkers** (published in Neurology)
- **Led by UCL Prof. Pearse Keane & Dr. Siegfried Wagner at INSIGHT — the world's largest ophthalmic imaging bioresource**
- **2025 update: expanded 2018–2024 linkage with cause of death certificates; ethical approval for neurodegeneration & dementia studies**

Wagner SK & Keane PA. AlzEye: linking retinal images with NHS Hospital Episode Statistics. UCL/Moorfields INSIGHT Hub 2025 dataset update. | Rastmanesh R. Early prediction of CNS problems by combined ocular markers. Front Integr Neurosci 2024. doi:10.3389/fnint.2024.1394254

Cataract Surgery & Dementia Prevention

⭐ **LANDMARK: Tseng et al. — JAMA Internal Medicine 2022**

Prospective cohort (n=3,038). Adults undergoing cataract surgery had a 29% lower risk of developing dementia over 10 years vs. non-surgical controls (HR 0.71, 95% CI 0.63–0.79). Effect size exceeded hearing aids, social activity interventions, and most pharmacological trials to date.

Restored Luminous Input

Cataract removal restores blue-spectrum light, normalising circadian rhythm via ipRGCs — improves sleep quality and reduces delirium (Lam et al., Sleep Med. 2021).

Re-activated Neural Circuits

Visual cortex re-engagement restores cholinergic and dopaminergic pathway activity involved in attention and memory consolidation (Jefferis et al., Age Ageing 2021).

Social Re-engagement

Improved VA enables reading, driving, face recognition — rebuilding protective social networks (Miyata et al., Sci Rep. 2021; Wilson et al., Arch Neurol. 2007).

Neuroinflammatory Pathway

UV-blocking IOLs used post-surgery may reduce lens-mediated oxidative stress signals linked to retinal amyloid accumulation (Shang et al., IOVS 2023).

Tseng VL et al. JAMA Intern Med. 2022;182(2):134-141. | Lam B et al. Sleep Med. 2021;77:118-123. | Jefferis JM et al. Age Ageing. 2021;50(2):402-409. | Miyata K et al. Sci Rep. 2021;11:11741.

The eye is not just a window to the soul — it is a window to the brain. Preserve vision; protect cognition.

1

Screen All Dementia Patients for Vision Impairment

Annual visual acuity, contrast sensitivity, and fundus exam. Up to 70% of memory-clinic patients have uncorrected vision loss.

2

Refer Cataracts Promptly — Do Not Defer

Cataract surgery is the single most evidence-based modifiable intervention. Cognitive impairment is NOT a contraindication.

3

Incorporate OCT into Memory Clinic Workflows

Baseline RNFL and macular thickness provide predictive value beyond cognitive composite scores alone.

4

Address Vision AND Hearing Together

Dual sensory impairment multiplies dementia risk. Combined correction offers synergistic cognitive benefit.

5

Embrace Oculomics as a Screening Tool

Retinal deep phenotyping and AI-based RetinalAge gap can identify high-risk individuals 5 years before diagnosis.

6

Optimise Visual Environment in Care Settings

High contrast, adequate luminance, blue-spectrum therapy, and glare reduction reduce BPSD, falls, and caregiver burden.

Tseng VL et al. JAMA Intern Med. 2022;182(2):134-141. | van de Kreeke JA et al. Neurology. 2022;98:e1642. | Livingston G et al. Lancet. 2020;396:413-446. | Tian J et al. Br J Ophthalmol. 2023;107:1663-1669.

