CLINICAL/SCIENTIFIC NOTE

Risk of Incident Mild Cognitive Impairment and Dementia Soon After Leaving Incarceration Among a US Veteran Population

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Abstract

Objectives

Increasing numbers of older adults are reentering community following incarceration (i.e., reentry), yet risk of incident neurodegenerative disorders associated with reentry is unknown. Our objective was to determine association between reentry status (reentry vs never-incarcerated) and mild cognitive impairment (MCI) and/or dementia.

Methods

This nationwide, longitudinal cohort study used linked Centers for Medicare & Medicaid Services and Veterans Health Administration data. Participants were aged 65 years or older who experienced reentry between October 1, 2012, and December 31, 2018, with no preincarceration MCI/dementia, compared with age-matched/sex-matched never-incarcerated veterans. MCI/dementia was defined by diagnostic codes. Fine-Gray proportional hazards models were used to examine association.

Results

This study included 35,520 veterans, mean age of 70 years, and approximately 1% women. The reentry group (N = 5,920) had higher incidence of MCI/dementia compared with the never-incarcerated group (N = 29,600; 10.2% vs 7.2%; fully adjusted hazard ratio [aHR] 1.12; 95% CI 1.00–1.25). On further investigation, reentry was associated with increased risk of dementia with or without prior MCI diagnosis (aHR 1.21; 95% CI 1.06–1.39) but not MCI only.

Discussion

Transition from incarceration to community increased risk of neurocognitive diagnosis. Findings indicate health/social services to identify and address significant cognitive deficits on late-life reentry. Limitations include generalizability to nonveterans.

Introduction

The justice-involved population is aging rapidly[1] and has much higher rates of adverse health outcomes such as premature mortality than never-incarcerated peers,[2-5] and, overall, 95% are eventually released.[6] We recently found that approximately 3% of individuals who reenter community in mid-life to late-life following incarceration have dementia or mild cognitive impairment (MCI) before incarceration.[7] However, incident MCI and dementia on reentry are unknown.

The purpose of our study was to use a unique national cohort of veterans aged 65 years or older to evaluate whether risk of incident MCI or dementia is higher for reentry in later life compared with never-incarcerated.

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Methods

Data and Participants

We conducted a national longitudinal cohort study of Medicare-eligible veterans aged 65 years or older who returned to community after incarceration with release date (i.e., reentry) during the study period between October 1, 2012, and December 31, 2018, using Centers for Medicare & Medicaid Services (CMS) and Department of Veterans Affairs (VA) claims data since October 1, 2000. Criteria for inclusion were (1) duration of incarceration ≤10 years (over 95% of total) to ensure minimum of 3 years of preincarceration medical records[7] and (2) at least 1 health care encounter after release date. We excluded veterans who had a diagnosis of dementia or MCI before incarceration (eTable 1).[7] We performed 1:5 matching using age, sex, and index date to create a never-incarcerated comparison sample who had the same 3-year dementia/MCI timeframe of exclusion and at least 1 health care encounter from index date (for reentry, most recent release date due to timing of Medicare eligibility; for never-incarcerated, birthdate [i.e., Medicare eligibility at study start] matched in same year nearest to release date of reentry veteran).

Measures

MCI and Dementia Postincarceration

Incident MCI/dementia was defined by first diagnosis post index date using ICD-9/10 codes. We also conducted supplemental analyses broken down by dementia and MCI (i.e., dementia with or without prior MCI diagnosis and MCI without subsequent dementia separately). Dementia with or without prior MCI diagnosis was defined by dementia diagnosis date or MCI diagnosis date in a patient who went on to receive a dementia diagnosis within study period because event date was the first indicator of cognitive decline at follow-up.

Preincarceration Health History

We evaluated health history using standard ICD-9/10 codes for medical and psychiatric (including substance use) disorders. We used the Charlson Comorbidity Index (CCI)[8] to assess medical comorbidities, excluding dementia from the index score.

