Evidence Synthesis Program

Implementation of Age-Friendly Health Systems in Outpatient Settings

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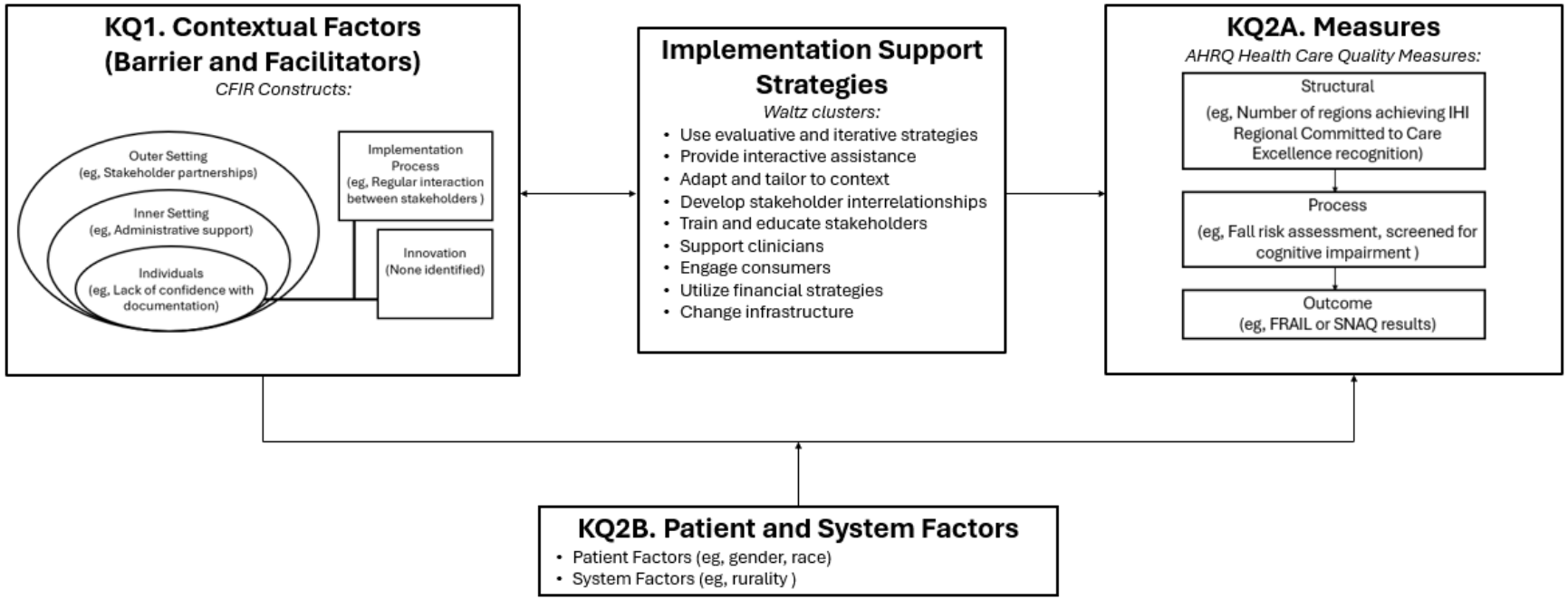
Appendix

APPENDIX A. CONCEPTUAL MODEL



APPENDIX B. SEARCH STRATEGIES

Search Date: 03/28/2024		Search Statement	Results
EMBASE	1	((age or aged) adj1 friendly adj10 (care or healthcare or health service* or health system* or hospital*)).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word]	405
	2	(4Ms or 5Ms or ('What Matters' and Medication and Mentation and Mobility)).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word]	1518
	3	1 or 2	1748
	4	limit 3 to yr="2015 -Current"	1156
CINAHL	1	((age or aged) N1 friendly N10 (care or healthcare or health service* or health system* or hospital*)) OR (4Ms or 5Ms ("What Matters" and Medication and Mentation and Mobility)) **Limiters** - Publication Date: 20150101-20241231	204
Ovid MEDLINE	1	((age or aged) adj1 friendly adj10 (care or healthcare or health service* or health system* or hospital*)).mp. [mp=title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word]	267
	2	(4Ms or 5Ms or ("What Matters" and Medication and Mentation and Mobility)).mp. [mp=title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word]	580
	3	1 or 2	766
	4	limit 3 to yr="2015 -Current"	534
Cochrane	1	(((“aged friendly” OR “age friendly”) NEAR/10 (healthcare OR “health care” OR hospital* OR health system* OR health service*)) OR "4Ms" OR "5Ms" OR ("What Matters" AND Medication AND Mentation AND Mobility)) in Title Abstract Keyword - (Word variations have been searched) Limit since 2015	72
Clinicaltrials.gov	1	((“elder friendly” OR “elderly friendly” OR “senior friendly” OR “older friendly” OR “age friendly” OR “geriatric friendly”) OR "4Ms" OR "5Ms" OR ("What Matters" AND Medication AND Mentation AND Mobility))	11
		Total	1977
		Total after deduplication	1537

APPENDIX C. STUDIES EXCLUDED DURING FULL-TEXT SCREENING, ARTICLES WHOSE CITATIONS WERE SEARCHED, AND IDENTIFIED CONFERENCE ABSTRACT CITATIONS

Citation and Reason for Exclusion
Abdallah M, Emmich M, Brennan M. Incorporating Age-Friendly Health System (AFHS) principles into internal medicine residents' continuity clinics. *Journal of the American Geriatrics Society.* 2020;68(SUPPL 1):S272. Annual Scientific Meeting of the American Geriatrics Society, AGS 2020. Long Beach, CA United States. *No extractable data.*
Adler-Milstein JR, Krueger GN, Rosenthal SW, et al. Health system approaches and experiences implementing the 4Ms: Insights from 3 early adopter health systems. *Journal of the American Geriatrics Society*. 2023;71(8):2627-2639. *Wrong setting/Not outpatient.*
Carney MT, Kwiatek S, Burns EA. Transforming health care: A large health organizations' journey to become an Age-Friendly Health System (AFHS) and beyond. *Journal of the American Geriatrics Society.* 2024;72(2):579-588. *Wrong setting/Not outpatient.*
Dolansky MA, Pohnert A, Ball S, et al. Pre-Implementation of the Age-Friendly Health Systems evidence-based 4Ms framework in a multi-state convenient care practice. *Worldviews on Evidence-Based Nursing.* 2021;18(2):118-128. *Pre-implementation.*
Dolansky M, Kalsy M, Pohert A. Using The Socio-Technical Model of Health Information Technology Model To Improve Age Friendly Care. BMJ Open Ophthalmology. 2022;11(Supplement 3):A15-A17. 2022 IHI Scientific Symposium. Online. *Copublication or preliminary results of included study.*
Dolansky MA, Pohnert A. The Intersection of Quality Improvement and Implementation Science: A Case Study. BMJ Open Quality. 2021;10(Supplement 2):A22-A24. Institute for Healthcare Improvement Scientific Symposium, IHI 2021. Virtual. *Copublication or preliminary results of included study.*
Dora MD, Haryanto J, Kholifah SN, et al. Factor affecting the success of aged-friendly primary health care program for elderly in Surabaya City. *Medico-Legal Update.* 2020;20(2):673-677. *No 4M implementation or not specific to 4Ms.*
Dryden EM, Kennedy MA, Conti J, et al. Perceived benefits of geriatric specialty telemedicine among rural patients and caregivers. *Health Services Research.* 2023;58(S1):26-35. *No 4M implementation or not specific to 4Ms.*
Faul A, Powers J, Waters B, et al. Using the 4M model of age-friendly healthcare to improve patient outcomes. In *Journal of the American Geriatrics Society.* 2021;69(SUPPL 1):S83. American Geriatrics Society Annual Meeting, AGS 2021. Virtual. *No extractable data.*
Golden RL, Mariani D, Carbonell E. The Age-Friendly Health Systems caregiver intervention: an evidence-based model for systemic change and improved outcomes. *Journal of the American Geriatrics Society*. 2022;70(SUPPL 1):S35. Annual Scientific Meeting of the American Geriatrics Society, AGS 2022. Orlando, FL United States. *No extractable data.*
Greenberg SA, Duffy EG, McCormack ME, et al. A quality improvement approach to develop an educational initiative for an age-friendly health system. *Geriatric Nursing.* 2022;45:193-197. *Education only.*
Lesser S, Zakharkin S, Louie C, et al. Clinician knowledge and behaviors related to the 4Ms framework of Age-Friendly Health Systems. *Journal of the American Geriatrics Society*. 2022;70(3):789-800. *No 4M implementation or not specific to 4Ms.*
Lundy J, Hayden D, Pyland S, et al. An age-friendly health system. *Journal of the American Geriatrics Society.* 2021;69(3):806-812. *Duplicate.*
Lynch MP, Kagan SH, Thomas TH, et al. Analysis of Age-Friendly cancer care readiness. *Oncology Nursing Forum.* 2021;48(3):333-340. *No 4M implementation or not specific to 4Ms.*

Citation and Reason for Exclusion
Nabong J, Evans E, Pohnert A, et al. A quality improvement project to boost uptake of the Age-Friendly Health Systems 4Ms in convenient care clinics. *Journal of the American Geriatrics Society*. 2022;70(SUPPL 1):S178. Annual Scientific Meeting of the American Geriatrics Society, AGS 2022. Orlando, FL United States. *Copublication or preliminary results of included study.*
Ogunyemi AO, Balogun MR, Ojo AE, et al. Barriers and facilitators to the delivery of Age-Friendly Health Services in primary health care centres in southwest, Nigeria: A qualitative study. *PLoS ONE*. 2024;19(3 MARCH):e0288574. *No 4M implementation or not specific to 4Ms.*
Severance JJ, Rivera S, Cho J, et al. A collaborative implementation strategy to increase falls prevention training using the Age-Friendly Health Systems approach. *International Journal of Environmental Research and Public Health*. 2022;19(10):5903. *Wrong setting/Not outpatient.*
Sheber M, McKnight M, Liebzeit D, et al. 335 "4Ms" conversation in the emergency department: A qualitative study. *Annals of Emergency Medicine.* 2022;80(4 Supplement):S143. ACEP Research Forum. Moscone Convention Center, San Francisco United States. *Wrong setting/Not outpatient.*
Shih C-I, Hung T-W, Chen W, et al. Difficulties and countermeasures in implementing age-friendly policies in primary health centers in Taiwan. *BMC Health Services Research.* 2022;22(1):1-8. *No 4M implementation or not specific to 4Ms.*
Shih CI, Hsu YH, Yang HF, et al. Development of an age-friendly health service recognition framework for primary health centers in Taiwan. *International Journal of Gerontology.* 2021;15(1):58-63. *No 4M implementation or not specific to 4Ms.*
Smith E, Gasper WJ, Schneider PA, et al. Room for improvement: Age-Friendly 4M assessments in a Veterans Affairs vascular surgery clinic. *Journal of Vascular Surgery*. 2022;75(6):e199-e200. VAM 2022. Boston United States. *No 4M implementation or not specific to 4Ms.*
Southerland LT, Presley CJ, Hunold KM, et al. Barriers to and recommendations for integrating the age-friendly 4-Ms framework into electronic health records. *Journal of the American Geriatrics Society.* 2023;71(5):1573-1579. *Wrong setting/Not outpatient.*
Tavares J, Santinha G, Rocha NP. Unlocking the WHO's age-friendly healthcare principles: Portugal's quest and recommendations. *International Journal of Environmental Research and Public Health*. 2023;20(22):7039. *No 4M implementation or not specific to 4Ms.*
Taylor K, Wagner T. Age friendly emergency medicine services: integrating what matters, medications, mobility, and mentation into emergency response. *Alzheimer's & Dementia : the journal of the Alzheimer's Association.* 2022;18(Supplement 9):e061165. *Wrong setting/Not outpatient.*
Thombley RL, Rogers SE, Adler-Milstein J. Developing electronic health record-based measures of the 4Ms to support implementation and evidence generation for Age-Friendly Health Systems. *Journal of the American Geriatrics Society*. 2024;72(3):882-891. *Wrong setting/Not outpatient.*
Vonnes C. Crafting age-friendly cancer care: A model for improvement utilizing the 4M's framework across the continuum of an NCI designated cancer center. *Journal of Geriatric Oncology.* 2019;10(6 Supplement 1):S11-S12. 19th Conference of the International Society of Geriatric Oncology/SIOG 2019. Geneva Switzerland. *Protocol.*
Waters L, Marrs SA, Tompkins CJ, et al. Creating interprofessional readiness to advance Age-Friendly U.S. Healthcare. *International Journal of Environmental Research and Public Health.* 2022;19(9):5258. *Education only.*
Wismann A, Jelinek D, Hand R, et al. Development of Age-Friendly Primary Care in an academic center. *Journal of the American Geriatrics Society.* 2023;71(Supplement 1):S89-S90. American Geriatrics Society Annual Meeting, AGS 2023. Long Beach, CA United States. *Copublication or preliminary results of included study.*
Yoo J, Choe I, Park J. Racial and ethnic disparity in 4M-based telehealth primary care and healthcare utilization in a provider shortage area. *Journal of the American Geriatrics Society.* 2023;71(Supplement 1):S90. American Geriatrics Society Annual Meeting, AGS 2023. Long Beach, CA United States. *No 4M implementation or not specific to 4Ms.*

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Zuo JX, Szymanski EP, Fessler E, et al. Implementation of a geriatric assessment SmartPhrase: A multi-institution pilot study. *Journal of the American Geriatrics Society*. 2023;71(Supplement 1):S150. American Geriatrics Society Annual Meeting, AGS 2023. Long Beach, CA United States. *No 4M implementation or not specific to 4Ms.*

Notes. 5 records were duplicated within this list.

