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Physician Rules Integrated with Small Language Models (PRISM) and Common Data Model for Probable Abdominal Pain Diagnosis

Gautam Ahuja

Multimodal Biomedical Data Scientist

Machine Learning Engineer

Koita Centre for Digital Health at Ashoka (KCDH-A)

Mphasis AI & Applied Tech Lab at Ashoka

Ashoka University, India

Scientific Computing Engineer

Nygen Analytics, Sweden



Koita Centre for
Digital Health
at Ashoka

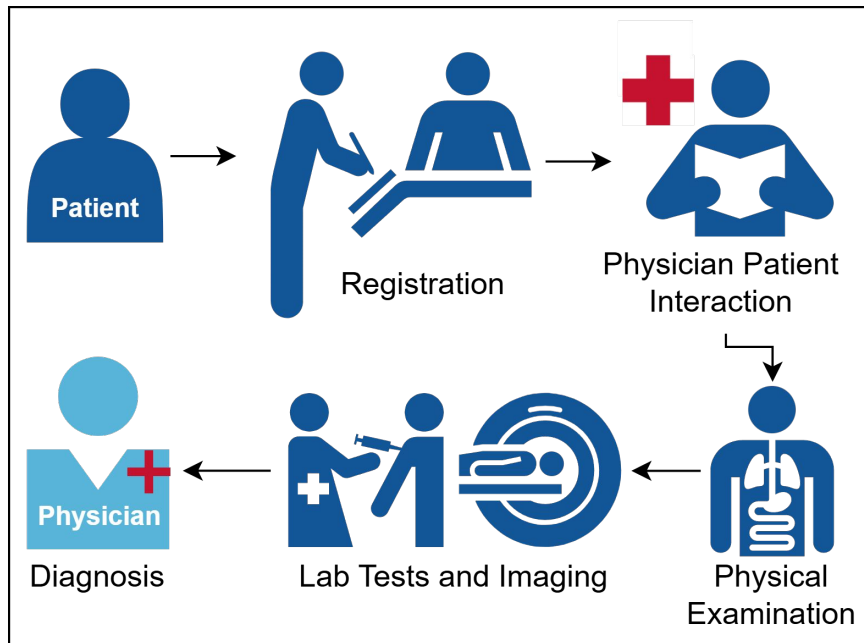
Mphasis AI &
Applied Tech Lab
at Ashoka

Department of
Gastroenterology
& Human Nutrition
Unit, AIIMS
New Delhi



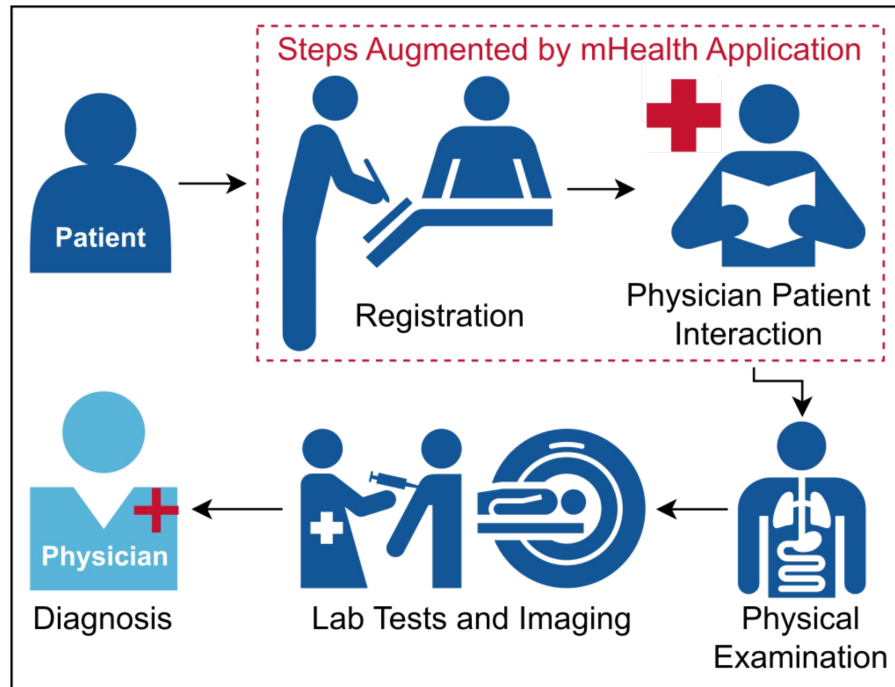
PRISM for Probable Abdominal Pain Diagnosis