Sociodemographic Variables

Race/ethnicity was categorized as non-Hispanic/Latino White, non-Hispanic/Latino Black, Hispanic/Latino, Multiracial, and Other/unknown using VA and CMS data. Education was estimated from 2013 census data using residential zip code in 3 years before index date. Financial strain was defined by VA priority group (poverty), Medicaid enrollee, food insecurity, and unemployment. Homelessness was indicated in the VA data as homelessness indicator or using ICD-9/10 codes.[9]

Statistical Analysis

Means, standard deviations, and frequencies were used to summarize participant characteristics. Bivariate analyses of reentry/never-incarcerated group differences were conducted using t tests for continuous variables and chi-square tests for categorical variables.

We used Fine-Gray proportional hazards regression to examine time to MCI/dementia diagnosis at follow-up, accounting for competing risk of death and with censoring at last medical encounter. We conducted 4 sets of multivariable models: (1) unadjusted; (2) adjusted for sociodemographic factors; (3) adjusted for sociodemographic and medical conditions (CCI); and (4) adjusted for sociodemographic factors, medical and psychiatric conditions. Statistical tests were two-tailed with $p < 0.05$ defining statistical significance. Analyses were performed using SAS, version 9.4 (SAS Institute Inc., Cary, NC), and StataMP, version 16.1 (64-bit) (Stata-Corp).

Standard Protocol Approvals, Registration, and Patient Consents

The study was approved by the Institutional Review Board of the University of California, San Francisco, and the Research and Development Committee of the San Francisco VA Health Care System. Informed consent was waived given secondary data analysis.

Data Availability

Given VA regulations and ethics policies, data used for this study are required to remain behind the VA firewall. VA data are made available to VA investigators with an approved VA study protocol. For more information, contact VIReC@va.gov.

Results

Our cohort included 5,920 reentry veterans and 29,600 never-incarcerated veterans. Characteristics of participants are given in Table 1. Reentry veterans had a higher proportion who identified as non-Hispanic/Latino Black or Latino/Hispanic or multiracial compared with never-incarcerated veterans, higher homelessness and financial strain, less college education, and greater burden of chronic medical (CCI) and psychiatric conditions.

Participants were followed up for a mean (SD) of 2.97 (1.60) years [reentry, 2.71 (1.62) years; never-incarcerated, 3.02 (1.59) years] until MCI and/or dementia diagnosis, death, or last clinical visit. The cumulative incidence of any MCI/dementia was higher for reentry across all years of follow-up (Figure). More reentry veterans received an MCI and/or dementia diagnosis during follow-up compared with never-incarcerated (10.2% vs 7.2%; Table 2). Risk of a neurocognitive diagnosis (MCI or dementia) was 12% greater in veterans who recently transitioned from incarceration (fully adjusted HR [aHR] 1.12; 95% CI 1.00–1.25).

Table 1 Baseline Characteristics by Reentry Status (N = 35,520, Age 65 y and Older)[a]

Characteristics n (%) or mean (SD)	Overall sample (N = 35,520)	Never incarcerated (N = 29,600)	Reentry (N = 5,920)
Age at most recent release date/matched date, y, mean (SD)	69.99 (4.3)	69.99 (4.3)	69.99 (4.3)
Male (matched)	35,254 (99.2)	29,380 (99.2)	5,874 (99.2)
Race/ethnicity			
Hispanic	1,470 (4.1)	1,093 (3.7)	377 (6.4)
Multiracial	1,249 (3.5)	881 (3.0)	368 (6.2)
Non-Hispanic Black	4,227 (11.9)	2,993 (10.1)	1,234 (20.8)
Non-Hispanic White	27,731 (78.1)	23,886 (80.7)	3,845 (65.0)
Other/unknown[b]	843 (2.4)	747 (2.5)	96 (1.6)
Live in area with ≥ 25% bachelor degree education level	13,728 (38.7)	11,886 (40.2)	1,842 (31.1)
Financial strain	1,840 (5.2)	808 (2.7)	1,032 (17.4)
Homelessness	331 (0.9)	64 (0.2)	267 (4.5)
Charlson Comorbidity Index without dementia (mean/SD)	1.74 (2.5)	1.71 (2.5)	1.92 (2.5)
0	16,431 (46.3)	14,045 (47.5)	2,386 (40.3)
1	5,557 (15.6)	4,492 (15.2)	1,065 (18.0)
2	3,920 (11.0)	3,247 (11.0)	673 (11.4)
3	3,285 (9.3)	2,702 (9.1)	583 (9.9)
4	1,954 (5.5)	1,571 (5.3)	383 (6.5)
5	1,379 (3.9)	1,121 (3.8)	258 (4.4)
≥6	2,994 (8.4)	2,422 (8.2)	572 (9.7)
Psychiatric conditions			
Any serious mental illness (major depression, bipolar, schizophrenia, or primary psychotic illness)	3,323 (9.4)	2,067 (7.0)	1,256 (21.2)
Major depression	2,373 (6.7)	1,601 (5.4)	772 (13.0)
Bipolar disorder	879 (2.5)	421 (1.4)	458 (7.7)
Schizophrenia	568 (1.6)	250 (0.8)	318 (5.4)
Primary psychotic illnesses	402 (1.1)	110 (0.4)	292 (4.9)
Posttraumatic stress disorder	4,048 (11.4)	2,913 (9.8)	1,135 (19.2)
Any substance use disorder	4,676 (13.2)	2,400 (8.1)	2,276 (38.5)
Alcohol use disorder	3,804 (10.7)	1,971 (6.7)	1,833 (31.0)
Drug use disorder	2,263 (6.4)	842 (2.8)	1,421 (24.0)
Tobacco dependence	6,785 (19.1)	4,664 (15.8)	2,121 (35.8)

