Computable Hospital at Home Eligibility Screening:
A Portable CQL-FHIR Framework Validated on MIMIC-IV

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Background

Hospital at Home (HaH) eligibility screening is currently labor-intensive, workflow-dependent, and lacks standardization & portability (Pati, 2023; Maniaci, 2024).
Our proposed computational informatics framework enables:

- Scalability (entire patient cohorts can be pre-screened in real-time and retrospectively within seconds)
- Auditability (eligibility evidence gets extracted and presented to assist clinicians in decision-making)
- Transferability (standardized protocols can easily be shared and customized across programs)

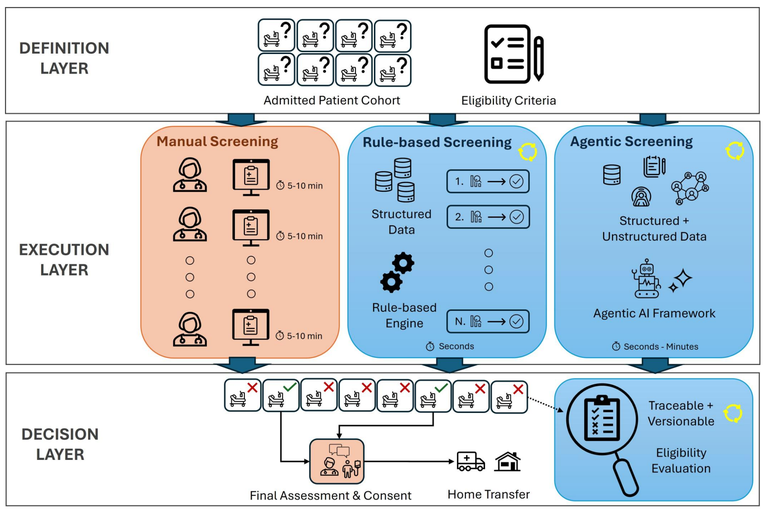


Figure 1: Hospital at Home eligibility screening process contrasting manual steps (orange) with automated steps using a computational informatics framework (blue)

Methods

Idea: Customizable artifacts that can automatically capture eligibility criteria and operate in every EHR system

Technical solution: Clinical Quality Language (CQL), part of the universal interoperability standard HL7 FHIR

Validation: Real-world EHR data (MIMIC-IV clinical database) loaded onto a HAPI FHIR server, retrospective sample cohort

Results

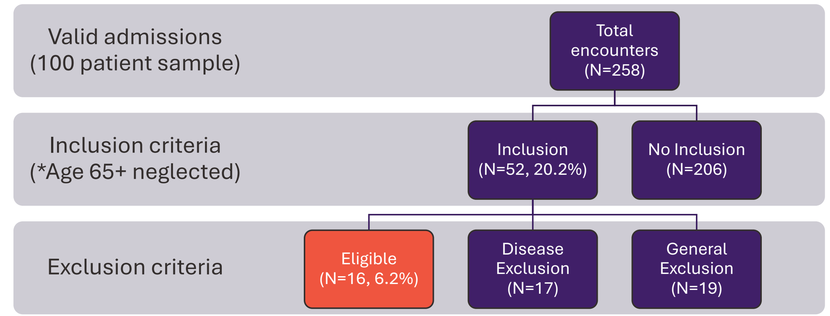
Part 1: Analyzing & encoding entire eligibility criteria sets in CQL

	Leff et al. (1997)	Levine et al. (2019)	Mnt Sinai (2018)	Presbyterian (2021)
No. of eligibility criteria (clinical | social/admin.)	25 (24 | 1)	36 (30 | 6)	51 (43 | 8)	74 (68 | 6)
Fully computable (T1)	11 (44.0%)	14 (38.9%)	20 (39.2%)	23 (31.1%)
	e.g., "Age≥18", "Hypotension: systolic blood pressure < 90 mm Hg"			
Partially computable (T2)	9 (36.0%)	14 (38.9%)	16 (31.4%)	30 (40.5%)
	e.g., "Presence of other significant pulmonary disease e.g. lung cancer, bronchiectasis"			
Not computable (T3)	5 (20.0%)	8 (22.2%)	15 (29.4%)	21 (28.4%)
	e.g., "Chest radiograph with cavitating lesion", "Expected terminal event"			

Table 1: Computability assessment of publicly available HaH eligibility criteria sets

- CQL captures most eligibility criteria (~70-80%, T1/T2)
- We built + distribute open-source templates & AI-assisted tooling to translate and customize program-specific criteria

Part 2: Executing CQL on MIMIC-IV within an FHIR-based EHR environment



Using the Leff criteria set, 6.2% of evaluated MIMIC-IV encounters would have been HaH-eligible with target diagnosis CHF/CAP/COAD

- Runtime: Ø2.03 s / patient
- Est. time saved: ~1.29 h / eligible patient (per screener)

[Assuming Ø 5 min baseline chart review vs. 3 min remaining manual assessment of potentially eligible patients]

Conclusions & Next Steps

- Beyond time savings: The created CQL libraries could run automatically in any EHR on respective patient populations, enabling cross-program portability and comparability
- Local CQL evaluation: PHI never leaves the EHR environment
- Next: Enhancing framework with agentic AI capabilities to capture more T2/T3 criteria from unstructured data (e.g., notes/images)

We are looking for additional clinical collaborators!

If interested, please contact: **tim.schwirtlich@northwestern.edu**