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Bhattacharyya KK, Molinari V, Black K, Whitbourne SK. Creating age-friendly nursing homes: The time is now. Gerontol Geriatr Educ. 2023;44(4):613-630. doi:10.1080/02701960.2022.2106981
Church K, Munro S, Shaughnessy M, Clancy C. Age-Friendly Health Systems: Improving care for older adults in the Veterans Health Administration. Health Serv Res. 2023;58 Suppl 1(Suppl 1):5-8. doi:10.1111/1475-6773.14110
Hodge O, Rasekaba T, Blackberry I, Steer CB. Age-friendly healthcare: integrating the 4Ms to enable age-friendly cancer care. Curr Opin Support Palliat Care. 2024;18(1):9-15. doi:10.1097/SPC.0000000000000687
Liaw ST, Ansari S, Jonnagaddala J, Narasimhan P, Ashraf MM, Harris-Roxas B, Harris M. Use of mHealth for promoting healthy ageing and supporting delivery of age-friendly care services: a systematic review. International Journal of Integrated Care. 2019;19(4).
Liebzeit D, Krupp A, Bunch J, et al. Rural age-friendly ecosystems for older adults: An international scoping review with recommendations to support age-friendly communities. Health Sci Rep. 2023;6(5):e1241. Published 2023 May 5. doi:10.1002/hsr2.1241
Lifset ET, Charles K, Farcas E, et al. Ascertaining Whether an Intelligent Voice Assistant Can Meet Older Adults' Health-Related Needs in the Context of a Geriatrics 5Ms Framework. Gerontol Geriatr Med. 2023;9:23337214231201138. Published 2023 Sep 30. doi:10.1177/23337214231201138
Manning JM. The 4M Model. Crit Care Nurs Clin North Am. 2023;35(4):367-374. doi:10.1016/j.cnc.2023.06.003
Mate K, Fulmer T, Pelton L, et al. Evidence for the 4Ms: Interactions and Outcomes across the Care Continuum. J Aging Health. 2021;33(7-8):469-481. doi:10.1177/0898264321991658
Montayre J, Foster J, Zhao IY, et al. Age-friendly interventions in rural and remote areas: A scoping review. Australas J Ageing. 2022;41(4):490-500. doi:10.1111/ajag.13101
Raparla A, Thorngthip S, Pino L, Hughes R, Pohnert AM, Dolansky MA. Age-Friendly Health Systems: Delivering evidence-based care to older adults. Nursing. 2023;53(12):40-43. doi:10.1097/01.NURSE.0000991584.91771.17
Tavares J, Santinha G, Rocha NP. Age-Friendly Health Care: A Systematic Review. Healthcare (Basel). 2021;9(1):83. Published 2021 Jan 16. doi:10.3390/healthcare9010083
Winterton R, Hodgkin S, Clune SJ, Brasher K. Age-friendly care for older adults within rural Australian health systems: An integrative review. Australas J Ageing. 2021;40(1):16-34. doi:10.1111/ajag.12834
Zonsius MC, Myftari K, Newman M, Emery-Tiburcio EE. Optimizing Older Adults' Medication Use Nurses can partner with caregivers to promote safe medication administration. Home Healthcare Now. 2022;40(6):304-10.

Citations for Identified Conference Abstracts
Arany S, Medina-Walpole A, Caprio T. Pilot study of dental AFHS metrics based on a new 4Ms checklist. Journal of the American Geriatrics Society. 2023;71(Supplement 1):S150-S151. *American Geriatrics Society Annual Meeting,* AGS 2023. Long Beach, CA United States. doi:https://dx.doi.org/10.1111/jgs.18336
Carrico C, McKibbin C, Bennett K, et al. ECHO in Action: Impact, Barriers, and Lessons Learned Across Six Age-Friendly Geriatric ECHOs. *Journal of the American Geriatrics Society.* 2022;70(SUPPL 1):S4. Annual

Citations for Identified Conference Abstracts
Scientific Meeting of the American Geriatrics Society, AGS 2022. Orlando, FL United States. doi:https://dx.doi.org/10.1111/jgs.17755
Carvalho Do Amaral A, Hasnain M, Gruss V, Haque K. Implementation of Annual Wellness Visits as a tool to enhance patient-centered geriatric care in underserved communities. Journal of the American Geriatrics Society. 2023;71(Supplement 1):S173. *American Geriatrics Society Annual Meeting,* AGS 2023. Long Beach, CA United States. doi:https://dx.doi.org/10.1111/jgs.18336
Casey CM, Fox A, Leigh S, Caulley J, Hodges MO. Outcomes of a Geriatric Mini-Fellowship: An Age-Friendly 4M curriculum addresses the quadruple aim. *Journal of the American Geriatrics Society.* 2023;71(Supplement 1):S2-S3. American Geriatrics Society Annual Meeting, AGS 2023. Long Beach, CA United States. doi:https://dx.doi.org/10.1111/jgs.18336
Dobert R, Sibley A, Brennan M. Baystate health: An age friendly health system improving health outcomes for older adults (OA). *Journal of the American Geriatrics Society.* 2020;68(SUPPL 1):S277. Annual Scientific Meeting of the American Geriatrics Society, AGS 2020. Long Beach, CA United States. doi:https://dx.doi.org/10.1111/jgs.16431
Dobert R, Sibley A, Peretti J, Mustain C, Speight I, Brennan M. Maintaining 4m age friendly care standards in a house calls program, it takes a team! *Journal of the American Geriatrics Society*. 2021;69(SUPPL 1):S80-S81. American Geriatrics Society Annual Meeting, AGS 2021. Virtual. doi:https://dx.doi.org/10.1111/jgs.17115
Drost J, Fosnight S, Krebs A, et al. Use of a high intensity clinic to implement the 4-M frame work in a community based health system. *Journal of the American Geriatrics Society.* 2020;68(SUPPL 1):S115-S116. Annual Scientific Meeting of the American Geriatrics Society, AGS 2020. Long Beach, CA United States. doi:https://dx.doi.org/10.1111/jgs.16431
Khanna P, Nemytova E, Ajmal S, Wallach AB, Chodosh J, Ouedraogo Tall S. Outcomes of 4Ms Assessments during Early Phase of Adoption at an Urban Safety Net Primary Care Geriatrics Clinic. Journal of the American Geriatrics Society. 2022;70(SUPPL 1):S46. *Annual Scientific Meeting of the American Geriatrics Society,* AGS 2022. Orlando, FL United States. doi:https://dx.doi.org/10.1111/jgs.17755
Kim L, Fadhel E, Chong MT, et al. Racial/ethnic disparity in 4M-based primary care delivery via telehealth in provider shortage area. *Journal of the American Geriatrics Society*. 2022;70(SUPPL 1):S125. Annual Scientific Meeting of the American Geriatrics Society, AGS 2022. Orlando, FL United States. doi:https://dx.doi.org/10.1111/jgs.17755
O'Hara G, Parikh T, McIlvaine T, et al. Lessons learned from implementing age-friendly care in a veterans affairs-based clinic and a safety-net hospital-based geriatrics primary care clinic. Journal of the American Geriatrics Society. 2021;69(SUPPL 1):S62. *American Geriatrics Society Annual Meeting*, AGS 2021. Virtual. doi:https://dx.doi.org/10.1111/jgs.17115
Rubino M, Waters L, Slattum P. An age friendly program to enhance primary care for an older population experiencing adverse social determinants of health. Journal of the American Geriatrics Society. 2021;69(SUPPL 1):S54. *American Geriatrics Society Annual Meeting*, AGS 2021. Virtual. doi:https://dx.doi.org/10.1111/jgs.17115
Vu KH, Cheung J, Diamond L, McPherson D, O'Hara G. Improving a Community-Based, Residency-Affiliated, Urban, Primary Care Clinic as an Age-Friendly Health System Utilizing the 4Ms Framework. Journal of the American Geriatrics Society. 2022;70(SUPPL 1):S253. *Annual Scientific Meeting of the American Geriatrics Society,* AGS 2022. Orlando, FL United States. doi:https://dx.doi.org/10.1111/jgs.v70.S1
Vu KH, Cheung J, McPherson D, Roh E, O'Hara G. Achieving Level 2 Age-Friendly Health Systems - Committed to Care Excellence Recognition as a Community-Based, Residency- Affiliated, Primary Care Clinic. Journal of the American Geriatrics Society. 2023;71(Supplement 1):S352*. American Geriatrics Society Annual Meeting,* AGS 2023. Long Beach, CA United States. doi:https://dx.doi.org/10.1111/jgs.18336
Yang HC, Kim L, Yoo J. Impact of Workforce Interprofessional Education and Telehealth Training on Care Plans and Financial Outcomes of Nevada Frail Older Adults (TH112B). Journal of Pain and Symptom Management. 2023;65(3):e255-e256. *The Annual Assembly of Hospice and Palliative Care*. Montreal Canada. doi:https://dx.doi.org/10.1016/j.jpainsymman.2022.12.037

APPENDIX D. WALTZ CLUSTERS WITH EXAMPLE IMPLEMENTATION STRATEGIES (ERIC)

Waltz Strategy Cluster	Example Implementation Strategies (ERIC)
Use evaluative and iterative strategies	• Develop implementation tools for quality monitoring • Conduct local needs assessments
Provide interactive assistance	• Facilitation • Provide clinical supervision
Adapt and tailor to context	• Tailor strategies • Use data experts
Develop stakeholder interrelationships	• Identify and prepare champions • Build coalitions
Train and educate stakeholders	• Conduct ongoing trainings • Develop educational materials
Support clinicians	• Create new clinical teams • Remind clinicians
Engage consumers	• Prepare patients to be active participants • Increase uptake or adherence
Utilize financial strategies	• Access new funding • Develop alternate incentive structures
Change infrastructure	• Mandate change • Change physical structures and equipment

APPENDIX E. RISK OF BIAS ASSESSMENTS

Authors, Year, PMID (Design)	Blinding of Outcome Assessor	Incomplete Outcome Data (Attrition Bias)	Clear Reporting With No Discrepancies	Were Eligibility Criteria Clear?	Were Interventions Adequately Described?	Were The Outcomes Fully Defined?	NRCS & Single: Representative-ness of the Cohort(S)	NRCS: Comparator Representative-ness	NRCS: Adjustment for Confounders	Other Bias	Overall Risk of Bias
Berish, 2023, 36129432, (Baseline-later time point)[a,b]	No (Low concern)	No (Low concern)	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	Unclear			No (Low concern)	**Low**
Garbarino, 2023, 38038359, Single group (Pre-post)	No (Low concern)	No (Low concern)	No (High Concern)[c]	Yes (Low concern)	Yes (Low concern)	No (High Concern)[d]	Yes (Low concern)	NA	NA	Yes (High Concern)[e]	**High**
Guth, 2020, 32976620, Single group (Pre-post)	No (Low concern)	Unclear	No (High Concern)[f]	Yes (Low concern)	Yes (Low concern)	No (High Concern)[g]	Unclear	NA	NA	No (Low concern)	**High**
Lundy, 2021, 33275785, Single group (Post-only)	No (Low concern)	No (Low concern)	Yes (Low concern)	No (High Concern)[h]	Yes (Low concern)	No (High Concern)[i]	Unclear	NA	NA	Yes (High Concern)[j]	**High**
Pohnert, 2023, 36134714, NRCS[k]	No (Low concern)	No (Low concern)	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	No (High Concern)[l]	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	No (Low concern)	**Moderate**
Powers, 2022, 36286213, Single group[m]	No (Low concern)	No (Low concern)	No (High Concern)[n]	No (High Concern)[o]	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)			Yes (High Concern)[j]	**High**
Tewary, 2023, 36062563, Single group (Pre-post)	No (Low concern)	No (Low concern)	No (High concern)[p]	No (High Concern)[o]	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	NA	NA	No (Low concern)	**High**
Tewary, 2023, 37489318,	No (Low concern)	No (Low concern)	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	NA	NA	Yes (High Concern)[r]	**Moderate**

Authors, Year, PMID (Design)	Blinding of Outcome Assessor	Incomplete Outcome Data (Attrition Bias)	Clear Reporting With No Discrepancies	Were Eligibility Criteria Clear?	Were Interventions Adequately Described?	Were The Outcomes Fully Defined?	NRCS & Single: Representative-ness of the Cohort(S)	NRCS: Comparator Representative-ness	NRCS: Adjustment for Confounders	Other Bias	Overall Risk of Bias
Single group (pre-post)[q]											
Vonnes, 2023, 37783590, Single group (Post-only)	No (Low concern)	Unclear	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	NA	NA	Yes (High concern)[j]	**High**
Wismann, 2024, 38488173, Single group (Pre-post)	Yes (Low concern)	No (Low concern)	No (High Concern)[s]	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	Yes (Low concern)	NA	NA	Yes (High Concern)[t]	**High**

Notes. [a]Initial implementation phase to a later time point; [b]Study compared results at 3 pilot sites to 18 sites after they implemented strategies at a later date. Because all 21 sites implemented the same strategies, we reported this as a single group pre-post study; [c]Only reported on one M; [d]Did not report on population seen by other physicians; [e]No inclusion of data for annual wellness visits not seen by RNs; [f]Lack of clarity in sample used for each outcome; [g]Compliance not fully defined; [h]Minimal information provided about those who were eligible to be included; [i]No information about measure cutoffs provided; [j]Data only reported for single time point; [k]Reported mostly single group outcomes, but also compared sites that implemented 2 specific strategies (Virtual Clinic strategy and PDSA strategy) to sites that did not implement the strategies, therefore used as single group (baseline-later time point) design for sites that did not already have AFHS and NRCS for sites with existing AFHS; [l]It was not clear how they defined "completion" of the 4Ms; [m]Study compared a site that incorporated a templated note as part of their electric health record to a site that implemented AFHS but did not use a templated note. Because the overall strategies and 4Ms assessments were different between sites, we reported this as a single group study; [n]Results reported in the text versus table were different; report of "intermediate" health factor without explanation of what this term means; [o]Not clear which patients were eligible or minimum information about those included; [p]Outcome tables included extra data without explanation of what these were; [q]Study reported 2 different strategies implemented at 2 different sites, which we reported as a single group pre-post study, though 1 site had post-only data; [r]Only reported post-intervention outcomes on a small number of patients; [s]Missing information from text and figures; [t]Different baseline years and follow-up times.