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THANK YOU FOR YOUR ATTENTION

QUESTIONS / COMMENTS

Renee Bovelle, MD, FAAO, CSIM

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Speaker

Daniel N. Pierce, MD

YPS Delegate, American Academy of Physician Medicine and Rehabilitation (PM&R)

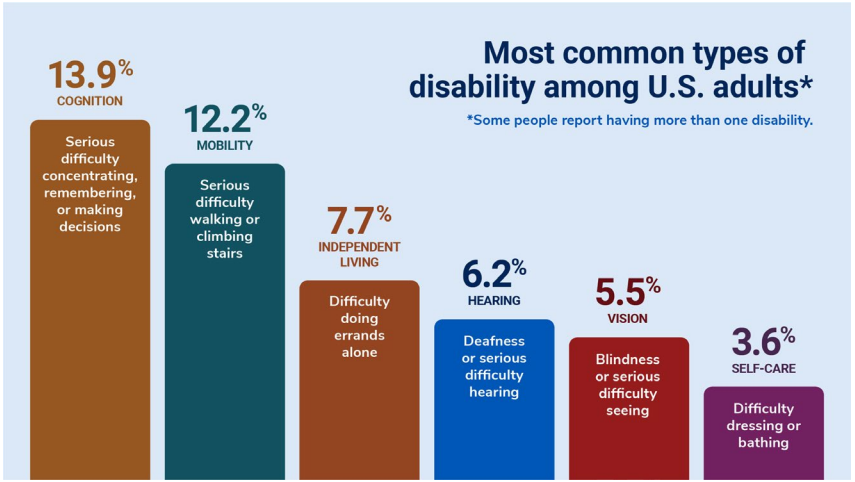
Poll Question 3:

The current Olympic distance for race walking is 20 km, with the world record pace at this distance being 4.3 m/s (almost 10 mph). What is the generally accepted threshold for gait speed at which there is an increased risk of cognitive decline?

1. 0.8 m/s
2. 1.0 m/s
3. 1.2 m/s
4. No definitive threshold exists

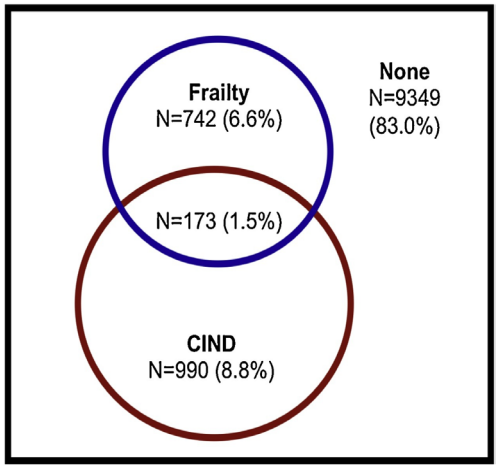
Physical Medicine and Rehabilitation

- From AAPM&R:
  - Physiatry (PM&R) is the medical specialty which aims “to **enhance and restore functional ability** and quality of life to those with **physical impairments or disabilities**… Unlike other medical specialties that focus on a medical cure, the goals of the physiatrist are to maximize patients’ independence in activities of daily living and improve quality of life.”



Overlap of Physical and Cognitive Decline: Cognitive Frailty

- Definition
  - Simultaneous physical frailty and mild cognitive impairment (MCI) without dementia.



BMC Geriatr. 2026 Mar 16;26(1):569. doi: 10.1186/s12877-026-07332-x.

Associations of frailty and cognitive impairment with fall risk in older adults: a longitudinal cohort study based on CHARLS

Kai Zhou [1], Boyuan Shi [2], Fangye Shi [3], Lei Chen [1], Jiandong Yuan [1], Zhiqiang Xue [4,5]

Affiliations + expand

PMID: 41840571 PMCID: PMC13104237 DOI: 10.1186/s12877-026-07332-x

Abstract

Background: Falls are one of the leading causes of disability and mortality in older adults. Frailty and cognitive impairment are recognized as key risk factors, but their joint impact on fall risk and the underlying association remain unclear.

Methods: This study utilized data from the China Health and Retirement Longitudinal Study, with a 7-year follow-up period (2011–2018). The study included 6,274 participants aged ≥ 60 years. Follow-up surveys were conducted at approximately 2-year intervals to assess the incidence of falls.Frailty was assessed using a modified physical frailty phenotype, and cognitive function was measured with standardized memory and executive function tests. Logistic regression, moderation, and mediation models were applied to examine the independent and interactive effects of frailty and cognitive impairment on falls, with multivariable adjustment for demographic, behavioral, and clinical factors.