- **Abdominal pain** is one of the most common yet a significant diagnostic challenge in **high-volume, resource-constrained** OPDs.
- **Large volume of patients & physician burden:** At the AIIMS New Delhi, the Gastroenterology OPD alone managed ≈ 0.11 million cases in 2023-2024.
- **Black-box AI dilemma:**
 - End-to-end large language models (LLMs) offer **flexibility** but are **prone to hallucinations** and **lack reliability** and **transparency** required for clinical diagnosis.
 - Rule-based systems are transparent & safe, but rigid.



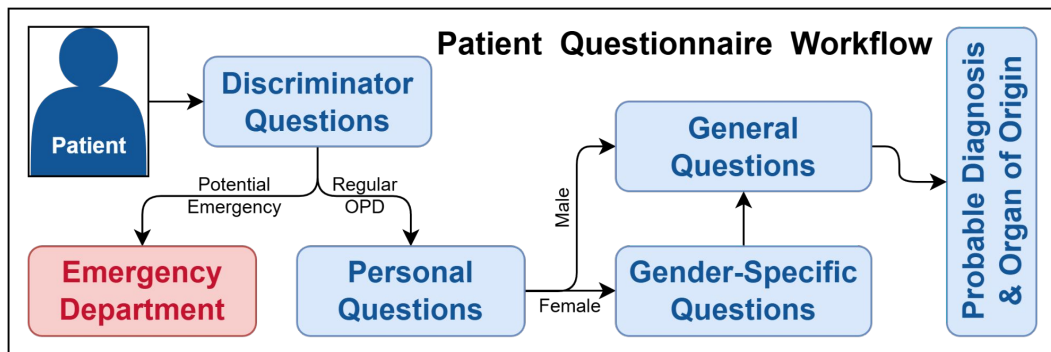
PRISM for Probable Abdominal Pain Diagnosis

- **PRISM** is a Hybrid Conversational System (hCS) that combines the safety of physician-guided, rules-based logic for diagnostic reasoning with an ensemble of open-source small language models (SLMs) for patient-facing conversational and targeted non-diagnostic tasks.
- **PRISM** augments the initial step by identifying probable diagnoses and their organ of origin for the physicians to consider.