APPENDIX F. RELEVANT CONFERENCE ABSTRACTS

Authors, Year, Key Question	Strategy Implemented	Design Details (Setting, Study Years, Eligibility Criteria)	Sample Details	Overview of Results
Arany, 2023, KQ2	Dental Clinic patients receiving the 4Ms assessment - Developed dental definition of the 4Ms and incorporated into a templated note	Setting: Dental Clinic; Study Years: 2021-2021 (8 months); Eligibility criteria: NR	N=100 patients; Age= 65+ years old	Process Measures (KQ2) • Patients agreed with comprehensive dental treatments, including extractions (What Matters)= 78/100 (78%) • Patients who had a fall risk (Mobility)= 70/100 (70%) • Patients that had polypharmacy (Medication)= 8/100 (8%) • Patients taking high risk medications (Medication)= 45/100 (45%) Outcome Measures (KQ2) • Patients unable to brush alone (Mobility)= 23/100 (23%) • Patients who screened positive for cognitive impairment (Mentation)= 5/100 (5%)
Carrico, 2022, KQ1 & KQ2	Geriatric focused ECHOs with an emphasis on the 4Ms of Age-Friendly Health Systems (no further details provided)	Setting: Unclear; Study Years: 2019-NR; Eligibility criteria: NR	Geriatric Workforce Enhancement Programs= 6 Participants engaged= over 7, 500 from 64 professions	Barriers (KQ1) • Challenges in recruiting case presenters and maintaining consistent engagement of participants. Process Measures (KQ2) • Practice change data indicates improved ability to assess and address the 4Ms (Other) (p=NR)
Carvalho Do Amaral, 2023, KQ2	Clinic A: Clinic health professionals trained on AWV and 4Ms Healthcare system integration; AWV template integrated into EPIC EMR system Clinic B Development of an implementation plan to optimize geriatric care, which included creation of a visit template with all aspects of AWV and 4Ms and staff training to ensure engagement and role clarity.	Setting: Primary care clinics sites affiliated with an academic institution located in urban underserved areas of Chicago, serving mostly Latinx and Black or African American communities; Study Years: 2021-2022 Eligibility criteria: geriatric care	Total N= 437 chart audits	Process Measures (KQ2) • AWVs (Clinic A) (Other)= 26/100 (26%) • Falls screenings (Clinic A) (Mobility)= 22/100 (22%) • Dementia screenings (Clinic A) (Mentation)= 9/100 (9%) • Depression screenings (Clinic A (Mentation))= 18/100 (18%) • Polypharmacy screenings (Clinic A) (Medication)= 7/100 (7%) • Advanced Directive screenings (Clinic A) (What Matters)= 11/100 (11%) • Clinic B= NR

Authors, Year, Key Question	Strategy Implemented	Design Details (Setting, Study Years, Eligibility Criteria)	Sample Details	Overview of Results
Casey, 2023, KQ2	A 4-week geriatric 'mini-fellowship' structured using the Age-Friendly Health System 4Ms principles of care.	Setting: Health system clinics; Study Years: 2018; Eligibility criteria: NR	Total N= about 3,600 patients 65+ years old; 13 providers	Process Measures (KQ2) Change from 12 months before vs 12 months after intervention: • Percent of patients with fall risk intervention (Mobility)= 34% vs 60% • Percent of patients with documented goals of care (What Matters)= 0% vs 2% • Discontinuation of high-risk medication (Medication)= 34%[a] Outcome Measures (KQ2) • Percent with new dementia diagnosis on problem list (Mentation)= 3.0 vs 4.3% Structural Measures (KQ2) • Cost savings for the health care system (per year) (Other)= at least $560,000/year
Dobert, 2020, KQ2	Geri Pal Interprofessional Team (IPT) who received Geriatrics and Palliative Care training and weekly geriatrician consultation, with integration of 4Ms in the care delivery model.	Setting: Outpatient Clinic; Study Years: NR; Eligibility: ≥ 3 NP visits	N=47 patients	Process Measures (KQ2) • Screened for depression with PHQ2 (Mentation)= 45 (96%) • Had a cognition screening (AD8, MiniCog, MOCA, or MMSE) (Mentation)= 43 (91%) • Mobility assessed using TUG (Mobility)= 37 (74%) • Had a valid HCP (What Matters)= 44 (94%) • Introduced to Goals of Care (GOC) using the Conversation Starter Kit (What Matters)= 28 (55%) • Had GOC discussion (What Matters)= 28 (60%) • Had a valid MOLST (What Matters)= 14 (30%) Structural Measures (KQ2) • Average total acute care cost per patient 6 months pre/6 months post 1st NP visit (Other)= $5,459 vs $3,967 • Number of inpatient hospitalizations6 months pre/6 months post 1st NP visit (Other)= 29 to 15 • Number of emergency room visits 6 months pre/6 months post 1st NP visit (Other)= 21 to 13

Authors, Year, Key Question	Strategy Implemented	Design Details (Setting, Study Years, Eligibility Criteria)	Sample Details	Overview of Results
Dobert, 2021, KQ2	IPT had twice monthly meetings to ensure 4Ms Care remains consistent. PDSA cycles include: increased flow of referrals, RN role refinement, identification of training needs, improved documentation with new care plan, and visit flow chart.	Setting: Community Health Centers Program Study Years: NR Eligibility criteria: NR	N= 167 patients	Process Measures (KQ2) • Made medication recommendation (Medication)s= 68% • 4Ms measures completed: Baseline vs follow up: ○ Health Care Proxy (What Matters)= 57% vs 88% ○ MOLST (What Matters)= 10% vs 25% • Prescribed potentially inappropriate medication (Medication): ○ >1= 73% ○ >2= 49% ○ >4= 92% • Had a reduction in total number of medications (Medication)= 19% ○ Fall Risk Diagnosis from baseline to follow up (Mobility)= 5% vs 88% Outcome Measures (KQ2) • 4Ms measures completed: Baseline vs follow up: ○ Acute Dementia Diagnosis (Mentation)= 33% vs 63%
Drost, 2020, KQ2	High Intensity Clinic (HIC) that implements the 4Ms in patients with multiple chronic illnesses who have complex care needs. Team consists of geriatric physicians, a pharmacist, a social worker, a nurse care manager, and a dedicated medical assistant.	Setting: High Intensity Clinic (HIC); Study Years: NR; Eligibility criteria: Eligibility for the HIC was based on utilization of the emergency room (ER) and hospital or a high score on a geriatric risk tool that tabulates geriatric syndromes.	N=25 patients; Age: 70 years old (range=47 to 87 years old	Process Measures (KQ2) • ER and admission visits (Other) = decreased by 57% during the evaluation period (p=0.016, 95% CI (-2.44, -0.27)) • Average number of office visits during 6 month intervention (Other)= 5.6 • Average number of medication changes in 6 month intervention window (Medication)= 6.7 • Average number of provider-initiated phone calls post intervention (Other)= 4.6 Outcome Measures (KQ2) • Average number of uncontrolled symptoms per patient (preintervention vs post-intervention) (Other)= 8 vs. 5

Authors, Year, Key Question	Strategy Implemented	Design Details (Setting, Study Years, Eligibility Criteria)	Sample Details	Overview of Results
Khanna, 2022, KQ2	4Ms implementation: "What Matters" was assessed by providers asking "What Matters the most to you;" potentially inappropriate Medications were identified using the Beers list; Mentation was evaluated using the Mini-Cog; and Mobility was assessed using timed up and go (TUG) test.	Setting: Outpatient geriatric clinic; Study Years: 2021 Eligibility criteria: NR	N=121 patients	Process Measures (KQ2) • Patients asked "what matters" (What Matters)= 103/121 (85%) • Providers reviewed Medications (Medication)= 118/121 (98%) • Providers conducted a Mini-Cog (Mentation)= 78/121 (64%) • Providers used the TUG test (Mobility)= 105/121 (87%) • Patients receiving further cognitive evaluation (among 14 patients with abnormal Minicog) (Mentation)= 2/14 • Patients receiving home care referrals (among 14 patients with abnormal Minicog) (Mentation)=2/14 • Intervention with devices, referrals or home services in patients with abnormal TUG (Mobility)= 19/51 (37%) • Patients with potentially inappropriate Medications (Medication)= 39/118 (33%) • Patients with medications either discontinued or reduced (Medication)= 10/39 (26%) Outcome Measures (KQ2) • Patients with abnormal MiniCog (Mentation)= 14/78 (18%) • Patients with abnormal TUG (Mobility)= 51/105 (73%)
Kim, 2022, KQ2	Training about 4Ms action plan in telehealth-based primary care. "What matters" measured through advanced care plan, Medications assessed through deprescribing or reducing high risk medications, mentation assessed through depression/cognition assessment and brief counseling, and mobility assessed though mobility/home safety and referral	Setting: Urban primary care provider; Study Years: 2020- 2021; Eligibility criteria: NR	14 primary care providers trained; 184 patients (60+) assessed; Ethnically/racially diverse population 39.7% (73/184)	Process Measures (KQ2) Overall: • Advanced care planning discussed (What Matters)= 79.9% • Medication assessed (Medication)= 16.8% • Mobility assessed (Mobility)= 46.2% • Mentation assessed (Mentation)= 14.7% • 4Ms action plans not discussed (Other)= 61.4% White vs Non-White patients: • Advanced care planning discussed (What Matters)= 84.7% vs 72.6% • Medication assessed (Medication)= 23.4% vs 6.8%

Authors, Year, Key Question	Strategy Implemented	Design Details (Setting, Study Years, Eligibility Criteria)	Sample Details	Overview of Results
				• Mobility assessed (Mobility)= 61.3% vs 26.0% • Mentation assessed (Mentation)= 19.8% vs 6.8% • 4Ms action plans not discussed (Other)= 60.4% vs 63.0%
O'Hara, 2021, KQ1	Not specified; achieving age friendly status	Settings: Geriatrics-staffed, primary care clinics in two different health systems, a Veterans Affairs-based clinic (VA) and a safety-net hospital-based primary care clinic; Study Years: NR Eligibility Criteria: NR	N= 2 healthcare systems	Barriers (KQ1) • Limited staffing, which resulted in task delegation being centralized around the provider. Facilitators (KQ1) • Buy-in of clinic directors and staff • Adequate staffing • Distribution of assessment of the 4Ms across interprofessional team members
Rubino, 2021, KQ2	Senior Strong, which provides screening, referral and health professional training around all 4Ms	Setting: Outpatient Clinic; Study Years: 2020-2020 Eligibility: age 65+	N= 15 patients served by the Senior Strong program; NR for usual care group	Process Measures (KQ2) • Depression screening (Senior Strong vs Usual Care) (Mentation)= 73.3% vs 32% • Noted that similar results were seen for documentation of advance care planning discussions and falls screening
Vu, 2022, KQ1	Not specified; age friendly community clinic	Setting: Urban, community-based, family medicine primary care clinic Study Years: NR Eligibility criteria: NR	NR	Barriers (KQ1) • Lack of support staff • Lack of purposeful allocation of time • Lack of knowledge and training surrounding the use of available screening methods, community resources, utilization of pharmacist expertise, and distribution of educational materials Facilitators (KQ1) • Trained clinic staff and physicians who utilize screening measures during regular visits • Focused geriatric clinic appointments related to 4Ms framework • Involvement of all members of the care team
Vu, 2023, KQ1	Not specified; clinic that has obtained Level 1 status	Setting: Community-based Primary Care Clinic Study Years: NR Eligibility criteria: NR	65+ years old	Facilitators (KQ1) • Consistent utilization of the electronic health record system • Trained clinic staff

Authors, Year, Key Question	Strategy Implemented	Design Details (Setting, Study Years, Eligibility Criteria)	Sample Details	Overview of Results
				• Involvement of all members of the care team Barriers (KQ1) • Staffing • Allocation of time to train the care team on how to utilize and apply the 4Ms • Consistent emphasis on how to provide Age-Friendly, high-quality care to patients
Yang, 2023, KQ2	Interprofessional education and telehealth training curriculum for primary care healthcare providers, informed by the 4Ms	Setting: A provider shortage area; Study Years: 2021-2021 Eligibility criteria: Patients with mild to moderate dementia	N= 50 patients; Age: 67-94	Process Measures (KQ2) • Improvement in MIPS Dementia Caregiver Education and Referral (Mentation)= 15.6% vs 51.0% • MIPS Advance Care Planning (What Matters)= 10.8% vs 42.8% Structural Measures (KQ2) • Hospitalization-related healthcare cost (Other): Average cost saving of $22,135 per patient for those trained vs those without training

Notes. [a]As reported in the figure presented in the abstract, percent of patients on high-risk medications = 35.7% versus 35.8%.

Abbreviations. 4Ms=What Matters, Medication, Mentation, and Mobility; AD8=Eight-item Informant Interview to Differentiate Aging and Dementia; AWV=annual wellness visit; ECHO=Extension for Community Healthcare Outcomes; EMR=electronic medical record; ER=emergency room; GOC=goals of care; HCP=health care proxy; HIC=high intensity clinic; IPT=interprofessional team; KQ=key question; MIPS=merit-based incentive payment system; MMSE=mini mental status exam; MOCA=Montreal Cognitive Assessment; MOLST=medical orders for life-sustaining treatment NP=nurse practitioner; PDSA=plan-do-study-act; PHQ2=patient health questionnaire-2; TUG=timed up and go test.

APPENDIX G. DESIGN DETAILS

Author, Year, PMID	Study Design	Setting, Funding	Study Years	Inclusion
Berish, 2023, 36129432	Single group; (Baseline-later time point)[a,b]	Outpatient Clinic, Non-industry	2020-2021	21 Federally Qualified Health Centers (FQHC) clinical sites.
Garbarino, 2023, 38038359	Single group (Pre-post)	Outpatient Clinic, Non-industry	2019-2022	A patient centered primary care practice in a northeastern, increasingly urban region of the United States.
Guth, 2020, 32976620	Single group (Pre-post)	Outpatient Clinic, Not reported	2018 - 2019	An ambulatory care practice that specializes in the case of older adults with medical, medication, and psychosocial needs during the study period.[c]
Lundy, 2021, 33275785	Single group (Post only)	Outpatient Clinic (Rural Primary Health Care), Non-industry	2015-2019	Workforce at an outpatient clinic who attended at least 5 of 8 class sessions.
Pohnert, 2023, 36134714	NRCS[d]	Convenient care clinic, Non-industry	2020-2022	MinuteClinics located in 35 states and DC.
Powers, 2022, 36286213	Single group[e] (Post only)	Outpatient Clinics,[f] Non-industry	2021-2021	Workforce at 2 VA Medical Centers.
Tewary, 2023, 36062563	Single group (Pre-post)	Outpatient Clinic, Non-industry	2019-2020	Clinic personnel, physicians, medical assistants, and nurses at identified clinics.
Tewary, 2023, 37489318	Single group (Pre-post)[g]	Outpatient Clinic, Non-industry	2021-2023	Two primary care clinics in South Florida that have both been designated as age-friendly clinics by the Institute of Healthcare Improvement (IHI).
Vonnes, 2023, 37783590	Single group (Post only)	Cancer center, Not reported	2019-2023	Senior Adult Oncology Program (SAOP).
Wismann, 2024, 38488173	Single group (Pre-post) with Qualitative Component	Outpatient Clinics, Non-industry	2020-2023	Primary care clinics within an academic health system. [c]

Notes. [a]Initial implementation phase to a later time point; [b]Study compared results at 3 pilot sites to 18 sites after they implemented strategies at a later date. Because all 21 sites implemented the same strategies we reported this as a single group pre-post study; [c]At MedStar Center for Successful Aging (CSA); [d]Reported mostly single group outcomes, but also compared sites that implemented 2 specific strategies (Virtual Clinic strategy and PDSA strategy) to sites that did not implement the strategies, therefore used as single group (baseline-later time point) design for sites that did not already have AFHS and NRCS for sites with existing AFHS; [e]Study compared a site that incorporated a templated note as part of their electric health record to a site that implemented AFHS but did not use a templated note. Because the overall strategies and 4Ms assessments were different between sites, we reported this as a single group study; [f]Two VA Medical Centers; [g]Study reported 2 different strategies implemented at 2 different sites, which we reported as a single group pre-post study, though 1 site had post-only data; [h]University of Oklahoma (OU) Health.

