

BACKGROUND

- Cognitive impairment and dementia are often **recognized late**.
- Risk information is **fragmented** across medical, cognitive, functional, social, environmental and caregiver domains; no single workflow turns it into one actionable picture.
- AI may support earlier recognition, but healthcare AI must be **explainable, equitable, clinically meaningful** and **built into existing workflows**.

THE CHALLENGE

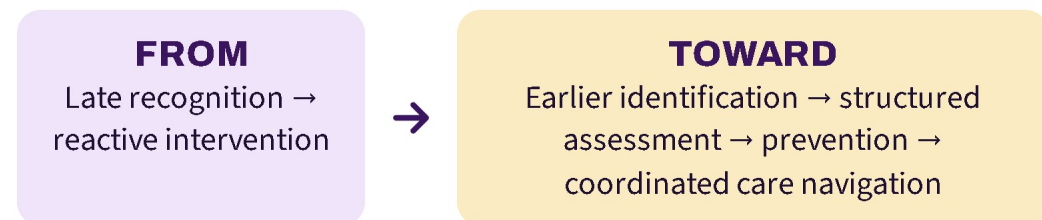
Important cognitive-risk signals exist, but they are **scattered across systems and domains**. The result:

- ✓ Late recognition of cognitive impairment
- ✓ Missed prevention and care-planning windows
- ✓ Delayed navigation to geriatrics and memory care

WHY THIS FRAMEWORK HELPS

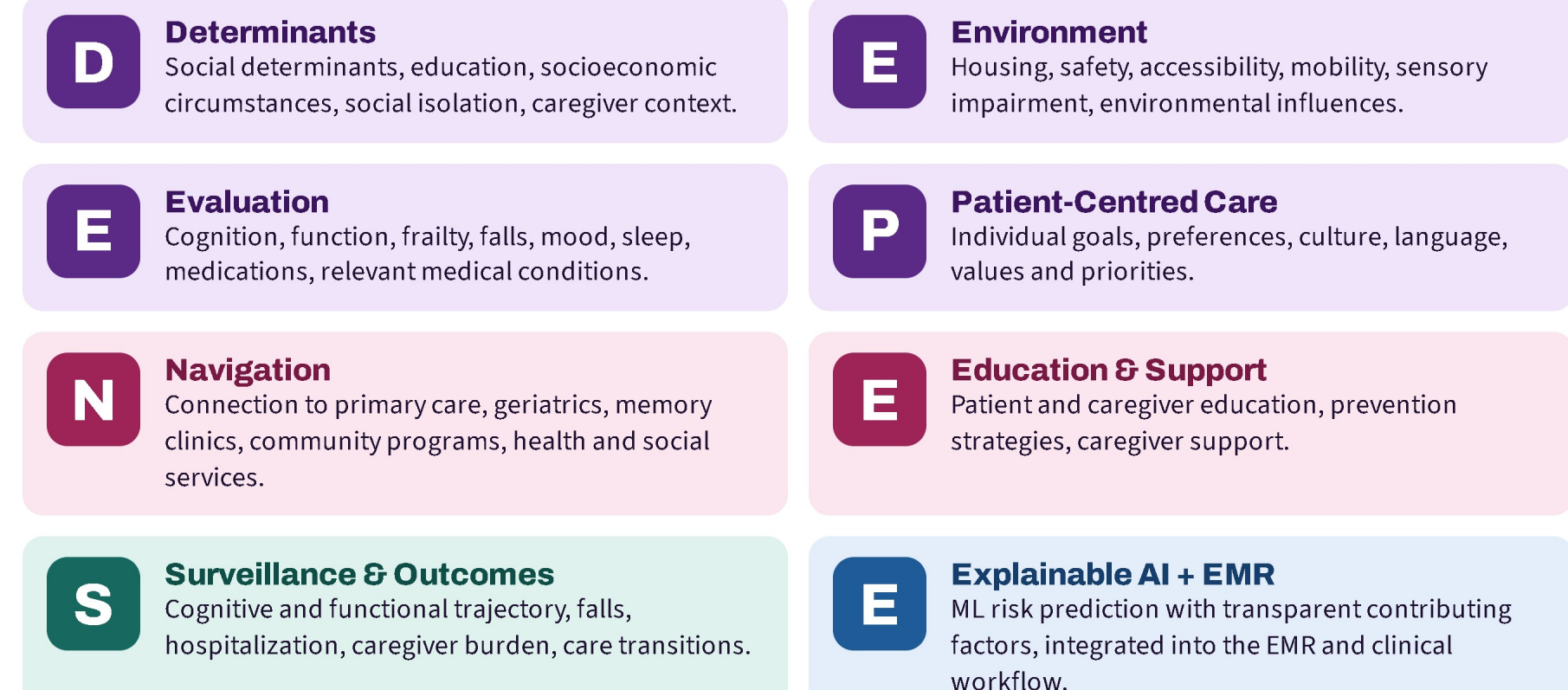
- One picture, not fragments.** Medical, cognitive, functional, social, environmental and caregiver signals are read together.
- The whole person, not just biology.** Social determinants, housing, sensory loss and caregiver strain are often modifiable, and often missed.
- A reason, not just a score.** Clinicians see the contributing factors, so they can check, trust, act on or override the result.
- Risk linked to action.** Each risk level connects to a next step: further assessment, referral, caregiver support, follow-up.
- Equity by design.** Performance is tested in rural, low-income, racialized, Indigenous and language groups before any scale-up.
- Learns and stays safe over time.** Outcome surveillance tracks trajectories and model drift, inside the existing EMR workflow.