Results: During the 7-year follow-up, 19.4% of participants reported at least one fall. Frailty was independently associated with increased fall risk (OR 2.06, 95% CI 1.35–3.12), as was cognitive impairment (OR 1.48, 95% CI 1.27–1.71). Moderation analysis showed a significant interaction, indicating that cognitive impairment amplified the association between frailty and falls (P for interaction < 0.001). Mediation analysis further revealed that cognitive impairment partially mediated the frailty–falls association, accounting for 49.4% of the total effect. These associations were consistent across demographic subgroups and robust to sensitivity analyses.

Conclusion: This study provides longitudinal evidence that frailty and cognitive impairment synergistically increase the risk of falls in older adults through both moderation and mediation pathways. In this longitudinal cohort of older Chinese adults, our findings suggest that frailty and cognitive impairment may jointly increase fall risk, with evidence of both statistical moderation and mediation.

These findings highlight the importance of jointly assessing frailty and cognition in fall prevention and suggest that targeted interventions in cognitively frail populations may yield greater benefits.

Early Identification: Function as the "Sixth Vital Sign"

White Paper: "Walking Speed: the Sixth Vital Sign"

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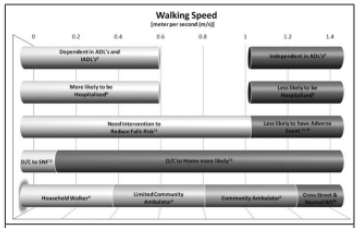
Walking speed is "almost the perfect measure."[1] A reliable, valid,[2,3] sensitive[4] and specific[5] measure, self-selected walking speed (WS), also termed gait velocity, correlates with functional ability,[6] and balance confidence.[7] It has the potential to predict future health status,[8,9] and functional decline[10] including hospitalization,[11] discharge location,[12,13] and mortality.[14] Walking speed reflects both functional and physiological changes,[4] is a discriminating factor in determining potential for rehabilitation,[15] and aids in prediction of falls[16] and fear of falling.[17] Furthermore, progression of WS has been linked to clinical meaningful changes in quality of life[18] and in home and community walking behavior.[19] Due to its ease of use[20] and psychometric properties, WS has been used as a predictor and outcome measure across multiple diagnoses.[8,9,15,21-26] In addition, WS was chosen by a panel of experts as the standardized assessment to measure locomotion for the Motor Function Domain of the NIH Toolbox.[27]

Walking speed, like blood pressure, may be a general indicator that can predict future events and reflect various underlying physiological processes.[8] While WS cannot stand alone as the only predictor of functional abilities, just at blood pressure is not the only sign of heart disease; WS can be used as a functional "vital sign" to help determine outcomes such as functional status,[4,8] discharge location,[12] and the need for rehabilitation[15] (Figure 1).

Walking is a complex functional activity; thus, many variables contribute to or influence WS. These include, but are not limited to, an individual's health status,[28] motor control,[29] muscle performance and musculoskeletal condition,[30,31] sensory and perceptual function,[32] endurance and habitual activity level,[33] cognitive status,[34] motivation and mental health,[35,36] as well as the characteristics of the environment in which one walks.[37] While performance measures used in conjunction with WS are often better able to predict health status,[24] the use of WS alone can be an excellent predictor.[11,26] For example, WS predicts the post hospital discharge location 78% of the time, and the addition of cognition or initial FIM scores does not significantly strengthen the ability of defining if a patient will be discharged to home or to a skilled nursing facility.[12]

Several standardized assessments and physical performance tests reliably predict function and health related events. Yet the consistent use of measures in physical therapy and other clinical settings is not widely practiced.[38] Factors contributing to this non-use of standardized assessments may include insufficient time, inadequate equipment or space, or lack of knowledge in interpreting the assessment.[39] Walking speed is one standardized measure that can be quickly and easily incorporated into the PT examination/evaluation process.

