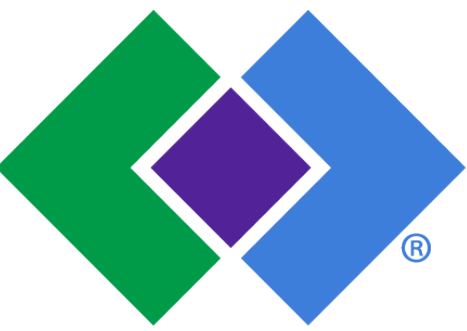




A Clinic-Randomized Trial Of A Novel Clinical Decision Support System For Diagnosis Of Cognitive Impairment In Primary Care

Leah R Hanson¹, A Lauren Crain¹, Sally K Gustafson¹, Patrick J O'Connor¹, Michael V. Maciosek¹, JoAnn M. Sperl-Hillen¹, Heidi L. Ekstrom¹, Aleta L Svitak¹
Bethany Crouse¹, Deepika Appana¹, Ann M. Werner¹, Soo Borson², Meghan M. Jaka¹, Rebecca C Rossom¹

¹HealthPartners Institute, ²Keck USC School of Medicine

Key Take-aways:

1 The cognitive impairment (CI) clinical decision support system (CDSS) did not improve CI diagnosis rates in primary care

2 Clinician actions on the CI diagnostic pathway, like specialty referrals and brain imaging, were also unchanged

3 Future work is needed to understand why CDSS has been successful with other chronic conditions and not in dementia

Background

- Detection and diagnosis of cognitive impairment (CI) is often delayed for years beyond onset of symptoms.
- Early diagnosis of CI, including Alzheimer's disease and related dementias, enables timely connection to support and resources, informed planning for families, and access to treatment and symptom management.
- Clinical decision support systems (CDSS) have demonstrated effectiveness in improving management and treatment of other chronic disorders including diabetes, heart disease, and high blood pressure.
- Study goal: determine whether an electronic health record (EHR)-embedded CDSS designed to improve CI diagnosis and management for high-risk individuals (CI-CDSS) increased CI diagnosis in primary care.

Methods

Overview

- Pragmatic clinic-randomized trial conducted from August 2023 to February 2025 in a large U.S. integrated healthcare system.
- Thirty-eight primary care clinics were randomized 1:1 to CI-CDSS or usual care (UC). Clinicians in CI-CDSS clinics received a 1hr virtual training that included dementia education.
- Eligible patients were 65+ years, visited a randomized clinic, had no CI diagnosis in the 3 years prior to index, and failed the Mini-Cog or other assessment or were predicted to have high CI risk.
- CI-CDSS provided personalized treatment recommendations to primary care clinicians and patients through printouts. Additional information was available to clinicians through the EHR.
- Primary outcome: CI diagnosis.
- Exploratory outcomes: clinician actions taken for diagnostic workup, such as brain imaging or neuropsychological testing

Figure 1. CI-CDSS Example Patient

Clinical Priorities

Cognitive Health

Provider

Patient

Print

Relevant Conditions:

10-year Cardiovascular Risk : Data needed to calculate the risk score is missing.

#1 COGNITIVE HEALTH

Treatment Considerations

- Patient screened positive for potential cognitive impairment on the MiniCog (score less than 3).
- Consider completing a cognitive health evaluation, such as the MoCA. See the Wizard Tools Cognitive Health tab for more information.

Results

MINICOG (nl >=3) 2 7/24/22

(nl = normal)

No relevant medications

#2 BLOOD PRESSURE

Potential CV Risk Reduction: 2.7%

Experts recommend BP goals ranging from less than 130/80 to less than 140/90

Treatment Considerations

Results

BP (mm Hg) 155/75 5/24/23

Last BP (mm Hg)

No relevant medications

Clinical Priorities

Cognitive Health

Relevant Evaluation

Relevant Screening

Mini-Cog 07/24/2022 2 Normal

3-5

Quick Actions

OT cognitive eval.

