

Kaiser Permanente Research Brief

Aging

This brief summarizes the contributions of Kaiser Permanente Research since 2007 on the topic of aging. Although this topic encompasses a wide variety of health issues, this brief will focus on geriatric syndromes (e.g., frailty, falls), cognitive illnesses, the management of multiple chronic conditions, and end-of-life care.

For much of the past century, the average life expectancy in the United States has increased dramatically, and with the aging of the baby boom generation, the number of elderly Americans has reached unprecedented levels. Today, there are 35 million people in the United States age 65 and older, and by 2030, these older adults are expected to comprise 20% of the U.S. population. Additionally, people age 85 and older number 4 million in the United States, and are the fastest-growing segment of the population.¹ Of Americans age 65 and older, 2 out of every 3 have multiple chronic health problems.²

The health of older adults is complicated by common, multifactorial health problems known as geriatric syndromes. Frailty – a condition defined by fatigue and decreased strength, mobility, and activity – affects approximately 15% of older adults, with higher prevalence among women, members of racial and ethnic minorities, and lower-income individuals.³ According to the Centers for Disease Control and Prevention, 29 million American adults age 65 and older fall each year; these accidents are implicated in 30,000 deaths.⁴ Roughly half of older adults also suffer from urinary or bowel incontinence.⁵ Moreover, many adults experience declines in cognitive ability as they age; for many, these changes progress to dementia, a condition characterized by personality changes and impairments in memory and reasoning ability that limit their ability to live independently. The most common form of dementia, Alzheimer’s disease, affects 1 in 10 Americans over the age of 65⁶ and is associated with death and disability,

Kaiser Permanente Publications Related to Aging 2007-2020



Source: Kaiser Permanente Publications Library and PlumX metrics, as of January 13, 2020.

a Number of citing journal articles, according to Scopus.

b Number of references in PubMed guidelines.

c Citations in DynaMed Plus, a point-of-care clinical reference tool.

This brief summarizes a selection of the publications contained within the Kaiser Permanente Publications Library, which indexes journal articles and other publications authored by individuals affiliated with Kaiser Permanente. The work described in this brief originated from across Kaiser Permanente’s 8 regions and was supported by a wide range of funding sources, including internal research support as well as both governmental and nongovernmental extramural funding.

significant burdens for paid and unpaid caregivers, and nearly \$300 billion in annual health care costs.⁷ Finally, the last months of life are frequently characterized by high medical costs⁸ and the challenge of balancing appropriate treatment and the patient's wishes. Although most patients with terminal illness prefer to die at home, recent data indicate that this only happens in 30% of cases.⁹

Aging is an active area of study for Kaiser Permanente Research. Scientists across the organization have used our rich, comprehensive, longitudinal data to advance knowledge in the areas of understanding risk, improving patient outcomes, and translating research findings into policy and practice. We have published nearly 1,600 articles related to aging since 2007; together, these articles have been cited almost 51,000 times. These articles are the product of observational studies, randomized controlled trials, meta-analyses, and other studies led by Kaiser Permanente scientists. Our unique environment – a fully integrated care and coverage model in which our research scientists, clinicians, medical groups and health plan leaders collaborate – enables us to contribute generalizable knowledge on aging, and many other topics of research.

Understanding Risk

What are the unique health risks associated with aging?

Kaiser Permanente researchers have conducted extensive research on the unique health risks faced by older patients. Common illnesses such as osteoporosis,^{10;11} chronic obstructive pulmonary disease,^{12;13} and congestive heart failure^{14;15} are more severe and have poorer prognoses at later ages. The challenge of managing these conditions is often increased in older patients, for whom the benefits of many medications must be weighed against heightened risks,¹⁶⁻²⁰ and who are often underrepresented in clinical trials.²¹ For example, many widely prescribed medications are associated with heightened risks for falls,²²⁻²⁶ as well as declines in cognition²⁷⁻²⁹ and functional status²⁸ in older patients.