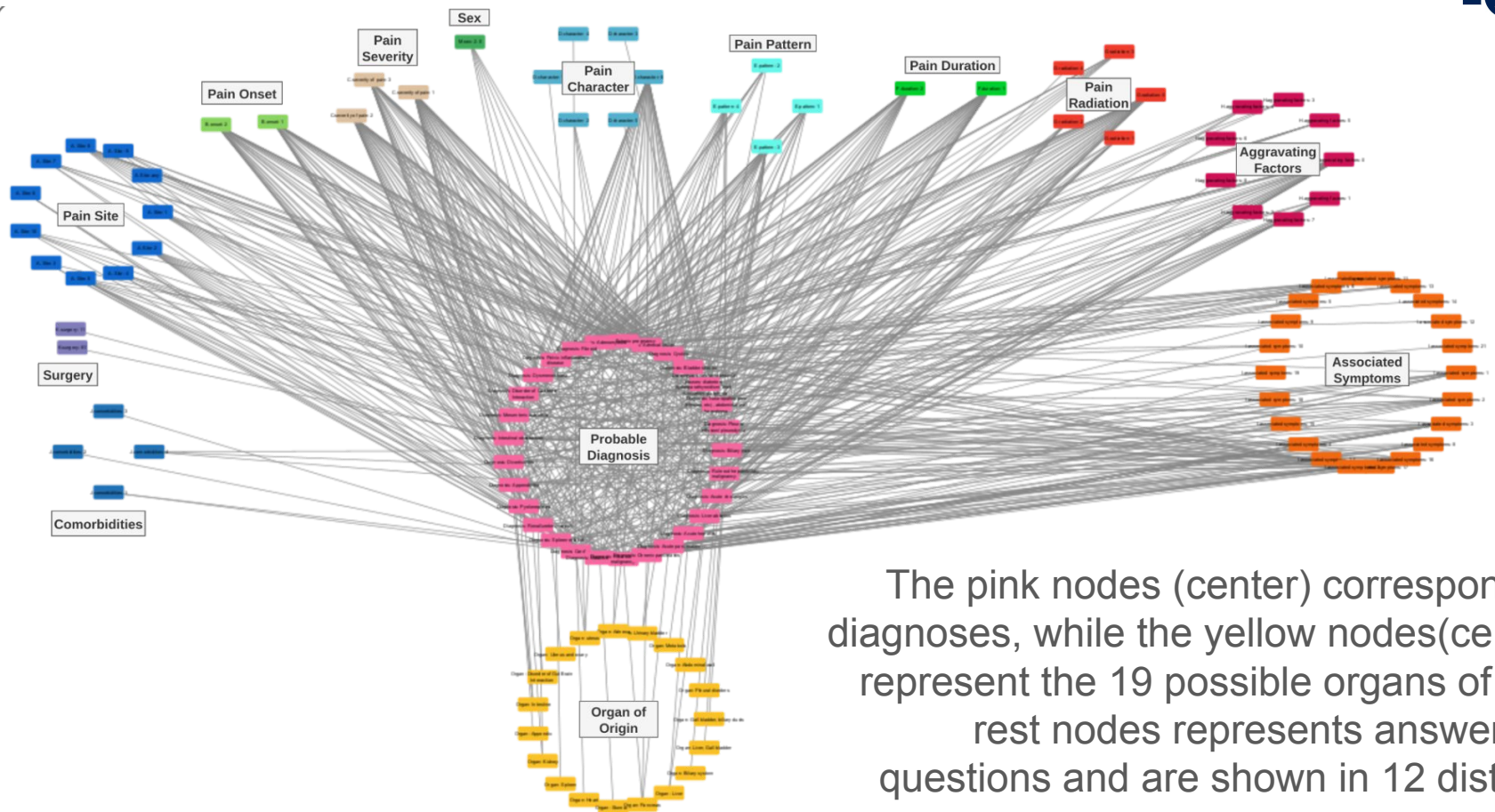


Patient Questionnaire and Triage Logic

Discriminators - Please rate the severity of the pain on a scale of 1 to 10 - Have you experienced any trauma? - Are there any danger signs present?	General - Where does the pain occur in the abdomen? - How did the pain start? - What is the character of your pain? - What's the pattern of your pain? - How long have you been experiencing the pain? - Does the pain radiate to any other areas? - Does the pain increase or decrease with the following aggravating/relieving factors? - Are there any associated symptoms with your pain? Please specify if you experience none, or if you have any of the following symptoms. - Do you have any co-morbidities? - Do you have a history of any previous surgeries?
Personal - Choose your gender - Choose your age group	
Gender-Specific - Have you experienced any recent changes in your menstrual cycle? - Have you noticed any of the following abnormalities?	