E-Consult Neurology

Refer to Neurology

Assessments

Additional Evaluation

Diagnostic Criteria

Care & Support

Atypical symptoms? ☐ Yes ☒ No

Atypical symptoms may include:

- a) rapid decline in functioning (over 3-6 months) OR
- b) aggression, hallucinations, motor symptoms, expressive or receptive aphasia.

Recommendations:

Recommended Orders

Place Orders

☒ B12

☒ TSH

☒ Neurology Referral

☒ Head CT

☐ Brain MRI

☐ Neuropsychology Referral

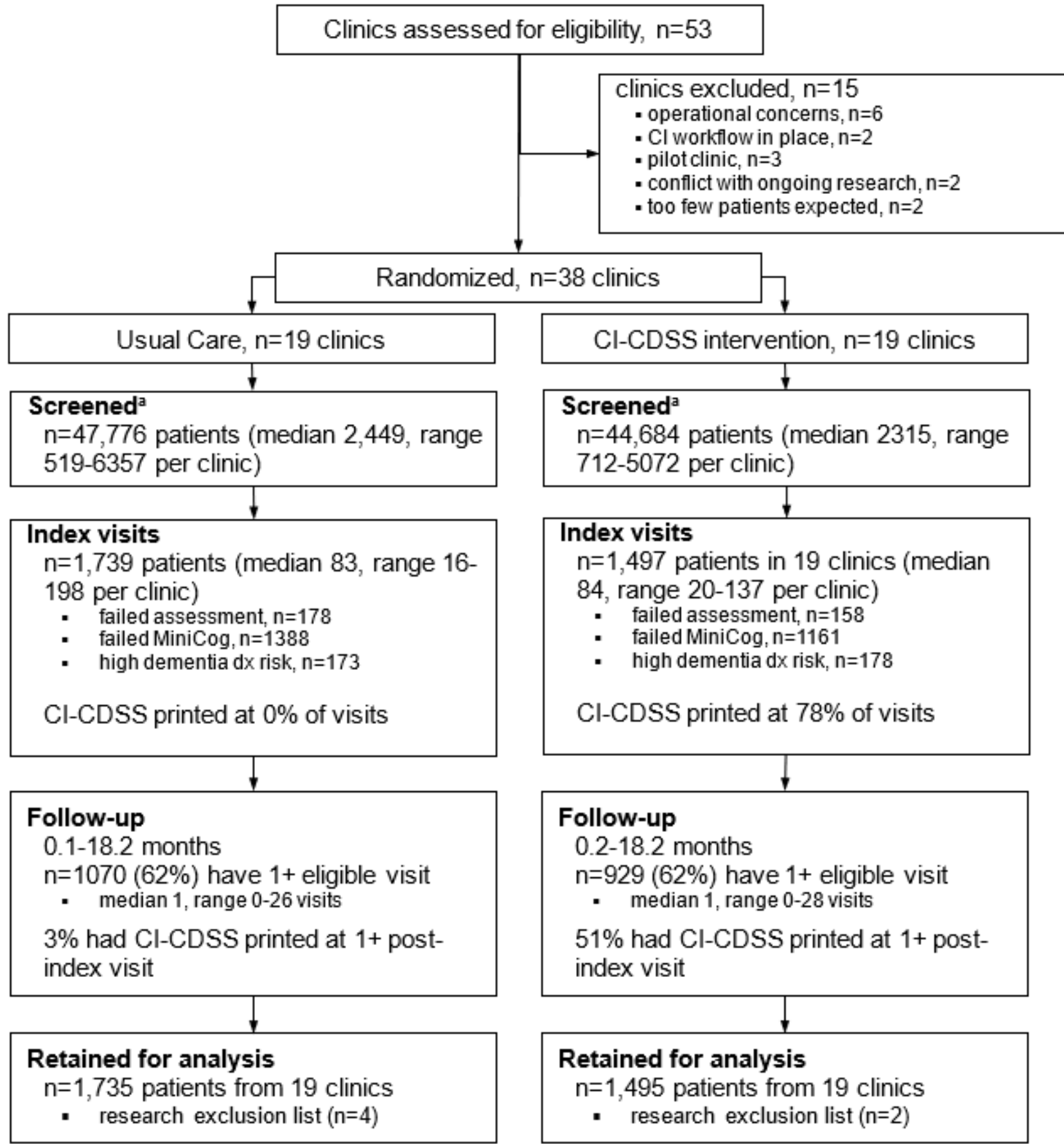
Recommended Screenings

Launch Screening

☒ PHQ-9

Patient Accrual

Figure 2. 92,460 patients at 38 clinics were screened for eligibility by the CI-CDSS, and 3,230 were retained in the analytic cohort. Most (79%) were eligible due to a recently failed cognitive screen. Observation period was similar between groups with a minimum of 10 months. The CI-CDSS was used at 78% of index visits.



* Algorithms screened all patients >=65 years old at in-person visits during the accrual period.

Patient Characteristics

Table 1. Treatment groups were relatively balanced on sex, age, and reason for eligibility.

Characteristics of accrued patients at index visit				
	N	UC	CI-CDSS	ALL
Patients		1735	1495	3230
Sex				
Female	n (%)	983 (56.7)	839 (56.1)	1822 (56.4)
Male	n (%)	752 (43.3)	656 (43.9)	1408 (43.6)
Age, years	M (SD)	78.5 (8.5)	78.4 (8.6)	78.5 (8.6)
65-75	n (%)	716 (41.3)	649 (43.4)	1365 (42.3)
75-100	n (%)	1019 (58.7)	846 (56.6)	1865 (57.7)
Race				
Asian	n (%)	165 (9.5)	108 (7.2)	273 (8.5)
Black, African American	n (%)	134 (7.7)	159 (10.6)	293 (9.1)
Native Hawaiian, Pacific Islander	n (%)	0 (0)	1 (0.1)	1 (0)
American Indian, Alaskan Native	n (%)	1 (0.1)	6 (0.4)	7 (0.2)