Abbreviations. NRCS=nonrandomized comparative study.

APPENDIX H. BASELINE CHARACTERISTICS

Author, Year, PMID, Study Design	Subject Group	N	Age	Demographics [Male %, Race or Ethnicity %]	Other
Berish, 2023, 36129432, (Baseline-later Time point)[a,b]	Workforce participants	368	NR	NR	Included primary health network employees, students, students who are also primary health network employees, community group members, college of nursing faculty, area agency on aging, specialty providers
	Patients seen	6924[c]	74.3 (6.9)	NR	NR
Garbarino, 2023, 38038359, Single group (Pre-post)	Primary care clinic workforce	NR	NR	NR	Number of patients seen annually; ~ 2500 patients (~ 571 enrolled in Medicare)
	Patients seen	116	<70: 25% 71-75: 32% 76-80: 25% 81-85: 11% >85: 7%	Male: 39% White: 96% Asian: 1% Others: 2% Declined: 2%	NR
Guth, 2020, 32976620, Single group (Pre-post)	Healthcare providers	11	NR	NR	NR
	New patients	122	NR	NR	NR
Lundy, 2021, 33275785, Single group (Post only)	NR	NR	NR	NR	NR
	Patients seen	1,326	≤65	NR	Frailty: 36.5% Sarcopenia: 42.1% Anorexia risk: 26.1% Dementia: 28.1%
Pohnert, 2023, 36134714, NRCS[d]	Approximately 1,100 MinuteClinics	2901[e]	NR	NR	NR
	Patients eligible for 4Ms	324,245	NR	NR	NR

Author, Year, PMID, Study Design	Subject Group	N	Age	Demographics [Male %, Race or Ethnicity %]	Other
Powers, 2022, 36286213, Single group (Post only) [f]	Workforce VA Medical Center clinics	2	NR	NR	NR
	Patients seen	176	NR	NR	NR
Tewary, 2023, 36062563, Single group (Pre-post)	Primary care clinic providers who received training	80	NR	Male: 38%[g] White: 44% [g] Hispanic: 12% [g] Others: 88% [g]	Clinic personnel, physicians, medical assistants, and nurses at identified clinics
	Patients seen at these clinics	NR	≥65	NR	NR
Tewary, 2023, 37489318, Single group (Pre-post)[h]	1 university clinic and 1 health center clinic	NR	NR	NR	NR
	Patients seen	146	≥65	NR	NR
Vonnes, 2023, 37783590, Single group (Post only)	Senior Adult Oncology Program at a cancer center	NR	Facility patients that are over the ≥65: 49%	NR	Facility had 97 geriatric resource nurses and 134 geriatric patient care associates who are unlicensed geriatric care experts.
	Patients seen	5500	NR	NR	NR
Wismann, 2024, 38488173, Single group (Pre-post)	5 primary care clinics (geriatrics, internal medicine, 3 family medicine clinics)	NR	Percent of patients 65+: 11 to 98%	Patients see at clinics: White: 47.2 to 91.8% Black: 4.2 to 40% American Indian: 1.2 to 2.1% Asian: 1.3 to 3.4% Native Hawaiian/Pacific Islander: 0.2 to 0.8% Hispanic: 2.7 to 9.2% Not reported: 1.4 to 7.6%	3 academic training sites, 2 non-academic training sites; 3 urban sites, 2 rural sites
	Patients	5807	≥65	NR	NR

Notes. [a]Initial implementation phase to a later time point; [b]Study compared results at 3 pilot sites to 18 sites after they implemented strategies at a later date. Because all 21 sites implemented the same strategies, we reported this as a single group pre-post study; [c]Patients seen from 3 pilot sites and 18 comparison sites; [d]Reported mostly single group outcomes, but also compared sites that implemented 2 specific strategies (Virtual Clinic strategy and PDSA strategy) to sites that did not implement the strategies, therefore used as single group (baseline-later time point) design for sites that did not already have AFHS and NRCS for sites with existing AFHS; [e]Providers

completed the orientation introducing 4Ms care; [f]Study compared a site that incorporated a templated note as part of their electric health record to a site that implemented AFHS but did not use a templated note. Because the overall strategies and 4Ms assessments were different between sites, we reported this as a single group study; [g]Of participants provided feedback by completing the knowledge survey (N=16); [h]Study reported 2 different strategies implemented at 2 different sites, which we reported as a single group pre-post study, though 1 site had post-only data.

Abbreviations. NR=not reported; NRCS=nonrandomized comparative study.

APPENDIX I. CONTEXTUAL FACTORS FOR AFHS IMPLEMENTATION (KQ1)

Study	Implementation Facilitators	Implementation Barriers	Uncategorized Contextual Factors
Wismann, 2024, 38488173[a]	• Leadership prioritization • Team buy-in and shared goals • Modification of EHR templates to prompt documentation • Monthly meetings with practice facilitator • QI measure review • Visual reminders to cue providers • Patient resources • Importance of trainee exposure to 4Ms	• Short visit length; time limitations • Nursing staff shortages • Lack of physician buy-in • Competing clinical priorities • Too much information in one visit • Establishing new workflows • EHR limitations • Need for clinical support tools • Challenges with deprescribing • Unfamiliarity with asking about what matters most	NR
Berish, 2023, 36129432 [b]	• Leadership buy-in	• Unspecified data collection and documentation issues	NR
Garbarino, 2023, 38038359 [b]	• Clinical team buy-in	• Patient preferences • Inconvenience to patients if multiple visits were required	NR
Guth, 2020, 32976620 [b]	• Existing weekly high-risk rounds	• Lack of efficiency of processes, leading to missing screening data	NR
Lundy, 2021, 33275785 [b]	• Administrative support • Clinical-team buy-in • Regular interaction between stakeholders • Availability of community-based supports	NR	NR
Pohnert, 2023, 36134714 [b]	• Clinical team knowledge of 4Ms • Stakeholder partnerships • Effective UI design	• Providers lacking knowledge of their own performance in 4Ms. • Lack of confidence with documentation	
Powers, 2022, 36286213 [b]	NR	NR	• Clinical team engagement with the development of the dashboard

Tewary, 2023, 36062563 [b]	NR	• Barriers to telehealth visits:
		  ○ Technology
		  ○ Computer literacy
		  ○ Broadband
		• Barriers to telehealth visits: Scheduling constraints
		• Getting provider buy-in for documentation
			• Operational policies
			• Provider constraints such as time to chart and AFHS documentation
			• Concerns about infection
			• Limited face-to-face patient visits with providers

Study	Implementation Facilitators	Implementation Barriers	Uncategorized Contextual Factors
		• Time constraints for documentation and comprehensive evaluation of patients restricting the implementation of best practices • Reduced training participation due to COVID-19 • Overall difficulty in changing the culture of established healthcare system	
Tewary, 2023, 37489318[b]	NR	• Making contact with patients • Inability to fully assess mobility and environment due to method of visit (telehealth) • Access to interpreter services for afterhours visits • Difficult to implement 4Ms with medically complex or cognitively impaired patients or those who require more time in their appointments for other reasons	NR
Vonnes, 2023, 37783590[b]	NR	• Need for engaging pharmacists • Need to establishing processes for referral to appropriate follow up care after cognitive screening	NR

Notes. [a]Study explicitly assessing contextual factors; [b]Study that mentioned contextual factors without explicit examination of these.

Abbreviations. 4Ms=What Matters, Medication, Mentation, and Mobility; AFHS=Age-Friendly Health System; EHR=electronic health record; NR=not reported; Qi=quality improvement; UI=user interface.

APPENDIX J. CFIR 2.0 DOMAIN DETAILS

Study	Individual Barriers Identified	Innovation Domain	Outer Setting Domain	Inner Setting Domain	Individuals Domain	Implementation Process Domain
Barrier Categories						
Challenges With Data Collection and Documentation						
Berish, 2023, 36129432	Unspecified data collection and documentation issues					Planning; Reflecting & Evaluating: Implementation
Guth, 2020, 32976620	Lack of efficiency of processes, leading to missing screening data			Structural Characteristics: Work infrastructure		Planning
Pohnert, 2023, 36134714	Lack of confidence with documentation				Roles: Innovation deliverers Characteristics: Capability	Engaging: Innovation deliverers
Difficulty Changing Culture, Engaging Other Team Members, or Establishing New Processes						
Wismann, 2024, 38488173	Establishing new workflows			Structural Characteristics: Work infrastructure		Adapting
Wismann, 2024, 38488173	Challenges with deprescribing			Culture; Access to knowledge and information	Roles: Innovation deliverers; Implementation team members Characteristics: Capability; Motivation	
Tewary, 2023, 36062563	Overall difficulty in changing the culture of established healthcare system			Relative Priority; Culture		
Vonnes, 2023, 37783590	Need for engaging pharmacists				Other Implementation Support	
Vonnes, 2023, 37783590	Need to establishing processes for referral to appropriate follow up care after cognitive screening			Structural Characteristics: Work infrastructure		Tailoring Strategies; Adapting
Lack of Buy-In or 4Ms Knowledge						

Study	Individual Barriers Identified	Innovation Domain	Outer Setting Domain	Inner Setting Domain	Individuals Domain	Implementation Process Domain
Wismann, 2024, 38488173	Lack of physician buy-in				Roles: Mid-level leaders; Implementation team members Characteristics: Motivation	
Wismann, 2024, 38488173	Unfamiliarity with asking about what matters most			Access to knowledge and information	Characteristics: Compatibility	
Pohnert, 2023, 36134714	Providers lacking knowledge of their own performance in 4Ms.					Reflecting and evaluating implementation
Tewary, 2023, 36062563	Getting provider buy-in for documentation				Roles: Innovation Deliverers Characteristics: Motivation	
Patient Preferences						
Wismann, 2024, 38488173	Too much information in one visit			Structural Characteristics: Work infrastructure; Compatibility		
Garbarino, 2023, 38038359	Patient preferences			Relative Priority	Roles: Innovation Recipients Characteristics: Motivation	Tailoring Strategies
Garbarino, 2023, 38038359	Inconvenience to patients if multiple visits were required			Relative Priority	Roles: Innovation Recipients	Tailoring Strategies
Tewary, 2023, 37489318	Making contact with patients					Engaging
Scheduling/Time Constraints						
Wismann, 2024, 38488173	Short visit length; time limitations			Available Resources; Structural Characteristics: Work infrastructure		
Wismann, 2024, 38488173	Nursing staff shortages			Available Resources; Structural Characteristics: Work infrastructure		
Wismann, 2024, 38488173	Competing clinical priorities			Structural: Work infrastructure; Relative priority		
Tewary, 2023, 36062563	Time constraints for documentation and comprehensive evaluation of patients restricting the implementation of best practices			Relative Priority	Available Resources	

Study	Individual Barriers Identified	Innovation Domain	Outer Setting Domain	Inner Setting Domain	Individuals Domain	Implementation Process Domain
Tewary, 2023, 36062563	Barriers to telehealth visits: scheduling constraints			Structural Characteristics: Work infrastructure; Compatibility		
Technology Barriers						
Wismann, 2024, 38488173	EHR limitations			Structural: Information technology infrastructure		
Tewary, 2023, 37489318	Inability to fully assess mobility and environment due to method of visit (telehealth)					Tailoring Strategies
Tewary, 2023, 36062563	Barriers to telehealth visits: (Technology, computer literacy, broadband)			Structural Characteristics: Work infrastructure; Compatibility		
Other						
Tewary, 2023, 36062563	Reduced training participation due to COVID		Critical Incidence	Relative Priority		
Wismann, 2024, 38488173	Need for clinical support tools			Structural Characteristics: Information technology infrastructure; Physical infrastructure; Available Resources		
Tewary, 2023, 37489318	Access to interpreter services for after hours visits			Available Resources	Other implementation support	
Tewary, 2023, 37489318	Difficult to implement 4Ms with medically complex or cognitively impaired patients or those who require more time in their appointments for other reasons			Available Resources; Innovation Recipients; Relative priority		
Facilitator Categories						
Buy-In						
Wismann, 2024, 38488173	Leadership prioritization			Relative Priority	Roles: Mid-Level Leaders Characteristics: Motivation	
Wismann, 2024, 38488173	Team buy-in and shared goals				Roles: Innovation deliverers Characteristics: Motivation	
Berish, 2023, 36129432	Leadership buy-in				Roles: High-Level Leaders	

Study	Individual Barriers Identified	Innovation Domain	Outer Setting Domain	Inner Setting Domain	Individuals Domain	Implementation Process Domain
					Characteristics: Motivation	
Garbarino, 2023, 38038359	Clinical team buy-in				Roles: Mid-Level Leaders; Implementation team members Characteristics: Motivation	
Lundy, 2021, 33275785	Clinical-team buy-in				Roles: High-level leaders; Mid-level leaders; Implementation team members Characteristics: Motivation	
Admin Support or Existing Infrastructure						
Wismann, 2024, 38488173	Modification of EHR templates to prompt documentation			Structural Characteristics: IT infrastructure		Adapting
Wismann, 2024, 38488173	Monthly meetings with practice facilitator				Implementation Facilitators	Teaming
Wismann, 2024, 38488173	QI measure review					Reflecting and Evaluation: Implementation
Guth, 2020, 32976620	Existing weekly high-risk rounds			Structural Characteristics: Work Infrastructure; Relational connections; Communications		
Lundy, 2021, 33275785	Administrative support			Structural Characteristics: Work infrastructure	Roles: Other Implementation Support; High level leader Characteristics: Motivation	
Clinical Team Knowledge of 4Ms						
Wismann, 2024, 38488173	Importance of trainee exposure to 4Ms			Culture: Learning-Centeredness; Access to knowledge and information		
Pohnert, 2023, 36134714	Clinical team knowledge of 4Ms			Access to Knowledge & Information	Roles: Implementation team members Characteristics: Capability	

Study	Individual Barriers Identified	Innovation Domain	Outer Setting Domain	Inner Setting Domain	Individuals Domain	Implementation Process Domain
Stakeholder Partnerships/Community Support						
Lundy, 2021, 33275785	Regular interaction between stakeholders					Teaming; Engaging: Innovation Deliverers
Lundy, 2021, 33275785	Availability of community-based supports		Partnerships & Connections; Local Conditions			
Pohnert, 2023, 36134714	Stakeholders partnerships		Partnerships & Connections			Teaming
Other						
Pohnert, 2023, 36134714	Effective UI design			Structural Characteristics-Information Technology Infrastructure		
Wismann, 2024, 38488173	Visual reminders to cue providers					Tailoring Strategies
Wismann, 2024, 38488173	Patient resources		Partnerships & Connections	Available Resources		

Abbreviations. 4Ms=What Matters, Medication, Mentation, and Mobility; EHR=electronic health record; QI=quality improvement.