One area of significant work at Kaiser Permanente concerns the challenges of managing multiple

chronic conditions, particularly with respect to minimizing the burden of inappropriate care.³⁰ Use of multiple medications, known as polypharmacy, is common in patients with multiple chronic conditions, and is also associated with an increased risk of falls²⁵ and other adverse outcomes.^{31;32} Sources of these risks include drug interactions^{33;34} and inadequate communication among multiple prescribing clinicians.³⁵ Polypharmacy and use of high-risk medications are also frequent causes of hospital-acquired delirium,³⁶ and many Kaiser Permanente medical centers have implemented early detection programs for delirium.³⁷ Finally, treatment of multiple health problems often requires frequent medical imaging, which may lead to distress associated with incidental detection of new lesions.³⁸

Geriatric syndromes such as frailty, falls, and declines in functional ability are a focus of research at Kaiser Permanente. Studies conducted by our

Food Insecurity

Nearly 6% of elderly Kaiser Permanente members in Colorado said that they did not always have enough money to buy food.⁸³



Factors Associated With Food Insecurity

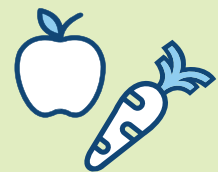
Less Likely

- Age \geq 85
- Living at home with a friend or relative
- Heavy alcohol use
- Recent stay in a skilled nursing facility
- Someone to call for help



More Likely

- Black Americans
- Medicaid or Special Needs Plan insurance
- Fair or poor quality of life
- Dental or mouth problems
- Financial problems
- Zero daily serving of fruits or vegetables



scientists have found that vitamin D deficiency,^{39;40} disturbed sleep patterns,⁴¹ vision impairment,⁴² kidney disease,⁴³ low blood pressure,⁴⁴ and metabolic illnesses^{45;46} are associated with increased risks of falls and frailty. Functional status limitations, including disability and impaired mobility, are linked to disrupted sleep behaviors,⁴⁷ other geriatric syndromes,⁴⁸⁻⁵⁰ and increased risks of falls,^{51;52} cognitive impairment,⁵³ hospitalization,⁵⁴ and mortality.⁵⁵ Our scientists participated in a large, community-based study that found lower walking speed and decreased physical activity was associated with chronic disability, long-term nursing home stays, and an increased risk of death.⁵⁶ We have also explored various risk factors associated with age-related cognitive decline and dementia, including race or ethnicity,⁵⁷⁻⁵⁹ obesity,⁶⁰ physical inactivity,^{61;62} poor pulmonary function,⁶³ sleep disturbances,^{64;65} social isolation,⁶⁶ life stress,⁵⁷ brain characteristics,^{67;68} genetic factors,⁶⁹ and illnesses such as diabetes,⁷⁰⁻⁷⁴ kidney disease,⁷⁵ and psychiatric disorders.⁷⁶⁻⁷⁸ Our scientists contributed to the Lancet Commission's life-course model for reducing dementia risks, which emphasizes early interventions to target modifiable risk factors.^{79;80} This model was based in part on findings from the long-running Adult Changes in Thought study, conducted by Kaiser Permanente Washington researchers.⁸¹

Which subgroups of older adults are at particularly high risk for health problems?

Social needs are one domain of risk factors that impact older adults. Kaiser Permanente scientists have studied social determinants of health in elderly people.⁸² A survey of Kaiser Permanente members in Colorado age 65 and older found that approximately 6% did not have enough money for food. Black members and those with Medicaid insurance, lower self-reported quality of life, dental problems, poor diet, or inadequate social support were at particularly high risk.⁸³ Food insecurity in the elderly is associated with poor diabetes control and higher rates of falls, hospitalizations, and emergency department visits.^{84;85} Financial constraints and poverty are also linked to poor health outcomes in older people, according to research conducted by our scientists.⁸⁶⁻⁸⁹ Kaiser Permanente studies

also show that social isolation is associated with a lower quality of life among the elderly⁹⁰ and with the development of cognitive illness.⁶⁶ Our scientists have evaluated various methods for proactively screening our members for unmet social needs,⁹¹ and have found greater health care utilization in members with greater unmet needs.^{91;92} Our researchers have also found that high-risk opioid prescribing in elderly patients is a common problem^{93;94} and is associated with greater risks of fractures⁹⁵ and overdoses.⁹⁶

Improving Patient Outcomes

What prevention or early intervention strategies are effective in mitigating the health risks of aging?