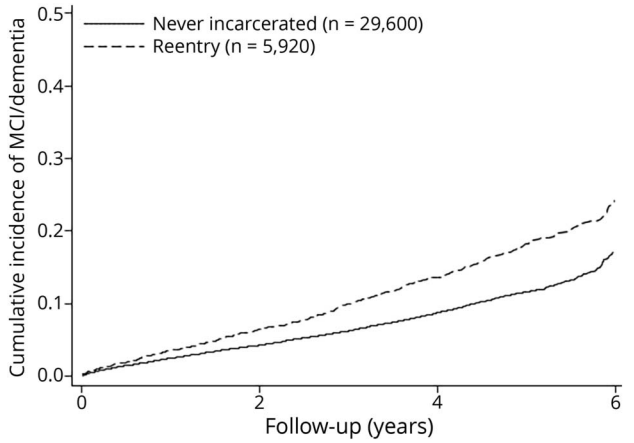
[a] All *p*-values for differences between nonmatched factors (matched variables are age and sex) comparing reentry and never-incarcerated are $p < .001$. The *p* values are based on *t* test for age and Charlson Comorbidity Index, and the χ^2 test for other variables.
[b] Unknown race: 1.3% overall sample, 0.5% reentry, 1.5% never-incarcerated.

The risk of dementia with or without previous MCI diagnosis was 21% greater in reentry veterans than never-incarcerated (aHR 1.21; 95% CI 1.06–1.39). When investigating MCI only (with no dementia diagnosis afterward), the risk attenuated to nonsignificance (aHR 0.95; 95% CI 0.79–1.15).

Discussion

In this national cohort study, transition from incarceration to community increased risk of being diagnosed with dementia with or without prior MCI diagnosis independent of other

Figure Cumulative Incidence of MCI/Dementia by Reentry Status



Start time for study follow-up was time from most recent release from correctional facility to any MCI or dementia diagnosis for reentry veterans and matched index date for never-incarcerated veterans. MCI = mild cognitive impairment.

factors. Acquiring a diagnosis of MCI only did not differ between the 2 groups independent of other factors.

These findings are deeply concerning because persons with dementia may have difficulty navigating complex requirements of parole or accessing services after release. An underlying mechanism may be persistence of symptomatic distress arising from incarceration adversely influencing brain health, similar to models of allostatic load.[10] Reentry itself may be disabling or cause increased risk of dementia from worse health behaviors,[11] including heightened psychiatric disorders, which are known risk factors for incident dementia/MCI.[12,13]

Our finding that reentry was associated with dementia with or without previous MCI diagnosis and not associated with MCI only may indicate more advanced neurodegeneration upon reentry. This coincides with prior research showing justice-involved adults 55 years or older have earlier onset of geriatric conditions ("accelerated aging") than an age-matched sample.[4] Given underreporting of cognitive symptoms in health care settings and cognitive symptoms embedded in psychiatric disorders, MCI is often underdiagnosed; the association of MCI with reentry warrants further investigation.