APPENDIX K. RESULTS OF IMPLEMENTATION STRATEGIES (KQ2)

K1. What Matters

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]	Annual Wellness Visit completion Advanced Care Planning (ACP) (new on file)	All	June 2020-Jan 2022	Baseline 3 Pilot 4Ms sites	9/337 (3%)		Process
				3 Pilot 4Ms sites	97/397 (24%)	RD 0.22 (0.17, 0.26)[c]	
				18 comparison sites	815/6527(12%)	-	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]		All	June 2020-Jan 2022	Baseline 3 Pilot 4Ms sites	1/337 (0%)		Process
				3 Pilot 4Ms sites	31/397 (8%)	RD 0.08 (0.05, 0.10)[c]	
				18 comparison sites	131/6527 (2%)	-	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]	ACP (discussed with patient [advance care plan conversation documented])	All	June 2020-Jan 2022	Baseline 3 Pilot 4Ms sites	0/337 (0%)		Process
				3 Pilot 4Ms sites	73/397 (18%)	RD 0.18 (0.15, 0.22),[c] p = 0.000	
				18 comparison sites	849/6527 (13%)	-	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]	ACP (patient declined [those who refused an advance care plan conversation])	All	June 2020-Jan 2022	Baseline 3 Pilot 4Ms sites	0/337 (0%)		Process
				3 Pilot 4Ms sites	1/397 (0%)	RD 0.00 (0.00, 0.01),[c] p = 0.317	

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
				18 comparison sites	0/6527 (0%)	-	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]	Caregiver/ Care partner identification	All	Jan 2021-Jan 2022	Baseline 3 Pilot 4Ms sites	4/328 (1%)		Process
				3 Pilot 4Ms sites	44/397 (11%)	RD 0.10 (0.07, 0.13)	
				18 comparison sites	849/6527 (13%)	-	
Garbarino, 2023, 38038359, Single group (Pre-post)	Patients responding to "What Matters" questions	Patients scheduled for an RN-led AWV	At follow-up (2021)	Patients scheduled for an RN-led AWV	114/116 (98.3%)	-	Process
Garbarino, 2023, 38038359, Single group (Pre-post)	Asked the "what matters" question: "Currently in your life, in one or two sentences, what matters most to you?"	Patients receiving AWV	At AWV	RN-led AWV	116	-	Process
Guth, 2020, 32976620, Single	"Usually" or "Always" discussing 4Ms during high-risk rounds (provider reported) - Matters	Providers	Pre- vs. post-implementation (Oct-Dec 2018 vs Jan-Mar 2019)	Pre-intervention	6/11 (54.5%)		Process
				Post intervention	8/11 (72.7%)	RD 0.18 (-0.21, 0.58)[c]	
Guth, 2020, 32976620, Single group (Pre-post)	What matters: Patient completed the "what matters" question in the intake packet, which asks them to choose an item that is most important to them regarding their medical care.	Snapshot of patients before training in 4Ms and after	Pre- vs. post-implementation (Oct-Dec 2018 vs Jan-Mar 2019)	Pre-implementation	63/67 (94%)		Process
				Post-implementation	38/55 (69%)	RD-0.25 (-0.38, -0.11)[c]	
Lundy, 2021, 33275785, Single group (Post only)	Had advanced directive completed prior to or during the program	65-74 years old	At assessment	Patients receiving a rapid geriatric assessment (RGA)	NR/NR (47.6%)	-	Process
		75-84 years old	At assessment	Patients receiving a rapid geriatric assessment (RGA)	NR/NR (66.7%)	-	

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
		>=85 years old	At assessment	Patients receiving a rapid geriatric assessment (RGA)	NR/NR (63.8%)	-	
Pohnert, 2023, 36134714, NRCS[d]	Completion of "What Matters"	Eligible patients completing 4Ms	First 8 months vs February 2022	First 8 months	3.4%		Process
				Following best practice alert	18.2%	14.8%	
				February 2022	24.1%	20.7%	
Pohnert, 2023, 36134714, NRCS[d]	Respondents giving the highest score on the CollaboRATE questionnaire- *How much effort was made to help you understand your health issues?*	Eligible patients completing 4Ms	Follow-up (Year 2)	Adults aged 65 and older that received care in the system in 2021	75.6%	-	Process
Pohnert, 2023, 36134714, NRCS[d]	Respondents giving the highest score on the CollaboRATE questionnaire- *How much effort was made to listen to what matters most to you about your health issues?*	Eligible patients completing 4Ms	Follow-up (Year 2)	Adults aged 65 and older that received care in the system in 2021	77.6%	-	Process
Pohnert, 2023, 36134714, NRCS[d]	Respondents giving the highest score on the CollaboRATE questionnaire- *How much effort was made to include what matters most to you in choosing what to do next?*	Eligible patients completing 4Ms	Follow-up (Year 2)	Adults aged 65 and older that received care in the system in 2021	76.2%	-	Process
Pohnert, 2023, 36134714, NRCS[d]	Mean CollaboRATE score (on a 4-point scale)	Eligible patients completing 4Ms	Follow-up (Year 2)	Adults aged 65 and older that received care in the system in 2021	3.6	-	Process
Powers, 2022, 36286213, Single group[e] (Post only)	Health Factor Addressed (What Matters)- Patient portal messages (proxy for engagement) or What Matters is asked and documented, and care plan is	All	During 30-day period	GeriPACT Non-Templated Notes	19/127 (15%)	-	Process

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
	aligned with their health outcome goals and care preferences						
				GeriPACT and HBPC Templated Notes	11/49 (22%)		
Tewary, 2023, 37489318, Single group (Pre-post)[f]	Matters Most—ACP documentation or refusal	All	Oct-Dec 2021	University Clinic- Needs Assessment	5/146 (3.4%)		Process
			Sep-Dec 2022	University Clinic- After QI Implementation	15/15 (100%)	RD 0.97 (0.94, 1.00)[1]	
			Dec 2022-Mar 2023	Health Center- After QI Implementation	6/6 (100%)	-	
Tewary, 2023, 36062563, Single group (Pre-post)	Advance Care Plan	Clinics completing all components of Phases 1 and 2	Baseline vs. follow up	Baseline (2019)	6.79%		Process
				Year 1 (2020)	20.24% (Improving)	13.45%	
Vonnes, 2023, 37783590, Single group (Post only)	Older adults engaged in What Matters Most conversations in the Senior Adult Program since program implementation	All	Since 2019	Geriatric oncology patients	18,474	-	Process
Wismann, 2024, 38488173, Single group (Pre-post)	At least one "What Matters Most" question documented in the EHR	Adults aged ≥ 65 years in Geriatrics	Baseline for the first two quarters of 2023	Baseline	0/725 (0%)		Process
				Q2-3 2023	NR/NR (30%)	30%	
		Adults aged ≥ 65 years in Internal medicine	Baseline for the first two quarters of 2023	Baseline	0/1441 (0%)		

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
				Q2-3 2023	NR/NR (3%)	3%	
		Adults aged ≥ 65 years in Family medicine A	Baseline for the first two quarters of 2023	Baseline	0/1703 (0%)		
				Q2-3 2023	NR/NR (5%)	5%	
		Adults aged ≥ 65 years in Family medicine B	Baseline for the first two quarters of 2023	Baseline	0/1386 (0%)		
				Q2-3 2023	NR/NR (1%)	1%	
		Adults aged ≥ 65 years in Family medicine C	Baseline for the first two quarters of 2023	Baseline	0/552 (0%)		
				Q2-3 2023	NR/NR (0%)	0%	
Wismann, 2024, 38488173, Single group (Pre-post)	Advance care plan or surrogate decision maker documented in the EHR (or documentation that the patient did not wish to have this documented)	Adults aged ≥ 65 years in Geriatrics	Baseline for the first two quarters of 2023	Baseline	~44/[1]725 (6%)		Process
				Q2-3 2023	NR/NR (66%)	60%	
		Adults aged ≥ 65 years in Internal medicine	Baseline for the first two quarters of 2023	Baseline	~86[1]/1441 (6%)		
				Q2-3 2023	NR/NR (26%)	20%	
		Adults aged ≥ 65 years in Family medicine A	Baseline for the first two quarters of 2023	Baseline	~443[1]/1703 (9%)		
				Q2-3 2023	NR/NR (26%)	17%	
		Adults aged ≥ 65 years in Family medicine B	Baseline for the first two quarters of 2023	Baseline	~360[1]/1386 (26%)		
				Q2-3 2023	NR/NR (28%)	12%	

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
		Adults aged ≥ 65 years in Family medicine C	Baseline for the first two quarters of 2023	Baseline	~55[1]/552 (10%)		
				Q2-3 2023	NR/NR (11%)	1%	

Notes. [a]Initial implementation phase to a later time point; [b]Study compared results at 3 pilot sites to 18 sites after they implemented strategies at a later date. Because all 21 sites implemented the same strategies we reported this as a single group pre-post study; [c]Calculated by the research team; [d] Reported mostly single group outcomes, but also compared sites that implemented 2 specific strategies (Virtual Clinic strategy and PDSA strategy) to sites that did not implement the strategies, therefore used as single group (baseline-later time point) design for sites that did not already have AFHS and NRCS for sites with existing AFHS; [e]Study compared a site that incorporated a templated note as part of their electric health record to a site that implemented AFHS but did not use a templated note. Because the overall strategies and 4Ms assessments were different between sites, we reported this as a single group study; [f]Study reported 2 different strategies implemented at 2 different sites, which we reported as a single group pre-post study, though 1 site had post-only data.

Abbreviations. 4Ms=What Matters, Medication, Mentation, and Mobility; ACP=advanced care planning; AWV=annual wellness visit; EHR=electronic health record; GeriPACT=geriatric patient aligned care teams; HBPC=home-based primary care; NR=not reported; RD=risk difference; RN=registered nurse; QI=quality improvement.

K2. Medication

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]	High-risk medication elimination	All	June 2020-Jan 2022	Baseline 3 Pilot 4Ms sites	177/337 (53%)		Process
				3 Pilot 4Ms sites	226/397 (57%)	RD 0.04 (-0.03, 0.12)[c]	
				18 comparison sites	4112/6527 (63%)	-	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]	Opioid misuse mitigation	All	June 2020-Jan 2022	Baseline 3 Pilot 4Ms sites	31/40 (78%)		Process
				3 Pilot 4Ms sites	22/23 (96%)	RD 0.18 (0.03, 0.34)[c]	
				18 comparison sites	5613/6527 (86%)	-	
Guth, 2020, 32976620, Single group (Pre-post)	"Usually" or "Always" discussing 4Ms during high-risk rounds (provider reported) - Medication	Providers	Pre- vs. post-implementation (Oct- Dec 2018 vs Jan-Mar 2019)	Pre-intervention	7/11 (63.6%)		Process

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
				Post intervention	10/11 (90.9%)	RD 0.27 (-0.06, 0.60)[c]	
Guth, 2020, 32976620, Single group (Pre-post)	Medication: Patient was seen by the Center for Successful Aging's onsite pharmacist and completed a medication review.	Snapshot of patients before training in 4Ms and after	Pre- vs. post-implementation (Oct- Dec 2018 vs Jan-Mar 2019)	Pre-implementation	57/67 (85%)		Process
				Post-implementation	47/55 (85%)	RD 0.00 (-0.12, 0.13)[c]	
Pohnert, 2023, 36134714, NRCS[d]	Completion of "Medication"	Eligible patients completing 4Ms	First 8 months vs. February 2022	First 8 months	3.1%		Process
				February 2022	21.9%	18.8%	
Powers, 2022, 36286213, Single group[e] (Post only)	Health Factors Addressed (Medication)- Medication review and reconciliation Or High-risk medications are reviewed, documented, deprescribed, and avoided. If Medication is necessary, the Medication does not interfere with What Matters to the older Veteran, their Mobility, or Mentation.	All	During 30-day period	GeriPACT Non-Templated Notes	64/127 (50%)	-	Process
				GeriPACT and HBPC Templated Notes	12/49 (24%)	-	
Tewary, 2023, 37489318, Single group (Pre-post)[f]	Medication—Review and reconciliation	All	Oct-Dec 2021	University Clinic- Needs Assessment	146/146 (100%)		Process
			Sep-Dec 2022	University Clinic- After QI Implementation	15/15 (100%)	RD 0.00 (0.00, 0.00)[c]	
			Dec 2022-Mar 2023	Health Center- After QI Implementation	6/6 (100%)	-	
Tewary, 2023, 36062563, Single group (Pre-post)	High risk medications in elderly	Clinics completing all components of Phases 1 and 2	Baseline vs. follow up	Baseline (2019)	No data available	-	Process
				Year 1 (2020)	3.71%	-	

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
					(Improving)[g]		
Vonnes, 2023, 37783590, Single group (Post only)	Medication history screening that prompted pharmacy consult	All	screening period	geriatric oncology patients	836/1044 (80.1%)	-	Process
Vonnes, 2023, 37783590, Single group (Post only)	Pharmacy collaborated for high-risk medications including anticoagulants and oral hypoglycemic agents	All	screening period	geriatric oncology patients	146/1044 (14.0%)	-	Process
Vonnes, 2023, 37783590, Single group (Post only)	Pharmacy collaborated for deprescribing opportunities in patients taking proton pump inhibitors, aspirin for primary prevention or potentially inappropriate medications	All	screening period	geriatric oncology patients	195/1044 (18.7%)	-	Process
Wismann, 2024, 38488173, Single group (Pre-post)	Currently prescribed an opioid and a sedative-hypnotic (benzo or z-drug) with 2 or more prescriptions in the last 12 months	Adults aged ≥ 65 years in Geriatrics	Baseline for the first two quarters of 2023	Baseline	~80/725 (11%)		Process
				Q2-3 2023	NR/NR (7%)	−4%	
		Adults aged ≥ 65 years in Internal medicine	Baseline for the first two quarters of 2023	Baseline	~346/1441 (24%)		
				Q2-3 2023	NR/NR (23%)	−1%	
		Adults aged ≥ 65 years in Family medicine A	Baseline for the first two quarters of 2023	Baseline	~681/1703 (20%)		
				Q2-3 2023	NR/NR (22%)	2%	
		Adults aged ≥ 65 years in Family medicine B	Baseline for the first two quarters of 2023	Baseline	~554/1386 (40%)		
				Q2-3 2023	NR/NR (39%)	−1%	
		Adults aged ≥ 65 years in Family medicine C	Baseline for the first two quarters of 2023	Baseline	~77/552 (14%)		
				Q2-3 2023	NR/NR (10%)	−4%	