Determining feasibility is the first essential step in deciding to use a test or measure in the clinic. The main questions clinicians should pose regarding a test's or measure's feasibility are:
(1) Is the test safe?
(2) Is it cost effective?
(3) How easy is the test to administer? and
(4) How easily are the results of the test graded and interpreted?



ADL: activities of daily living; IADL: instrumental ADLs; D/C: discharged; WS: walking speed; mph: miles per hour; sec: seconds

Figure 1. A collection of walking speed times that are linked to dependence, hospitalization, rehabilitation needs, discharge locations, and ambulation category.

Age Ageing. 2026 Apr 4;55(4):afag062. doi: 10.1093/ageing/afag062.

Trajectories of frailty, grip strength and gait speed preceding dementia: a nested case–control study

Zimu Wu [1], Aung Zaw Zaw Phyo [1], Lachlan Cribb [1], Swarna Vishwanath [1], Suzanne G Orchard [1], Alice Owen [1], Robyn Woods [1], Trevor T-J Chong [2 3 4], Rory Wolfe [1], Raj C Shah [5], Kerry Sheets [6], Anne Murray [7], Joanne Ryan [1]

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Abstract

Background: Functional decline may be an early indicator of dementia. This study examined the trajectories of frailty, grip strength, and gait speed over the 11 years prior to dementia, compared to matched individuals without dementia.

Methods: A total of 1092 dementia cases were matched on age, sex and education to 4368 controls from a cohort of community-dwelling older adults recruited in Australia and the USA, aged 65 years or above at recruitment. Frailty was characterised by a deficit-accumulation index involving 67 items. Hand grip strength and gait speed were measured regularly by physical examination. Linear mixed-effects models estimated the backward trajectories of frailty, grip strength and gait speed before dementia, compared to controls. Secondary analyses were stratified by sex and ApoE ε4 carrier status.

Results: Higher frailty burden, with a steeper increase over time, was found in the years before dementia, compared to controls (P-interaction < .001). Hand grip strength and gait speed declined more rapidly in dementia cases than in controls (P-interaction < .001 for both). Differences between cases and controls became consistently significant four to six years prior to dementia (P-contrast < .001). An earlier divergence across all three measures was observed for females, and to a lesser extent in ApoE ε4 non-carriers.

Discussion: Functional decline occurs within the decade before dementia onset, with gait speed being the earliest indicator. These findings support the utility of functional measures as early markers of dementia risk, with potential implications for targeted monitoring and preventative strategies.

Keywords: dementia; frailty; gait speed; grip strength; older people; physical function.

Randomized Controlled Trial > JAMA Netw Open. 2022 May 2;5(5):e2214647.
doi: 10.1001/jamanetworkopen.2022.14647.

Association of Dual Decline in Cognition and Gait Speed With Risk of Dementia in Older Adults

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PMID: 35639376 PMCID: PMC9157262 DOI: 10.1001/jamanetworkopen.2022.14647

Importance: Dual decline in gait speed and cognition has been found to be associated with increased dementia risk in previous studies. However, it is unclear if risks are conferred by a decline in domain-specific cognition and gait.

Objective: To examine associations between dual decline in gait speed and cognition (ie, global, memory, processing speed, and verbal fluency) with risk of dementia.

Design, setting, and participants: This cohort study used data from older adults in Australia and the US who participated in a randomized clinical trial testing low-dose aspirin between 2010 and 2017. Eligible participants in the original trial were aged 70 years or older, or 65 years or older for US participants identifying as African American or Hispanic. Data analysis was performed between October 2020 and November 2021.