White	n (%)	1306 (75.3)	1034 (69.2)	2340 (72.4)
Multiple groups	n (%)	89 (5.1)	131 (8.8)	220 (6.8)
Other or unknown	n (%)	40 (2.3)	56 (3.7)	96 (3.0)
Hispanic ethnicity	n (%)	42 (2.4)	54 (3.6)	96 (3.0)
Reason for CI eligibility				
Failed assessment	n (%)	178 (10.3)	158 (10.6)	336 (10.4)
Failed MiniCog	n (%)	1384 (79.8)	1159 (77.5)	2543 (78.7)
High risk	n (%)	173 (10.0)	178 (11.9)	351 (10.9)
Insurance at Index Visit				
Commercial	n (%)	1 (0.1)	8 (0.5)	9 (0.3)
Dual or Medicaid	n (%)	245 (14.1)	256 (17.1)	501 (15.5)
Medicare Advantage	n (%)	721 (41.6)	596 (39.9)	1317 (40.8)
Medicare FFS	n (%)	768 (44.3)	635 (42.5)	1403 (43.3)

Results

Cognitive Impairment Diagnosis

Table 2. Proportion of patients with CI diagnosis was similar across treatment groups (UC, 14.4%, CI-CDSS, 13.5%); this pattern held for both dementia and MCI diagnoses and when restricting to the first 6 or first 12 months of the observation period.

Number and proportion of patients with CI diagnoses by treatment arm				
		Usual Care	CI-CDSS	ALL
Patients	n	1735	1495	3230
Primary outcome				
Total CI diagnosis	n (%)	249 (14.4)	202 (13.5)	451 (14.0)
Dementia	n (%)	146 (8.4)	126 (8.4)	272 (8.4)
Mild Cognitive Impairment (MCI)	n (%)	129 (7.4)	104 (7.0)	233 (7.2)
Outcome at secondary time points				
First 6 months of observation period				
CI diagnosis	n (%)	127 (7.5)	90 (6.2)	217 (6.9)
Dementia	n (%)	77 (4.5)	53 (3.6)	130 (4.1)
MCI	n (%)	58 (3.4)	41 (2.8)	99 (3.1)
First 12 months of observation period				
CI diagnosis	n (%)	152 (11.5)	139 (12.3)	291 (11.9)
Dementia	n (%)	80 (6.1)	83 (7.4)	163 (6.7)
MCI	n (%)	84 (6.4)	74 (6.6)	158 (6.5)