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
Wismann, 2024, 38488173, Single group (Pre-post)	Chronic Opioid Use	Adults aged ≥ 65 years in Geriatrics	Baseline for the first two quarters of 2023	Baseline	~22/725 (3%)		Process
				Q2-3 2023	NR/NR (6%)	3%	
		Adults aged ≥ 65 years in Internal medicine	Baseline for the first two quarters of 2023	Baseline	~288/1441 (20%)		
				Q2-3 2023	NR/NR (10%)	−10%	
		Adults aged ≥ 65 years in Family medicine A	Baseline for the first two quarters of 2023	Baseline	~238/1703 (15%)		
				Q2-3 2023	NR/NR (17%)	2%	
		Adults aged ≥ 65 years in Family medicine B	Baseline for the first two quarters of 2023	Baseline	~194/1386 (14%)		
				Q2-3 2023	NR/NR (14%)	0%	
		Adults aged ≥ 65 years in Family medicine C	Baseline for the first two quarters of 2023	Baseline	~77/552 (14%)		
				Q2-3 2023	NR/NR (16%)	2%	

Notes. [a]Initial implementation phase to a later time point; [b]Study compared results at 3 pilot sites to 18 sites after they implemented strategies at a later date. Because all 21 sites implemented the same strategies we reported this as a single group pre-post study; [c]Calculated by the research team; [d]Reported mostly single group outcomes, but also compared sites that implemented 2 specific strategies (Virtual Clinic strategy and PDSA strategy) to sites that did not implement the strategies, therefore used as single group (baseline-later time point) design for sites that did not already have AFHS and NRCS for sites with existing AFHS; [e]Study compared a site that incorporated a templated note as part of their electric health record to a site that implemented AFHS but did not use a templated note. Because the overall strategies and 4Ms assessments were different between sites, we reported this as a single group study; [f]Study reported 2 different strategies implemented at 2 different sites, which we reported as a single group pre-post study, though 1 site had post-only data; [g]8.52% was reported in the study but it was not clear what this was reporting on.

Abbreviations. 4Ms=What Matters, Medication, Mentation, and Mobility; GeriPACT=geriatric patient aligned care teams; HBPC=home-based primary care; NR=not reported; RD=risk difference; QI=quality improvement.

K3. Mentation

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/ Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]	Dementia monitoring	All	June 2020-Jan 2022	Baseline 3 Pilot 4Ms sites	5/12 (42%)		Process
				3 Pilot 4Ms sites	9/15 (60%)	RD 0.18 (-0.19, 0.56)[c]	
				18 comparison sites	4634/6527 (71%)	-	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]	Dementia screening	All	Jan 2021-Jan 2022	Baseline 3 Pilot 4Ms sites	1/328 (0%)		Process
				3 Pilot 4Ms sites	95/397 (24%)	RD 0.24 (0.19, 0.28)[c]	
				18 comparison sites	783/6527 (12%)	-	
Guth, 2020, 32976620, Single group (Pre-post)	"Usually" or "Always" discussing 4Ms during high-risk rounds (provider reported) - Mentation	Providers	Pre- vs. post-implementation (Oct- Dec 2018 vs Jan-Mar 2019)	Pre-intervention	6/11 (54.5%)		Process
				Post intervention	10/11 (90.9%)	RD 0.36 (0.02, 0.70)[c]	
Guth, 2020, 32976620, Single group (Pre-post)	Mentation: Patient completed any of the following cognitive screenings with a provider: Mini Mental State Examination, Montreal Cognitive Assessment, Patient Health Questionnaire, or Geriatric Depression Scale.	Snapshot of patients before training in 4Ms and after	Pre- vs. post-implementation (Oct- Dec 2018 vs Jan-Mar 2019)	Pre-implementation	55/67 (82%)		Process
				Post-implementation	47/55 (85%)	RD 0.03 (-0.10, 0.16)[c]	
Lundy, 2021, 33275785, Single group (Post only)	Rapid Cognitive Screen (RCS)	Patients receiving a rapid geriatric assessment (RGA)	At assessment (July 1, 2015-June 30, 2019)	Normal	~818/1326 (61.7%)	-	Outcome
				Mild cognitive impairment	~232/1326 (17.5%)		
				Dementia	~276/1326 (20.8%)		

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/ Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
Pohnert, 2023, 36134714, NRCS[d]	Completion of "Mentation"	Eligible patients completing 4Ms	First 8 months vs. February 2022	First 8 months	0.8%		Process
				February 2022	9%	~8%	
Powers, 2022, 36286213, Single group[e] **(Post only)**	Health Factors Addressed (Mentation)- Mini-Cog and PHQ2 Or Awareness of cognitive impairment warning signs to prompt the evaluation of cognition. Depression and delirium are prevented, identified, treated, and managed. Changes in mood or mental health are identified and managed	All	During 30-day period	GeriPACT Non-Templated Notes	36/127 (24%)	-	Process
				GeriPACT and HBPC Templated Notes	14/49 (29%)		
Tewary, 2023, 37489318, Single group (Pre-post)[f]	Mentation—Depression or cognition addressed (PHQ2, qualitative comments mostly) few MOCA, Mini-Cog, MMSE	All	Oct-Dec 2021	University Clinic- Needs Assessment	41/146 (28%)		Process
			Sep-Dec 2022	University Clinic- After QI Implementation	13/15 (86.6%)	RD 0.59 (0.40, 0.77)[1]	
			Dec 2022-Mar 2023	Health Center- After QI Implementation	6/6 (100%)	-	
Tewary, 2023, 36062563, Single group (Pre-post)	Diabetes management poor control	Clinics completing all components of Phases 1 and 2	Baseline vs. follow up	Baseline (2019)	8.82%		Process
				Year 1 (2020)	22.73% (Worsening)	13.91%	
Tewary, 2023, 36062563, Single group (Pre-post)	HTN management adequately controlled	Clinics completing all components of Phases 1 and 2	Baseline vs. follow up	Baseline (2019)	78.43%		Process
				Year 1 (2020)	63.24% (Worsening)	−15.19%	

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/ Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
Tewary, 2023, 36062563, Single group (Pre-post)	Dementia caregiver education	Clinics completing all components of Phases 1 and 2	Baseline vs. follow up	Baseline (2019)	No data available		Process
				Year 1 (2020)	1.61% (Improving)	-	
Vonnes, 2023, 37783590, Single group (Post only)	Abnormal cognition screening results referred to pharmacy for medication adherence review	All	screening period	geriatric oncology patients	184/246 (74.8%)	-	Process
Vonnes, 2023, 37783590, Single group (Post only)	Had abnormal Mini-Cog	All	screening period	geriatric oncology patients	246/1044 (23.6%)	-	Outcome
Vonnes, 2023, 37783590, Single group (Post only)	Received social work consults	All	screening period	geriatric oncology patients	381/1044 (36.5%)	-	Process
Vonnes, 2023, 37783590, Single group (Post only)	Patients missing results in SAOP-3.	All	screening period	geriatric oncology patients	280/1044 (26.8%)	-	Process
Vonnes, 2023, 37783590, Single group (Post only)	Screened positive for depression via PHQ-2	All	screening period	geriatric oncology patients	91/1044 (8.7%)[c]		Outcome
Wismann, 2024, 38488173, Single group (Pre-post)	Screened for cognitive impairment in the last 12 months	Adults aged ≥ 65 years in Geriatrics	Baseline for the first two quarters of 2023	Baseline	~22[1]/725 (3%)		Process
				Q2-3 2023	NR/NR (64%)	61%	
		Adults aged ≥ 65 years in Internal medicine	Baseline for the first two quarters of 2023	Baseline	~620[1]/1441 (43%)		
				Q2-3 2023	NR/NR (52%)	9%	
		Adults aged ≥ 65 years in Family medicine A	Baseline for the first two quarters of 2023	Baseline	~1328[1]/1703 (27%)		

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/ Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
				Q2-3 2023	NR/NR (40%)	13%	
		Adults aged ≥ 65 years in Family medicine B	Baseline for the first two quarters of 2023	Baseline	~1081[1]/1386 (78%)		
				Q2-3 2023	NR/NR (80%)	2%	
		Adults aged ≥ 65 years in Family medicine C	Baseline for the first two quarters of 2023	Baseline	~425[1]/552 (77%)		
				Q2-3 2023	NR/NR (81%)	4%	
Wismann, 2024, 38488173, Single group (Pre-post)	Age-Friendly Quality Measure Performance (Dementia Cognitive Assessment)	Adults aged ≥ 65 years in Geriatrics	Baseline for the first two quarters of 2023	Baseline	~22[1]/725 (3%)		Process
				Q2-3 2023	NR/NR (80%)	77%	
		Adults aged ≥ 65 years in Internal medicine	Baseline for the first two quarters of 2023	Baseline	~735[1]/1441 (51%)		
				Q2-3 2023	NR/NR (77%)	26%	
		Adults aged ≥ 65 years in Family medicine A	Baseline for the first two quarters of 2023	Baseline	~1533[1]/1703 (34%)		
				Q2-3 2023	NR/NR (48%)	14%	
		Adults aged ≥ 65 years in Family medicine B	Baseline for the first two quarters of 2023	Baseline	~1247[1]/1386 (90%)		
				Q2-3 2023	NR/NR (88%)	−2%	
		Adults aged ≥ 65 years in Family medicine C	Baseline for the first two quarters of 2023	Baseline	~475[1]/552 (86%)		
				Q2-3 2023	NR/NR (89%)	3%	
Wismann, 2024, 38488173, Single group (Pre-post)	Patients with a dementia diagnosis whose caregiver was provided with education on dementia disease management and health behavior changes and referred to additional resources for support within the last 12 months	Adults aged ≥ 65 years in Geriatrics	Baseline for the first two quarters of 2023	Baseline	0/725 (0%)		Process

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/ Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference
				Q2-3 2023	NR/NR (21%)	21%
		Adults aged ≥ 65 years in Internal medicine	Baseline for the first two quarters of 2023	Baseline	0/1441 (0%)	
				Q2-3 2023	NR/NR (8%)	8%
		Adults aged ≥ 65 years in Family medicine A	Baseline for the first two quarters of 2023	Baseline	0/1703 (0%)	
				Q2-3 2023	NR/NR (2%)	2%
		Adults aged ≥ 65 years in Family medicine B	Baseline for the first two quarters of 2023	Baseline	0/1386 (0%)	
				Q2-3 2023	NR/NR (0%)	0%
		Adults aged ≥ 65 years in Family medicine C	Baseline for the first two quarters of 2023	Baseline	0/552 (0%)	
				Q2-3 2023	NR/NR (0%)	0%

Notes. [a]Initial implementation phase to a later time point; [b]Study compared results at 3 pilot sites to 18 sites after they implemented strategies at a later date. Because all 21 sites implemented the same strategies, we reported this as a single group pre-post study; [c]Calculated by the research team; [d]Reported mostly single group outcomes, but also compared sites that implemented 2 specific strategies (Virtual Clinic strategy and PDSA strategy) to sites that did not implement the strategies, therefore used as single group (baseline-later time point) design for sites that did not already have AFHS and NRCS for sites with existing AFHS; [e]Study compared a site that incorporated a templated note as part of their electric health record to a site that implemented AFHS but did not use a templated note. Because the overall strategies and 4Ms assessments were different between sites, we reported this as a single group study; [f]Study reported 2 different strategies implemented at 2 different sites, which we reported as a single group pre-post study, though 1 site had post-only data; [g]8.52% was reported in the study but it was not clear what this was reporting on.

Abbreviations. 4Ms=What Matters, Medication, Mentation, and Mobility; GeriPACT=geriatric patient aligned care teams; HBPC= home-based primary care; HTN=hypertension; MOCA=Montreal Cognitive Assessment; MMSE=mini mental status exam; NR=not reported; PHQ2=Patient Health Questionnaire-2; RCS=rapid cognitive screen; RGA=rapid geriatric assessment; RD=risk difference; SOAP=Senior Adult Oncology Program; QI=quality improvement.