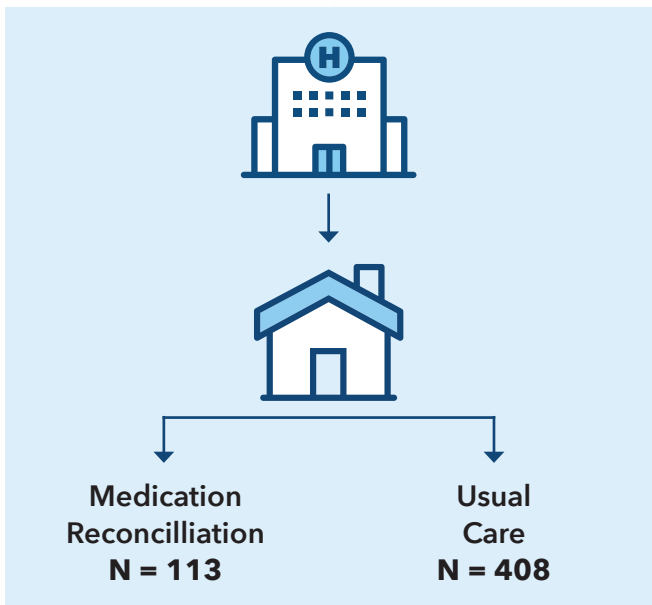
Kaiser Permanente scientists have studied various programs for primary prevention among elderly members. One component of these efforts includes the promotion of general wellness. Kaiser Permanente research has supported the implementation of exercise and physical fitness programs such as Silver Sneakers among elderly members.⁹⁷ Exercise programs in older patients are effective in preventing falls,⁹⁸⁻¹⁰² and may also reduce the risk of dementia^{62;103} and reduce health care costs.¹⁰⁴ Our scientists have incorporated social supports into programs for elderly patients to limit the impact of social isolation,^{105;106} and they have studied programs for early identification of depression.¹⁰⁷

Researchers at Kaiser Permanente have explored efforts to expand advance care planning to ensure that patient preferences are honored at the end of life. A study of the Advanced Steps program, which allows patients to discuss their end-of-life priorities with a health care agent and a planning facilitator, found a strong association with high rates of preference-concordant care, and demonstrated that preferences may evolve over time.¹⁰⁸ Other Kaiser Permanente scientists have studied the effect of incorporating advance care planning prompts into patients' electronic medical records.¹⁰⁹ Our researchers have explored ways to identify unrecognized dementia using medical record data,¹¹⁰ and have developed various methods for predicting the risk of future dementia.^{71;111-113}

What are the key factors in effective care for older adults?

The effectiveness and safety of medical care for older patients are significant areas of research at

Pharmacist-led medication reconciliation for older patients discharged from skilled nursing facilities was associated with a significantly lower risk of dying, but not with lower utilization.¹²⁷



In the Medication Reconciliation program:

- 73% had dosages adjusted
- 48% had a prescribed therapy dropped
- 19% had a duplicate treatment eliminated
- 6% had adherence problems identified
- 6% had contraindications identified

MORTALITY AFTER DISCHARGE
Risk Reduction=0.22 (0.06-0.88)

UTILIZATION	RISK REDUCTION
Emergency Dept Visits	0.71 (0.36-1.39)
Ambulatory Visits	1.17 (0.99-1.37)
Rehospitalizations	1.39 (0.77-2.52)

Kaiser Permanente. One component of effective care involves discontinuing or reducing the intensity of care for the elderly, as appropriate. For example, Kaiser Permanente research demonstrated that preventive breast,^{114;115} cervical,¹¹⁶ and colorectal¹¹⁷ cancer screenings have limited benefits in older patients. These findings led to recommendations to curtail screenings at later ages to protect these patients from unnecessary tests and risks.