Future work is needed to better understand the causal pathway and potential bi-directionality between criminal behavior and dementia. It would be helpful to investigate dementia subtypes with disinhibition as a core feature (exposure and outcome) of incarceration, and individuals younger than 65 and crime type.

Important strengths of our study include using linked data from 2 national health care systems (VA and CMS), which allowed assessment of MCI/dementia for patients aged 65 years or older and captured preincarceration health history.

There are several limitations to consider, including unknown generalizability to women and nonveterans, no information on early life experiences, unknown impact of incarceration >10 years, and use of ICD codes, which are not biomarker-based/mechanistic-based and may underdiagnose MCI[14] and increase misclassification. While there are some limitations with using the CCI for adjustment because it predicts mortality, it is a well-established measure of comorbidity burden and strong predictor of dementia in older adults.[15]

In conclusion, our findings indicate reentry is a prime intervention point where optimizing dementia assessment and care could reduce health disparities for incarcerated older adults.

Table 2 Recent Reentry and Risk of MCI/Dementia[a]

	No. (%)[a]		HR (95% CI)		
			Adjusted		
Outcome (incident)	NI (N = 29,600)	Reentry (N = 5,920)	Sociodemographics[b]	Sociodemographics, medical[c]	Sociodemographics, medical, psychiatric[d]
Neurocognitive diagnosis (MCI or dementia[e])	2,140 (7.2)	603 (10.2)	1.17 (1.06–1.30)	1.19 (1.08–1.32)	1.12 (1.00–1.25)
Dementia with or without prior MCI diagnosis[f]	1,404 (4.7)	421 (7.1)	1.23 (1.08–1.39)	1.25 (1.10–1.42)	1.21 (1.06–1.39)
MCI only[g]	736 (2.5)	182 (3.1)	1.06 (0.89–1.26)	1.08 (0.90–1.29)	0.95 (0.79–1.15)

Abbreviations: HR = hazard ratio; MCI = mild cognitive impairment; NI = never-incarcerated.
[a] *p*-values for differences of % all <0.001.
[b] Sociodemographic adjusted: race/ethnicity, homelessness, education, and financial strain (note: already age, sex, and visit matched).
[c] Adjusted for sociodemographic and Charlson Comorbidity Index.
[d] Adjusted for sociodemographic, Charlson Comorbidity Index, and psychiatric conditions (any serious mental illness [major depression, schizophrenia, bipolar, or primary psychotic illness], posttraumatic stress disorder, alcohol use disorder, drug use disorder, and tobacco dependence).
[e] Incident dementia included any of the following dementia subtypes defined by ICD-9/10 codes: Alzheimer disease, frontotemporal dementia, Lewy body dementia, vascular dementia, mixed dementia, dementia associated with Parkinson disease, senile dementia, and dementia not otherwise specified.
[f] Event date is the first indicator of cognitive decline at follow-up (i.e., first event date is dementia or MCI before diagnosis of dementia).
[g] Only MCI at follow-up, no subsequent dementia.

Author Contributions

A.L. Byers: drafting/revision of the manuscript for content, including medical writing for content; major role in the acquisition of data; study concept or design; analysis or interpretation of data. B. Williams: drafting/revision of the manuscript for content, including medical writing for content; study concept or design; analysis or interpretation of data. R. Fortinsky: drafting/revision of the manuscript for content, including medical writing for content; study concept or design; analysis or interpretation of data. W.J. Boscardin: drafting/revision of the manuscript for content, including medical writing for content; study concept or design; analysis or interpretation of data. Y. Li: drafting/revision of the manuscript for content, including medical writing for content; major role in the acquisition of data; study concept or design; analysis or interpretation of data. R. Clark: drafting/revision of the manuscript for content, including medical writing for content; major role in the acquisition of data; analysis or interpretation of data. R.T. Morin: drafting/revision of the manuscript for content, including medical writing for content; analysis or interpretation of data. L.C. Barry: drafting/revision of the manuscript for content, including medical writing for content; study concept or design; analysis or interpretation of data.

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Disclosure

The authors report no relevant disclosures. Go to Neurology.org/N for full disclosures.

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