EXPECTED IMPACT

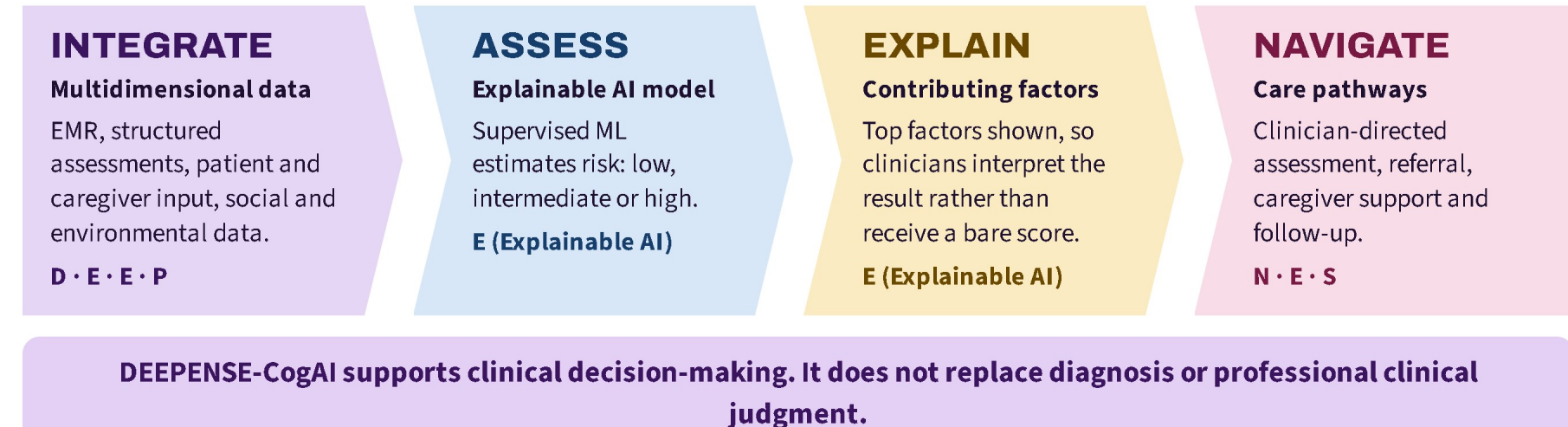


WHAT DOES DEEPENSE STAND FOR?

Eight domains, one framework: **Understand the person** → **Act** → **Learn**, powered by **Explainable AI**



HOW DEEPENSE-CogAI WORKS



CLINICAL WORKFLOW / IMPLEMENTATION

Built into routine care and the EMR: intelligence added **without creating parallel work**.



Needed for implementation: standardized data fields • alert ownership • referral pathway • clinician documentation • feedback loop • patient and caregiver communication. **Human oversight stays central:** clinicians retain responsibility for diagnosis and management.

MODEL DEVELOPMENT & VALIDATION

Data sources: EMR and primary-care records • geriatric and memory assessments • patient and caregiver input • social and environmental data.

Ground truth. Primary label: cognitive impairment confirmed by standardized cognitive assessment and clinician evaluation within a defined follow-up window. Secondary: functional decline, falls, hospitalization, caregiver burden, care transitions.

- 1 Logistic regression:** interpretable baseline
- 2 Gradient-boosted trees:** comparator for non-linear patterns
- 3 Output:** low / intermediate / high risk + top contributing factors

Decision rule: adopt the more complex model only if it improves prediction without losing explainability, fairness or workflow fit.

- ✓ Cross-validation
- ✓ Calibration
- ✓ Subgroup performance
- ✓ Discrimination (AUROC)
- ✓ Sensitivity and specificity
- ✓ Prospective validation

Accuracy alone is not enough: equity gate before scale. Monitor false positives and negatives, alert fatigue and model drift across diverse and underserved groups.

EQUITY, SAFETY & GOVERNANCE

Indigenous and underserved communities: partner with communities from design onward, communicate in culturally safe ways, respect Indigenous data sovereignty (e.g., First Nations OCAP® principles) and report subgroup results.

Regulatory: define intended use, users and claims; assess risk class as clinical decision support / Software as a Medical Device.

Privacy: PHIPA (Ontario), HIPAA (U.S.); data minimization, de-identification, consent, secure access.

Human oversight: clinician accountability, documented override, audit trail, incident reporting.

AI lifecycle: representative data, bias testing, drift surveillance, change control before updates.

ROADMAP & NEXT STEPS

- 1 Define:** intended use, labels, regulatory pathway
- 2 Build:** prototype and data governance
- 3 Validate:** retrospective and prospective studies
- 4 Implement:** pilot workflow and clinician training
- 5 Scale:** multi-site rollout with ongoing monitoring

We welcome: feedback, clinical-data partnerships, ethics and regulatory guidance, validation collaborators and implementation sites.