Exposures: Gait speed, measured at 0, 2, 4, and 6 years and trial close-out in 2017. Cognitive measures included Modified Mini-Mental State examination (3MS) for global cognition, Hopkins Verbal Learning Test-Revised (HVLT-R) for memory, Symbol Digit Modalities (SDMT) for processing speed, and Controlled Oral Word Association Test (COWAT-F) for verbal fluency, assessed at years 0, 1, 3, 5, and close-out. Participants were classified into 4 groups: dual decline in gait and cognition, gait decline only, cognitive decline only, and nondecliners. Cognitive decline was defined as membership of the lowest tertile of annual change. Gait decline was defined as a decline in gait speed of 0.05 m/s or greater per year across the study.

Main outcomes and measures: Dementia (using Diagnostic and Statistical Manual of Mental Disorders [Fourth Edition] criteria) was adjudicated by an expert panel using cognitive tests, functional status, and clinical records. Cox proportional hazard models were used to estimate risk of dementia adjusting for covariates, with death as competing risk.

Results: Of 19 114 randomized participants, 16 855 (88.2%) had longitudinal gait and cognitive data for inclusion in this study (mean [SD] age, 75.0 [4.4] years; 9435 women [56.0%], 7558 participants [44.8%] with 12 or more years of education). Compared with nondecliners, risk of dementia was highest in the gait plus HVLT-R decliners (hazard ratio [HR], 24.7; 95% CI, 16.3-37.3), followed by the gait plus 3MS (HR, 22.2; 95% CI, 15.0-32.9), gait plus COWAT-F (HR, 4.7; 95% CI, 3.5-6.3), and gait plus SDMT (HR, 4.3; 95% CI, 3.2-5.8) groups. Dual decliners had a higher risk of dementia than those with either gait or cognitive decline alone for 3MS and HVLT-R.

Conclusions and relevance: Of domains examined, the combination of decline in gait speed with memory had the strongest association with dementia risk. These findings support the inclusion of gait speed in dementia risk screening assessments.

Dementia Rehabilitation Interventions: Cognitive

- Goal
  - Maximize everyday functioning and independence by working around cognitive deficits rather than trying to restore lost brain tissue.
- Interdisciplinary Rehabilitation Team
  - Speech-Language Pathologists (SLPs) target cognitive-communication
    - Memory
    - Attention
    - Problem-Solving
    - Executive Function
  - Occupational Therapists (OTs) focus on functional cognition
    - Activities of Daily Living
    - Adapting the environment
  - Physical Therapists (PTs) can assist with cognitive-motor interference

Cochrane Database Syst Rev. 2023 Jun 29;6(6):CD013388. doi: 10.1002/14651858.CD013388.pub2.

Cognitive rehabilitation for people with mild to moderate dementia

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Affiliations + expand

PMID: 37389428 PMCID: PMC10310315 DOI: 10.1002/14651858.CD013388.pub2

Abstract in English, Spanish

Background: Cognitive impairments affect functional ability in people with dementia. Cognitive rehabilitation (CR) is a personalised, solution-focused approach that aims to enable people with mild-to-moderate dementia to manage everyday activities and maintain as much independence as possible.

Objectives: To evaluate the effects of CR on everyday functioning and other outcomes for people with mild-to-moderate dementia, and on outcomes for care partners. To identify and explore factors that may be associated with the efficacy of CR.

Search methods: We searched the Cochrane Dementia and Cognitive Improvement Group Specialised Register, which contains records from MEDLINE, EMBASE, CINAHL, PsycINFO, LILACS, and other clinical trial databases, and grey literature sources. The most recent search was completed on 19 October 2022.