Our scientists have also studied medication safety efforts aimed at deprescribing treatments¹¹⁸ that are associated with greater risks at older ages, including antidiabetic drugs,^{18;119} statins,¹²⁰ anticoagulants,¹²¹ and sedatives.^{122;123} The quality of communication between physicians and patients is critical for successful deprescribing.¹²⁴⁻¹²⁶ Kaiser Permanente researchers have also studied programs for reconciliation of medications among multiple clinicians. These programs ensure that elderly patients do not receive duplicative treatments.¹²⁷⁻¹³⁰ Our research has emphasized the importance of shared decision-making and goal setting in the care of these patients.

Finally, Kaiser Permanente researchers have studied the use of advance health care directives and other plans in end-of-life care. Our scientists have also studied the role of caregivers and surrogate decision-makers in the care of elderly patients with dementia.¹³¹ Studies conducted among our members in California have found that care delivered at the end of life is nearly always concordant with the preferences patients have expressed in their Physician Orders for Life-Sustaining Treatment forms. This research has also drawn attention to how preferences may change over time.^{108;132} While advance directives are consistently associated with less frequent delivery of intensive care services and a lower likelihood of dying in a hospital,^{133;134} they are often not completed.

Translating Research Findings Into Policy and Practice

Kaiser Permanente is a learning health care system that works to systematically use research to inform and improve practice. Our research, clinical, and operational partners have tested

a range of interventions to reduce risks and improve outcomes for older patients. Our researchers were heavily involved in the development of Primary Care Plus, a program combining palliative care with pharmacy, social, and behavioral health services to holistically care for elderly patients with complex needs.¹³⁵ This program was successfully implemented in Colorado¹³⁶ and is being expanded to other geographic areas within Kaiser Permanente.¹³⁷

Our researchers also led the development and implementation of a nurse-led program for increasing palliative care engagement among patients with non-small cell lung cancer,^{138;139} pharmacist-led medication deprescribing efforts,^{123;127;140;141} and intensive care unit-based assessments of delirium.³⁷ Kaiser Permanente researchers are also developing innovative methods for studying health problems in elderly patients. These include artificial intelligence models that have identified subgroups of elderly patients with consistent clusters of multiple chronic health problems¹⁴² and extensive survey studies of barriers to patient self-care.⁸⁷ Our scientists have also developed an algorithm for predicting hypoglycemic events among older patients with Type 2 diabetes; this tool is now integrated into our electronic health record system in Northern California.¹⁴³ Finally, Kaiser Permanente researchers in Southern California developed an index that uses electronic medical records to improve the identification of older patients with chronic kidney disease who have health conditions that complicate the treatment of their kidney disease.¹⁴⁴

Kaiser Permanente research contributes to policy and practice change within our delivery system, and has also advanced the national understanding of aging. Kaiser Permanente's research on aging since 2007 has been cited

Insights From Kaiser Permanente Research on Advance Care Planning

Advance care plans have been associated with less frequent hospitalization, fewer in-hospital deaths, and greater use of hospice services.¹³²⁻¹³⁴



Embedding a Care Directives tab into the electronic health record, or conducting a consultation with trained facilitators, can increase documentation of patients' preferences for end-of-life-care.^{108, 109, 132}



more than 500 times within recent consensus statements and clinical practice guidelines published by a wide range of entities, including the American Geriatrics Society.¹⁴⁵ In addition, Kaiser Permanente researchers and clinician scientists have directly contributed as authors of guidelines created for the U.S. Preventive Services Task Force.^{98;99;107;146;147} Our scientists have shown leadership in the broader field of research on aging. Their work includes extensive research on epidemiology, risk factors for development of dementia,^{57;58;60;70;71;78;111;112;148} and health care in elderly patients with multiple chronic conditions.^{35;87;149-151} Kaiser Permanente researchers also have leading roles in the U.S. Deprescribing Research Network, a National Institute on Aging initiative aimed at producing and disseminating high-quality research regarding medication deprescribing in American adults.¹⁵² Our scientists are also involved in the national Creating Age-Friendly Health Systems initiative.¹⁵³

Kaiser Permanente's nearly 170 research scientists and more than 1,600 support staff are based at 8 regional research centers and 1 national center. There are currently more than 2,400 studies underway, including clinical trials. Since 2007 our research scientists have published more than 12,000 articles in peer-reviewed journals. Kaiser Permanente currently serves more than 12.4 million members in 8 states and the District of Columbia.

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