Table 3. Primary effectiveness analysis comparing likelihood of CI diagnosis by treatment arm used a generalized linear mixed model (GLMM, binomial distribution) with a random effect to account for clinic-level randomization and within-clinic patient clustering and a fixed effect for study arm.

Likelihood of CI diagnosis by treatment arm and CI-CDSS treatment effect				
	UC% (95% CI)	CI-CDSS% (95% CI)	Odds Ratio: CI-CDSS vs UC (95% CI)	P-value
Primary outcome				
CI diagnosis	14.2 (12.0, 16.7)	13.1 (10.9, 15.6)	OR = 0.91 (0.69, 1.2)	0.51
Dementia	8.4 (7.1, 9.9)	8.4 (7.0, 10.1)	OR = 1.0 (0.76, 1.3)	0.99
MCI	7.0 (5.3, 9.2)	6.3 (4.6, 8.4)	OR = 0.89 (0.58, 1.4)	0.58
Outcome at secondary time points				
First 6 months of observation period				
CI diagnosis	7.5 (6.3, 8.9)	6.2 (5.0, 7.6)	OR = 0.81 (0.61, 1.1)	0.15
Dementia	4.5 (3.6, 5.7)	3.6 (2.7, 4.8)	OR = 0.79 (0.54, 1.2)	0.22
MCI	3.2 (2.2, 4.5)	2.6 (1.7, 3.8)	OR = 0.81 (0.49, 1.3)	0.40
First 12 months of observation period				
CI diagnosis	11.3 (9.3, 13.7)	12.0 (9.9, 14.6)	OR = 1.1 (0.79, 1.4)	0.65
Dementia	6.1 (4.9, 7.6)	7.4 (5.9, 9.1)	OR = 1.2 (0.88, 1.7)	0.21
MCI	6.1 (4.5, 8.0)	6.1 (4.5, 8.2)	OR = 1.0 (0.66, 1.5)	0.96

Clinician Diagnostic Actions

Table 4. Clinician actions on the CI diagnostic pathway did not differ by treatment arm.

Physician actions taken any time post-index by treatment arm				
		Usual Care	CI-CDSS	ALL
Cognitive assessment performed	n (%)	154 (8.9)	120 (8.0)	274 (8.5)
Brain imaging performed	n (%)	565 (32.6)	472 (31.6)	1037 (32.1)
Referral for neuropsych testing	n (%)	92 (5.3)	62 (4.1)	154 (4.8)
Referral to neurology specialist	n (%)	245 (14.1)	205 (13.7)	450 (13.9)
Anti-dementia medication ordered	n (%)	116 (6.7)	79 (5.3)	195 (6.0)
Referral to social work/case management	n (%)	33 (1.9)	35 (2.3)	68 (2.1)
Cumulative number of actions taken				
None	n (%)	1016 (58.6)	899 (60.1)	1915 (59.3)
At least one	n (%)	719 (41.4)	596 (39.9)	1315 (40.7)
At least one action taken vs no actions taken		OR = 0.93 (0.75, 1.2) P=0.52		

Discussion

- The majority of eligible patients in both study arms (79%) had screened positive on the Mini-Cog screen. We did not anticipate such high uptake of cognitive screening at the Medicare Annual Wellness Visit. The UC rate of CI diagnosis was also high compared to population studies (Manly et al. JAMA Neurol. 2022), which may have contributed to the null finding.
- A more robust intervention may be needed to increase CI diagnosis in primary care. Even when given information about diagnostic steps, clinicians are not acting on that information. Burden on primary care clinicians is high and visits are short. The CI-CDSS did not change clinic workflows or referrals to specialty care.