K4. Mobility

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]	Fall risk management	All	June 2020-Jan 2022	Baseline 3 Pilot 4Ms sites	0/8 (0%)		Process
				3 Pilot 4Ms sites	45/105 (43%)	RD 0.43 (0.33, 0.52)[c]	
				18 comparison sites	653/6527 (10%)	-	
Berish, 2023, 36129432, Single group; (Baseline-Later Time point)[a,b]	Mobility goal completion	All	Jan 2021-Jan 2022	Baseline 3 Pilot 4Ms sites	1/328 (0%)		Process
				3 Pilot 4Ms sites	75/397 (19%)	RD 0.19 (0.15, 0.22)[c]	
				18 comparison sites	587/6527 (9%)	-	
Guth, 2020, 32976620, Single group (Pre-post)	"Usually" or "Always" discussing 4Ms during high-risk rounds (provider reported) - Mobility	Providers	Pre- vs. post-implementation (Oct- Dec 2018 vs Jan-Mar 2019)	Pre-intervention	3/11 (27.3%)		Process
				Post intervention	7/11 (63.6%)	RD 0.36 (-0.02, 0.75)[c]	
Guth, 2020, 32976620, Single group (Pre-post)	Mobility: Patient was seen by the Center for Successful Aging's onsite physical therapist OR was referred to outpatient physical therapy by a provider.	Snapshot of patients before training in 4Ms and after	Pre- vs. post-implementation (Oct- Dec 2018 vs Jan-Mar 2019)	Pre-intervention	37/67 (55%)		Process
				Post intervention	38/55 (69%)	RD 0.14 (-0.03, 0.31)[c]	
Lundy, 2021, 33275785, Single group (Post-only)	SARC-F Results	Patients receiving a rapid geriatric assessment (RGA)	At assessment (July 1, 2015-June 30, 2019)	Sarcopenia	~558[1]/1326 (42.1%)	-	Outcome
				No sarcopenia	~768[1]/1326 (57.9%)	-	
Lundy, 2021, 33275785, Single group	Falls in the last year (1-3 falls in the last year)	Patients receiving a rapid geriatric	At assessment	1-3 falls in the last year	~424[1]/1326 (32%)	-	Outcome

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
(Post only)		assessment (RGA)					
				4 or more fall in the last year	~114[1]/1326 (8.6%)	-	
Pohnert, 2023, 36134714, NRCS[d]	Completion of "Mobility" following the implementation of a best practice alert in the EHR	Eligible patients completing 4Ms	First 8 months vs. February 2022	First 8 months	2.0%		Process
				February 2022	12.5%	10.5%	
Powers, 2022, 36286213, Single group[e] **(Post only)**	Health Factors Addressed (Mobility)- ADL mobility questions Or Mobility limitations are identified, and it is ensured that each older Veteran moves safely every day to maintain function and do What Matters	All	During 30-day period	GeriPACT Non-Templated Notes	68/127 (54%)	-	Process
				GeriPACT and HBPC Templated Notes	12/49 (24%)	-	
Tewary, 2023, 37489318, Single group (Pre-post)[f]	Mobility addressed (falls questions, TUG test, exercise, PT referral)	All	Oct-Dec 2021	University Clinic- Needs Assessment	57/146 (39%)		Process
			Sep-Dec 2022	University Clinic- After QI Implementation	15/15 (100%)	RD 0.61 (0.53, 0.69)[c]	
			Dec 2022-Mar 2023	Health Center- After QI Implementation	6/6 (100%)	-	
Tewary, 2023, 36062563, Single group (Pre-post)	Falls Risk Assessment	Clinics completing all components of Phases 1 and 2	Baseline vs. follow up	Baseline (2019)	No data available	-	Process
				Year 1 (2020)	46.72% (Improving)		
Vonnes, 2023, 37783590, Single group (Post only)	Fall risk screening at registration	All	screening period	geriatric oncology patients	~1699[1]/1770 (96%)	-	Process

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
Vonnes, 2023, 37783590, Single group (Post only)	Baseline TUG >12.0 s	All	screening period	screening period	376/1770 (21.2%)	-	Outcome
Vonnes, 2023, 37783590, Single group (Post only)	Missing TUG assessment at first visit	All	screening period	screening period	37		Process
Vonnes, 2023, 37783590, Single group (Post only)	Baseline falls within one month of TUG	All	screening period	geriatric oncology patients	~212[1]/1770 (12%)		Outcome
Vonnes, 2023, 37783590, Single group (Post only)	Peripheral neuropathy	All	screening period	geriatric oncology patients	~248[1]/1770 (14%)		Outcome
Wismann, 2024, 38488173, Single group (Pre-post)	Screened for future fall risk within the last 12 months	Adults aged ≥ 65 years in Geriatrics	Baseline for the first two quarters of 2023	Baseline	551/725 (76%)		Process
				Q2-3 2023	NR/NR (98%)	22%	
		Adults aged ≥ 65 years in Internal medicine	Baseline for the first two quarters of 2023	Baseline	~1369[1]/1441 (95%)		
				Q2-3 2023	NR/NR (89%)	−6%	
		Adults aged ≥ 65 years in Family medicine A	Baseline for the first two quarters of 2023	Baseline	~1669[1]/1703 (83%)		
				Q2-3 2023	NR/NR (85%)	2%	
		Adults aged ≥ 65 years in Family medicine B	Baseline for the first two quarters of 2023	Baseline	~1358[1]/1386 (98%)		
				Q2-3 2023	NR/NR (96%)	−2%	
		Adults aged ≥ 65 years in Family medicine C	Baseline for the first two quarters of 2023	Baseline	~508[1]/552 (92%)		
				Q2-3 2023	NR/NR (93%)	1%	

Notes. [a]Initial implementation phase to a later time point; [b]Study compared results at 3 pilot sites to 18 sites after they implemented strategies at a later date. Because all 21 sites implemented the same strategies we reported this as a single group pre-post study; [c]Calculated by the research team; [d]Reported mostly single group outcomes,

but also compared sites that implemented 2 specific strategies (Virtual Clinic strategy and PDSA strategy) to sites that did not implement the strategies, therefore used as single group (baseline-later time point) design for sites that did not already have AFHS and NRCS for sites with existing AFHS; [e]Study compared a site that incorporated a templated note as part of their electric health record to a site that implemented AFHS but did not use a templated note. Because the overall strategies and 4Ms assessments were different between sites, we reported this as a single group study; [f]Study reported 2 different strategies implemented at 2 different sites, which we reported as a single group pre-post study, though 1 site had post-only data.

Abbreviations. 4Ms=What Matters, Medication, Mentation, and Mobility; ADL=activities of daily living; EHR=electronic health record; GeriPACT=geriatric patient aligned care teams; HBPC=home-based primary care; NR=not reported; PT=physical therapy; RD=risk difference; RGA=rapid geriatric assessment; RN=registered nurse; SARC-F=Strength, Assistance with walking, Rise from a chair, Climb stairs and Falls; TUG=timed up and go test.

K5. Composite and Other[a,b]

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
Garbarino, 2023, 38038359, Single group (Pre-post)	Number of RN-led AWVs	All	Pre- vs. post-intervention (May-Oct 2021)	Pre-intervention	19	-	Process
				Post intervention	58	-	
Garbarino, 2023, 38038359, Single group (Pre-post)	Number of provider-led AWVs	All	Pre- vs post-intervention (May-Oct 2021)	Pre-intervention	72	-	Process
				Post intervention	41		
Garbarino, 2023, 38038359, Single group (Pre-post)	Completion of RN-led AWVs	All	2020 vs Follow up (2021)	Pre-intervention	24	-	Process
				Post intervention	150	-	
Guth, 2020, 32976620, Single group (Pre-post)	Team escalates interventions/intensity of care “Usually” or “Always” (provider reported)	Providers	Pre- vs post-implementation (Oct- Dec 2018 vs Jan-Mar 2019)	Pre-intervention	8/11 (72.7%)		Process
				Post intervention	5/10 (50%)	RD -0.23 (-0.63, 0.18)	
Guth, 2020, 32976620, Single group (Pre-post)	Team discusses outcome/impact of prior intervention “Usually” or “Always” (provider reported)	Providers	Pre- vs post-implementation (Oct- Dec 2018 vs Jan-Mar 2019)	Pre-intervention	5/11 (45.5%)		Process

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
				Post intervention	6/11 (54.5%)	RD 0.09 (-0.33, 0.51)[c]	
Guth, 2020, 32976620, Single group (Pre-post)	High risk rounds discussion informs and guides care plan "Usually" or "Always" (provider reported)	Providers	Pre- vs post-implementation (Oct- Dec 2018 vs Jan-Mar 2019)	Pre-intervention	4/11 (36.4%)		Process
				Post intervention	4/9 (44.4%)	RD 0.08 (-0.35, 0.51)[c]	
Lundy, 2021, 33275785, Single group (Post only)	Screened with the RGA	Adults 65 years and older	At assessment	Older adults in service area	1,326/NR (38%)	-	Process
Lundy, 2021, 33275785, Single group (Post only)	FRAIL results	Patients receiving a rapid geriatric assessment (RGA)	At assessment (July 1, 2015-June 30, 2019)	Not frail	~430/1326 (32.4%)	-	Outcome
				Pre-frail	~414/1326 (31.2%)	-	
				Frail	~484/1326 (36.5%)	-	
Lundy, 2021, 33275785, Single group (Post only)	SNAQ Results	Patients receiving a rapid geriatric assessment (RGA)	At assessment (July 1, 2015-June 30, 2019)	Not at risk for weight loss	~980/1326 (73.9%)	-	Outcome
				At risk for weight loss	~346/1326 (26.1%)		
Pohnert, 2023, 36134714, NRCS[d]	Improvement in "M-Score performance" (mean number of Ms delivered per visit)	Eligible patients completing 4Ms	Baseline vs follow up (2022)	Baseline	Mean 0.11		Process
				Follow up	Mean 0.73	Mean difference 0.62	
Pohnert, 2023, 36134714, NRCS[d]	Number of regions achieving IHI Regional Committed to Care Excellence recognition	All	follow up	MinuteClinics implementing 4Ms	74/74 (100%)	-	Structural
Pohnert, 2023, 36134714, NRCS[d]	Completion of all 4Ms	Eligible patients completing 4Ms	First 8 months vs February 2022	First 8 months	<1%		Process
				February 2022	5.84%	~4.84%	

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
Pohnert, 2023, 36134714, NRCS[d]	Ms delivered	Eligible patients completing 4Ms	Follow up (Year 2)	Virtual Clinic strategy patients	NR/NR (NR)		Process
				Control group	NR/NR (NR)	IRR 2.47 (1.42, 4.28) p = NR	
Pohnert, 2023, 36134714, NRCS[d]	Ms delivered	Eligible patients completing 4Ms	Follow up (Year 2)	PDSA intervention strategy patients	NR/NR (NR)		Process
				Control group	NR/NR (NR)	IRR 3.08 (1.19, 7.94) p = NR	
Powers, 2022, 36286213, Single group[e] (Post only)	Health Factors Addressed (indeterminate)	All	During 30-day period	GeriPACT Non-Templated Notes	NR/127 (NR)		Process
				GeriPACT and HBPC Templated Notes	5/49 (10%)	-	
Powers, 2022, 36286213, Single group[e] (Post only)	4 Health Factors (4Ms) Addressed	All	During 30-day period	GeriPACT Non-Templated Notes	1/127 (1%)		Process
				GeriPACT and HBPC Templated Notes	20/49 (41%)	-	
Powers, 2022, 36286213, Single group[e] (Post only)	3 Health Factors (4Ms) Addressed	All	During 30-day period	GeriPACT Non-Templated Notes	16/127 (13%)		Process
				GeriPACT and HBPC Templated Notes	12/49 (24%)	-	
Powers, 2022, 36286213, Single group[e] (Post only)	2 Health Factors (4Ms) Addressed	All	During 30-day period	GeriPACT Non-Templated Notes	38/127 (30%)	-	Process
				GeriPACT and HBPC Templated Notes	5/49 (10%)		
Powers, 2022, 36286213, Single group[e] (Post only)	1 Health Factors (4Ms) Addressed	All	During 30-day period	GeriPACT Non-Templated Notes	72/127 (56%)		Process

Author, Year, PMID, Study Design	Details	Population	Follow-Up	Groups/Comparators	N/N (%)	Effect Size (95% CI), Reported P Value/ Absolute Difference	
				GeriPACT and HBPC Templated Notes	7/49 (13%)	-	
Tewary, 2023, 37489318, Single group (Pre-post)[f]	Medicare Preventive template completion (falls, function, PHQ2, mentation, ACP discussion)	All	Oct-Dec 2021	University Clinic- Needs Assessment	20/146 (13.7%)	-	Process
Tewary, 2023, 37489318, Single group (Pre-post)[f]	All 4Ms were completed, including objective cognitive screening	All	Oct-Dec 2021	University Clinic- Needs Assessment	3/146 (2%)		Process
			Sep-Dec 2022	University Clinic- After QI Implementation	13/15 (86.6%)	RD 0.85 (0.67, 1.02)[c]	
			Dec 2022-Mar 2023	Health Center- After QI Implementation	6/6 (100%)	-	

Notes. [a]Results about N of providers included in the studies were considered to be features of the study; [b]Result about provider knowledge about responsible team member, knowledge of the intervention, or agreement with risk level were not extracted from Guth et al as these were not considered to be related to AFHS implementation; [c]Calculated by the research team; [d]Reported mostly single group outcomes, but also compared sites that implemented 2 specific strategies (Virtual Clinic strategy and PDSA strategy) to sites that did not implement the strategies, therefore used as single group (baseline-later time point) design for sites that did not already have AFHS and NRCS for sites with existing AFHS; [e]Study compared a site that incorporated a templated note as part of their electric health record to a site that implemented AFHS but did not use a templated note. Because the overall strategies and 4Ms assessments were different between sites, we reported this as a single group study; [f]Study reported 2 different strategies implemented at 2 different sites, which we reported as a single group pre-post study, though 1 site had post-only data.

Abbreviations. 4Ms=What Matters, Medication, Mentation, and Mobility; ACP=advance care planning; AWV=annual wellness visit; FRAIL=Fatigue, Resistance, Ambulation, Illness, Loss of weight; GeriPACT=geriatric patient aligned care teams; HBPC=home-based primary care; HTN=hypertension; IHI= Institute for Healthcare Improvement; NR=not reported; PDSA=plan do study act; RGA=rapid geriatric assessment; RN=registered nurse; RD=risk difference; SNAQ=Simplified Nutrition Appetite Questionnaire; SOAP=Senior Adult Oncology Program; QI=quality improvement.

APPENDIX L. AHRQ MEASURES REPORTED BY STUDY DESIGN

	What Matters- Process	What Matters- Outcome	What Matters- Structural	Medication- Process	Medication- Outcome	Medication- Structural	Mentation-Process	Mentation- Outcome	Mentation- Structural	Mobility- Process	Mobility- Outcome	Mobility- Structural	Other- Process	Other- Outcome	Other- Structural
NRCS															
Pohnert, 2023, 36134714															
Single Group With Multiple Time Points															
Berish, 2023, 36129432															
Garbarino, 2023, 38038359															
Guth, 2020, 32976620															
Tewary, 2023, 36062563															
Tewary, 2023, 37489318-A[a]															
Wismann, 2024, 38488173															
Single Group Without Data for Comparison															
Lundy, 2021, 33275785															
Powers, 2022, 36286213- A[b]															
Powers, 2022, 36286213-B[c]															
Tewary, 2023, 37489318-B[d]															
Vonnes, 2023, 37783590															

Notes. [a]University Clinic site; [b]Tennessee Valley Healthcare System site; [c]McGuire Richmond VAMCbsite; [d]Health Center Clinic site.