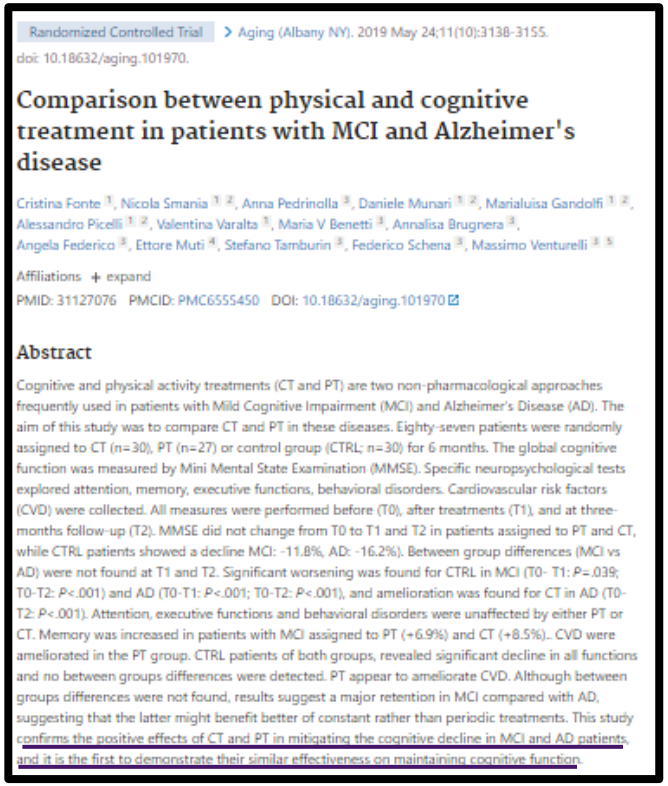
Selection criteria: We included randomised controlled trials (RCTs) comparing CR with control conditions and reporting relevant outcomes for the person with dementia and/or the care partner.

Data collection and analysis: We extracted relevant data from published manuscripts and contacted trial authors if necessary. Within each of the comparisons, we pooled data for each outcome of interest and conducted inverse-variance, random-effects meta-analyses. We evaluated the certainty of the evidence using GRADEpro GDT.

Authors' conclusions: CR is helpful in enabling people with mild or moderate dementia to improve their ability to manage the everyday activities targeted in the intervention. Confidence in these findings could be strengthened if more high-quality studies contributed to the observed effects. The available evidence suggests that CR can form a valuable part of a clinical toolkit to assist people with dementia in overcoming some of the everyday barriers imposed by cognitive and functional difficulties. Future research, including process evaluation studies, could help identify avenues to maximise CR effects and achieve wider impacts on functional ability and wellbeing.

Dementia Rehabilitation Interventions: Physical

- Goal
  - Improve or maintain mobility, balance, strength, and cardiovascular health to reduce the risk of falls and prolong independent living.
- Interdisciplinary Rehabilitation Team
  - Occupational Therapists (OTs) focus on Activities of Daily Living
  - Physical Therapists (PTs) can assist with physical function
    - Aerobic Exercises
    - Strengthening Exercises
    - Balance and Coordination
    - Dual-task and cognitive-motor



Randomized Controlled Trial > Aging (Albany NY). 2019 May 24;11(10):3138-3155.
doi: 10.18632/aging.101970.

Comparison between physical and cognitive treatment in patients with MCI and Alzheimer's disease

Cristina Fonte [1], Nicola Smania [1 2], Anna Pedrinolla [3], Daniele Munari [1 2], Marialuisa Gandolfi [1 2], Alessandro Picelli [1 2], Valentina Varalta [1], Maria V Benetti [3], Annalisa Brugnera [3], Angela Federico [3], Ettore Muti [4], Stefano Tamburin [3], Federico Schena [3], Massimo Venturelli [3 5]

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PMID: 31127076 PMCID: PMC6555450 DOI: 10.18632/aging.101970