APPENDIX M. PEER REVIEW COMMENTS AND RESPONSES

Comment #	Reviewer #	Comment	Author Response
Are the objectives, scope, and methods for this review clearly described?			
1	1	Yes	Thank you.
1	2	Yes	Thank you.
1	3	Yes	Thank you.
1	4	Yes	Thank you.
1	5	Yes	Thank you.
Is there any indication of bias in our synthesis of the evidence?			
2	1	No	Thank you.
2	2	No	Thank you.
2	3	No	Thank you.
2	4	No	Thank you.
2	5	No	Thank you.
Are you aware of any published or unpublished studies that we may have overlooked?			
3	1	No	Thank you.
3	2	No	Thank you.
3	3	No	Thank you.
3	4	Yes - See comments; some relevant studies excluded	Thank you. We have addressed your comments below.
3	5	No	Thank you.
Additional suggestions or comments can be provided			

Comment #	Reviewer #	Comment	Author Response
below. If applicable, please indicate the page and line numbers from the draft report.			
4	1	[No comments provided]	Thank you for your review.
4	2	Thank you for the opportunity to review the final document "Implementation of Age-Friendly Health Systems in Outpatient Settings: A Systematic Review." The document is impressive and will move the AFHS movement forward in important ways. I have some minor suggestions for clarity and consistency (e.g with IHI language). The Key findings section was a bit confusing with language. Suggest clarification of what is a process, outcome, structural measure Example: "A general combination of strategies may improve What Matters, Medication, Mentation, and Mobility process measures over time after AFHS implementation (moderate confidence)."	Thank you. We added the following text to the Methods section of the Executive Summary to clarify the definition of process, outcome, structural measures in this report: Executive summary: *For KQ 2 we analyzed the effect of implementation strategies on process (eg, proportion of patients screened for depression, fidelity to intervention protocols), outcome (eg, number of patient falls), and structural measures (eg, number of sites recognized as Age-Friendly) based on the Agency for Healthcare Research and Quality's Health Care Quality Measure categorization.* Methods: *Following the AHRQ Measure types we frame findings based on structural measures (eg, those that indicate capacity to provide care), process measures (eg, what providers do to maintain or improve health), and outcome measures (eg, those that reflect the impact of service on patient health status).*
5	2	What is meant by sites with and without AFHS? Note that the content under these headers both include strategies..but titles are different. *Effect of AFHS Strategies to Increase Uptake of 4Ms in Sites with*	Thank you. The sections differentiate between studies in sites with existing AFHS programming at the time of strategy implementation verses sites that were implementing AFHS into a

Comment #	Reviewer #	Comment	Author Response
		AFHS *Effect of AFHS Implementation in Sites Without AFHS*	setting without existing AFHS programming. We have updated these titles in the Executive Summary and Main Document to say: *Effect of Strategies to Increase the Uptake of 4Ms in Sites with Existing AFHS Programming* *Effect of AFHS Implementation in Sites Without Existing AFHS Programming*
6	2	Page vi: Line 17: Need to add “age 65 and older” as currently states “every Veteran”	Thank you. We have added this text.
7	2	Page vi: Line 30: suggest using “framework” and not “model” to be consistent with the IHI guidebooks	Thank you. We have updated the language here and throughout as appropriate.
8	2	Line 48: same as line 30 – consider this change throughout the document.	Thank you. We have updated the language here and throughout as appropriate.
9	2	Page viii: line27 Consider defining “sites with AFHS” or clarify header and sites with out AFHS. I am not clear on how there can be a site without AFHS studied in line 59 on page viii, it states those without AFHS programing. Not sure what this means.	Thank you. These refer to the difference between studies of sites with existing AFHS programming at the time of strategy implementation versus sites that were implementing AFHS into a setting without existing AFHS programming. We have updated these titles in the Executive Summary and Main Document to say: *Effect of Strategies to Increase the Uptake of 4Ms in Sites with Existing AFHS Programming*

Comment #	Reviewer #	Comment	Author Response
			Effect of AFHS Implementation in Sites Without Existing AFHS Programming
10	2	Consider clarifying early on process measure definition. Assuming this is the count of the 4Ms documented? Same with structural measures. These are defined on page 4.	Thank you. We added the following text to the Methods section of the Executive Summary: Executive summary: *For KQ 2 we analyzed the effect of implementation strategies on process (eg, proportion of patients screened for depression, fidelity to intervention protocols), outcome (eg, number of patient falls), and structural measures (eg, number of sites recognized as Age-Friendly) based on the Agency for Healthcare Research and Quality's Health Care Quality Measure categorization.* Methods: *Following the AHRQ Measure types we frame findings based on structural measures (eg, those that indicate capacity to provide care), process measures (eg, what providers do to maintain or improve health), and outcome measures (eg, those that reflect the impact of service on patient health status).*

Comment #	Reviewer #	Comment	Author Response
11	2	Main Document Recommendations: Consider VHA capture pre-implementation processes across VHA to understand what is needed to prepare for implementation. The pre-implementation process maybe just as important as strategies.	Thank you for this recommendation. We agree that VHA would benefit from capturing pre-implementation processes, including needs assessment, assessment of barriers and facilitators, and determination of fit to context prior to AFHS implementation. We have amended the discussion section of the report to state the following: *Third, future research, including that in VHA, may benefit from collecting and examining data on pre-implementation to better understand what is needed to prepare for implementation.*
12	2	Main Document Page 33 line 3. The statement does not reflect current recommended practice of aligning implementation strategies with local barriers and facilitators "replicable guidance on the strategies they should use to implement the AFHS model." But I do agree with your recommendation to specify details about strategies (e.g., actor, action, temporality, or dose).	Thank you and we agree. Our intent was to emphasize the need for standardization of the strategies facilities/organizations may consider but appreciate your comment that there needs to be consideration for the local context. We have edited this sentence to say: *To scale AFHS in the VHA (and health systems more broadly) there is a need for practical guidance on strategies to implement AFHS and how to select strategies that account for local barriers and facilitators.*
13	2	For the complete document: Make sure to refer to the 4Ms (not 4M- per IHI guidelines) (Note this suggestion throughout the complete document).	Thank you. We have made this correction throughout.
14	2	For the complete document: Suggest using "framework" and not "model" to be consistent with the IHI guidebooks	Thank you. We have updated the language throughout as appropriate.

Comment #	Reviewer #	Comment	Author Response
4	3	[No comments provided]	Thank you for your review.
4	4	Thank you for the opportunity to review this evidence synthesis. Overall, it is rigorous and does a strong job of refluxing the (unfortunately) limited evidence on the key questions. My suggestions for revision are as follows: (1) The conceptual relationship between AFHS and 4Ms as used in the review is confusing and shifts throughout the piece. **Could a paper (and its underlying study setting) be classified an AFHS without having implemented the 4Ms?** If a study included 4Ms process measures then isn't this by definition an AFHS? I might suggest that the piece defines an AFHS as a study site that has declared the intention to become AF, as defined as the specific intention to implement the 4Ms as a set of care processes. Then those that have begun 4Ms implementation are those that have started the AFHS transformation journey vs those who have not (which is then later used to divide studies).	Thank you for this comment. For this review, we only included studies that implemented all 4Ms of AFHS (aligning with the IHI definition of AFHS as a set of all 4Ms). To your comment, yes, it is possible that a site could be recognized as an AFHS (level 1) by developing a plan for future AFHS implementation but not yet implementing AFHS. These sites would not have been captured in our review. Unfortunately, since not all studies stated whether their sites had received level 1 (*ie*, completed planning worksheets to implement AFHS), were further along the AFHS transformation journey, or had achieved level 2 AFHS recognition (collecting at least three months of data on AFHS implementation with older adults), we were not able to specifically state this in the report. We have amended the discussion to address this: *Finally, our requirement that studies implement all 4Ms may have resulted in the exclusion of studies reporting on strategies used to implement individual component Ms of the 4Ms AFHS. Additionally, because it was not clear in all articles whether sites had received AFHS recognition, or were intending to become AFHS recognized, we based our classification of AFHS following the*

Comment #	Reviewer #	Comment	Author Response
			articles' inclusion of strategies surrounding all 4Ms.
5	4	(2) Similarly I struggled to conceptually understand the relationship between contextual factors, facilitators and barriers, implementation support strategies, and patient and system factors (as defined across the different key questions). Please add a conceptual model showing how these concepts relate to each other and to the concept of AFHS and implementation of the 4Ms as resolved in response to (1) above (and also as part of addressing (3 – 2a below).	Thank you for this recommendation. We now include a conceptual model for these concepts that mirrors an implementation research logic model. In addition, we now categorize the barriers and facilitators in KQ1 by CFIR 2.0. The newly added Table 3 and Appendix I support this text.
6	4	(3) Relatedly I struggled to understand KQs 2a and 2b as stated. Re: 2a – as explained more fully in (4) below, the 4Ms is a set of process measures and therefore being an AFHS is, by definition, measured by adherence to a set of process measures. Given this, I struggled to understand how a structural measure or outcome measure (by itself) can measure whether an AFHS implementation support strategy was successful. Again, this could likely be clarified by a conceptual model that explains how these different concepts relate.	Based on the IHI definition, we discuss the 4Ms as a framework, not exclusively a set of process measures. Process measures (often implementation outcomes) are upstream measures of implementation success, whereas outcome and structural measures may be downstream measures of success, often assessed as part of "effectiveness" in hybrid implementation-effectiveness trials. One of our recommendations emerging from this review is the need for more study designs of this nature to jointly assess implementation and effectiveness outcomes. We have added more information about how we defined process, outcome, and structural measures in the executive summary for earlier clarification of this.
7	4	Re: 2b - What does it mean to have "differences in measures"? The measures themselves are different across the sets of studies (Independent variables? Dependent variables?) or the values/impacts are different when the measures are the same? Or	Thank you. We have reworded this question to:

Comment #	Reviewer #	Comment	Author Response
		something else? I think rewording this question to improve clarity is essential.	*Do process, outcome, and structural measures differ based on patient or system factors (such as race, ethnicity, or rurality)?*
8	4	(4) One of the key takeaways is that there is not a standard definition of AFHS (or the 4Ms?) used in the literature. This is problematic as it means that even the 10 articles are not necessarily supporting evidence of a consistent "intervention". **Given that IHI has put out a standard set of assessment and act on care processes that define each M, it is critical to add, for each article, an assessment of the extent to which it addressed this set of care processes**. Notably, ACP documentation is not considered to constitute addressing What Matters. Thus, if an article is focused on this for WM, it may not be acceptable to classify it as evidence for 4Ms. Ultimately I think it is ok to leave as is as long as there is a clear table in the main body of the report that aligns with the IHI set of care processes so that the evidence can be interpreted with this in mind.	Thank you. We actually felt that studies were clear in their definition of AFHS and the 4Ms, aligning with the IHI definition. We had difficulty determining where sites were in the implementation trajectory, as not all studies specified whether they had achieved level 1 or level 2 AFHS recognition. We appreciate your recommendation to show how the M measures align with the IHI care processes described in their care planning worksheets and have updated Figure 2 to better show this alignment, and we have added a small summary statement to the results sections: *Figure 1 shows the different ways each of the 4Ms were assessed in the 10 studies. In this figure, measures that are highlighted in blue are part of IHI's standard assessments for these Ms. Approximately half of the measures used across studies were part of the standard IHI assessments, though this varied across the 4Ms. Of note, sites can request to use measures not specified on the IHI care planning worksheets.* In the discussion, we list this as a limitation, but also acknowledge that sites can request to use measures not specified on the IHI care planning

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			worksheets and have this approved by IHI. *Third, only around half of the measures included across studies aligned with IHI's standard assessment for assessing Ms, therefore they may not be acceptable to classify it as evidence for 4Ms. However, sites can request to use measures not specified on the IHI care planning worksheets and have this approved by IHI.*
9	4	(4a) A more minor but related point. The piece states (page 10 line 47) "Studies reported on the implementation of AFHS (had to act on all "4Ms")." This suggests that an inclusion criterion was that all 4Ms were not just assessed but acted upon. I saw no evidence that this was used to screen articles in the rest of the methods and the actual articles described also did not seem to fit this criterion. Please either remove or clarify.	Thank you for this careful attention to language and request for clarity. We have modified this sentence to read "Studies reported on the implementation of AFHS (had to assess or act on all "4Ms")."
10	4	(5) While I know it is traditional in an evidence review not to describe each article in the main body of the report, given that there are only 10, it would help the clarity and interpret ability immensely if you could start the results by summarizing each article - setting, study design, key outcomes. As a reader I had to do a lot of cross referencing and piecing together as I moved through the sections trying to remember what a given article was about and therefore how it supported the given evidence subdomain. As part of this, I would also consider shifting from using authors names to a short description (eg "in the Minute Clinic study" in much more helpful).	Thank you for these suggestions. We have added a table at the beginning to each of the subsections of the results that discuss the effect of strategies to increase uptake of 4Ms in sites with existing AFHS programming and the effect of AFHS implementation in sites without existing AFHS programming. These tables provide a brief description of the study settings, and the comparisons examined in the outcomes. We also added additional text to each of these sections providing more description of the studies.
11	4	While likely out of scope (especially at this point), there is additional evidence that could be garnered from expanding to allow broader settings beyond only ambulatory to be included. Many of the same issues related to AFHS implementation extend across settings and	We agree that studying implementation of AFHS across all settings is important, but yes, this was beyond the scope of this review. The paper cited

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		may therefore facilitate stronger conclusions to inform action. Indeed the whole premise of AFHS is that efforts are at the health system level and not focused only on one setting. I will specifically point to a paper directly on AFHS implementation barriers and facilitators than seems on point for inclusion but was excluded: https://pubmed.ncbi.nlm.nih.gov/37246845/	was excluded at the full text review stage due to having 21 of 29 interviews occurring in inpatient settings. However, we have added the following text to the discussion section to address your concern: *Third, future research, including that in VHA, may benefit from collecting and examining data on pre-implementation to better understand what is needed to prepare for implementation. Additionally, given the potential overlap in contextual factors experienced in other settings, there may be benefit in examining barriers and facilitators of AFHS implementation that have been identified in inpatient, emergency, or other similar settings.*[28]
4	5	Minor editorial comments: Page vi, Line 15: Veterans Health Administration does not need to be plural.	Thank you. We have made this correction.
5	5	Page ix, Line 29: "VHA has emerged as the nation's largest AFHS community…" Technically, there are more CVS minute clinics recognized than VHA settings. I would change this line to "VHA has emerged as a leader of AFHS in the US, demonstrating …" Also repeated in line 33 on page 34.	Thank you. We have adjusted this language in both places.
6	5	Page x, Line 39: duplicate use of "evidence." Can delete repeated word.	Thank you. We have made this correction.
7	5	Page 13, Figure 1: I would consider naming "4Ms Process Measures". Recommend flipping Mobility and Mentation so that Mentation comes after Medication so that the 4Ms are listed in order (What Matters, Medication, Mentation, Mobility, Other).	Thank you. Some of measures listed in this figure are outcome measures, so we have left this title as "4Ms Measures". We have moved the order of these per your suggestion.

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8	5	Page 35, line 11: Change “Age-Friendly Hospital measures” to “Age-Friendly Hospital Measure”. Measure is singular and capitalized.	Thank you. We have made this correction.