Abstract

Cognitive and physical activity treatments (CT and PT) are two non-pharmacological approaches frequently used in patients with Mild Cognitive Impairment (MCI) and Alzheimer's Disease (AD). The aim of this study was to compare CT and PT in these diseases. Eighty-seven patients were randomly assigned to CT (n=30), PT (n=27) or control group (CTRL; n=30) for 6 months. The global cognitive function was measured by Mini Mental State Examination (MMSE). Specific neuropsychological tests explored attention, memory, executive functions, behavioral disorders. Cardiovascular risk factors (CVD) were collected. All measures were performed before (T0), after treatments (T1), and at three-months follow-up (T2). MMSE did not change from T0 to T1 and T2 in patients assigned to PT and CT, while CTRL patients showed a decline MCI: -11.8%, AD: -16.2%). Between group differences (MCI vs AD) were not found at T1 and T2. Significant worsening was found for CTRL in MCI (T0- T1: $P=.039$; T0-T2: $P<.001$) and AD (T0-T1: $P<.001$; T0-T2: $P<.001$), and amelioration was found for CT in AD (T0-T2: $P<.001$). Attention, executive functions and behavioral disorders were unaffected by either PT or CT. Memory was increased in patients with MCI assigned to PT (+6.9%) and CT (+8.5%).. CVD were ameliorated in the PT group. CTRL patients of both groups, revealed significant decline in all functions and no between groups differences were detected. PT appear to ameliorate CVD. Although between groups differences were not found, results suggest a major retention in MCI compared with AD, suggesting that the latter might benefit better of constant rather than periodic treatments. This study confirms the positive effects of CT and PT in mitigating the cognitive decline in MCI and AD patients, and it is the first to demonstrate their similar effectiveness on maintaining cognitive function.

Example: Tailored Activity Program-VA

Dementia Lifestyle Interventions

Am J Health Promot. 2025 Sep;39(7):1051-1067. doi: 10.1177/08901171251328858. Epub 2025 Mar 31.

Walking Interventions and Cognitive Health in Older Adults: A Systematic Review of Randomized Controlled Trials

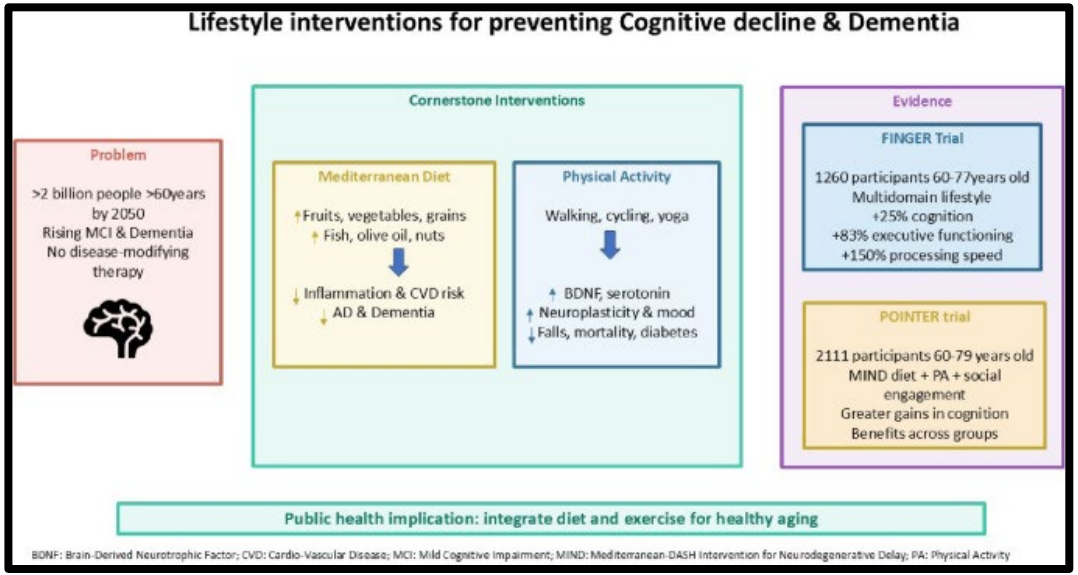
Jongwon Lee [1,2], Delia West [1,2], Christine Pellegrini [1,2], Jingkai Wei [3], Sara Wilcox [1,4], Jean Neils-Strunjas [5,6], A Caroline Rudisill [7], Daniela B Friedman [5,7], David X Marquez [8], Jenna Dzwierzynski [1], Joyce Balls-Berry [9], Rachelle Gajadhar [10], Chih-Hsiang Yang [1,2,4]

Affiliations + expand

PMID: 40165427 PMCID: PMC12284334 DOI: 10.1177/08901171251328858

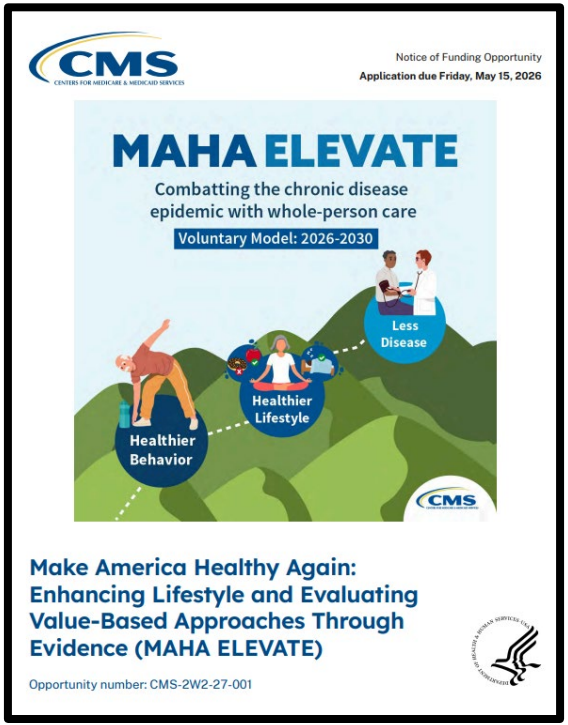
Abstract

ObjectiveThis systematic review summarizes the effectiveness and the dose of walking interventions on specific cognition domains in older adults, including executive function, memory, attention, processing speed, and global cognition.Data sourcePublished randomized controlled trials in PubMed, Embase, and Web of Science until 10 May 2023.Study Inclusion and Exclusion CriteriaStudies include older adults without Alzheimer's or related dementias, involving a walking intervention and performance-based neuropsychological assessments for executive function, memory, processing speed, attention, or global cognition.Data ExtractionTwo independent research assistants reviewed 8424 studies and included 17 studies.Data SynthesisParticipant demographics, intervention features (type, intensity, time, frequency, duration, format, and context), cognitive assessment tools, and main findings.ResultsNine studies found a favorable effect of walking interventions on at least one cognitive domain. Walking interventions improved executive function (n = 6) and memory (n = 3). These studies delivered the intervention individually (n = 3) for at least 40 minutes (n = 6) each time, three times per week (n = 8), between 6 to 26 weeks (n = 8), and walking at a moderate to vigorous intensity (n = 7).ConclusionWalking interventions may improve specific domains of cognitive function in older adults, particularly executive function and memory. More standardized reporting of intervention design and participant compliance based on published guidelines is needed to determine the dose-response association and the long-term effect of walking interventions on cognition.



Implementing Interventions at Scale

- $100 million of grants to consider population health-level implementation of lifestyle medicine interventions to improve health and cost outcomes in Medicare FFS population
    - 3 of the 30 grants to be reserved for interventions targeting cognition



Take-home points

- Decline in function can occur over multiple domains, with a significant co-occurrence of physical frailty and cognitive impairment
- Routine screening of physical measures such as grip strength and walking speed can improve early identification of cognitive impairment
- Functional deficits in cognitive impairment and dementia benefit from both Cognitive Rehabilitation and Physical Rehabilitation interventions
- While structured therapy programs are time-limited, targeted lifestyle medicine interventions can improve function in cognitive impairment

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- Youtube Video: https://youtu.be/fjToR6LAY6g?si=O_Toea5OyzrCdqKr

Facilitator

Michael A. DellaVecchia, MD, PhD
Chair-Elect, AMA Senior Physicians Section

Questions from Audience Members

Physicians' powerful ally in patient care