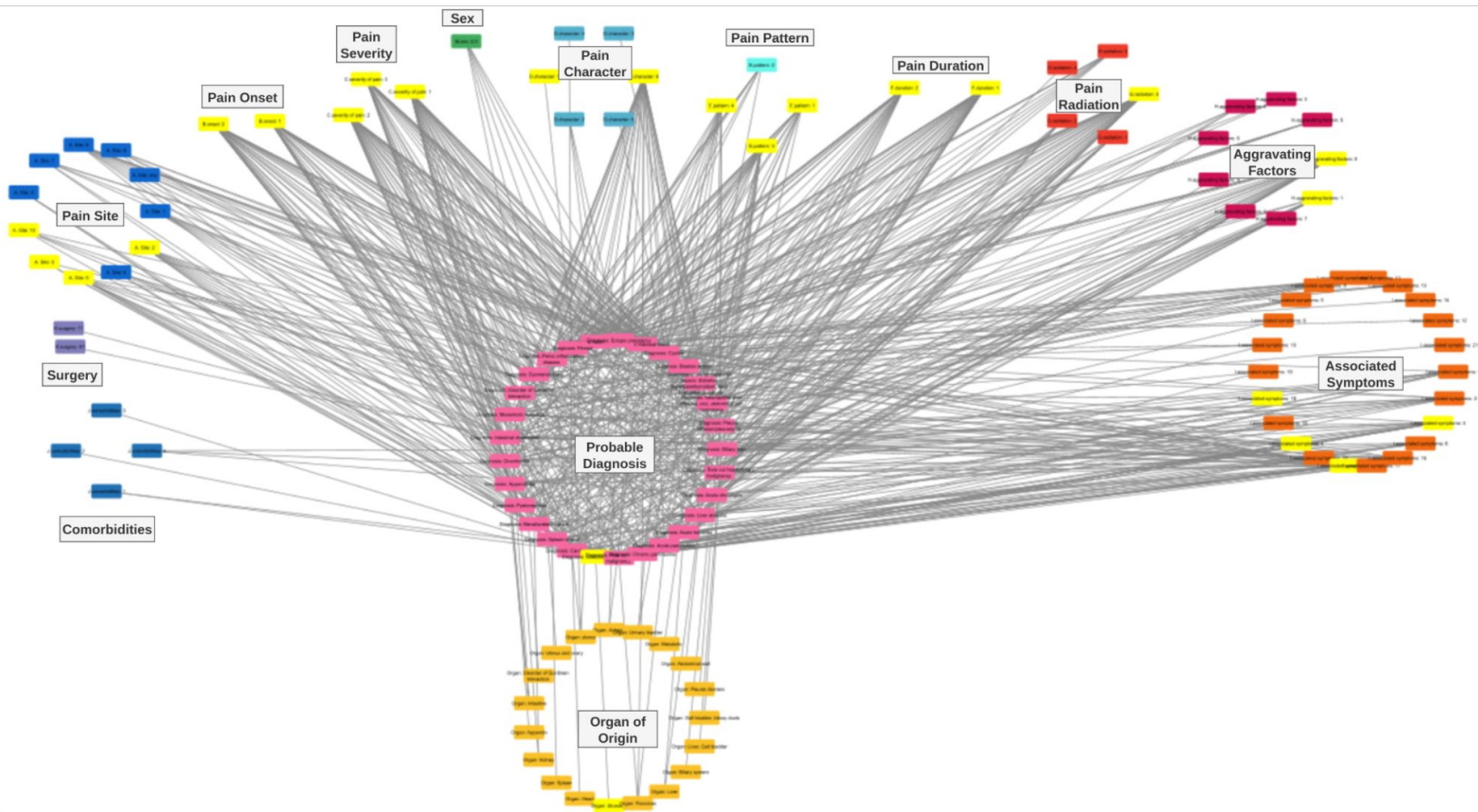


Probable Diagnosis and Organ of Origin Mapping



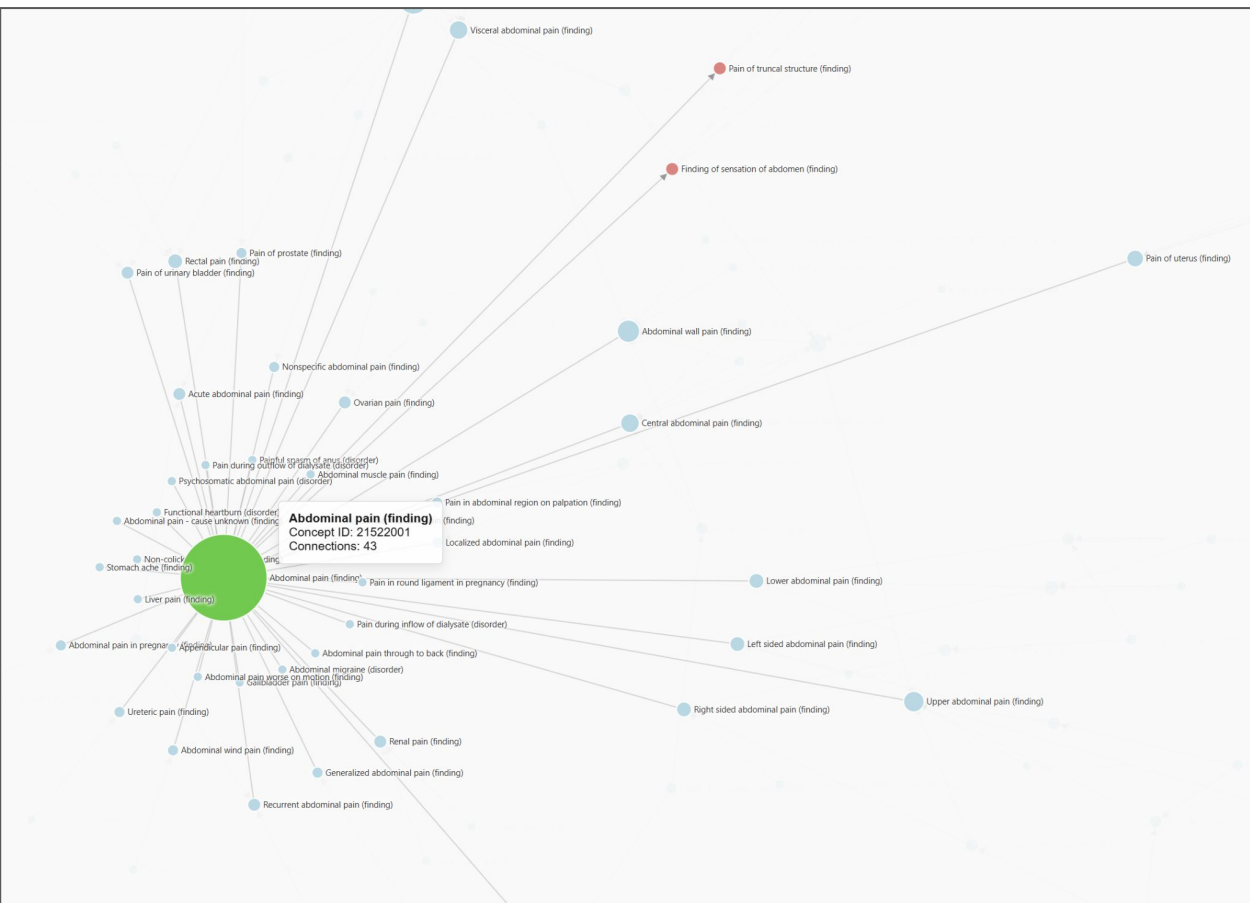
The pink nodes (center) correspond to the 29 diagnoses, while the yellow nodes(center below) represent the 19 possible organs of origin. The rest nodes represents answers to the 12 questions and are shown in 12 distinct colors.

Probable Diagnosis and Organ of Origin Mapping



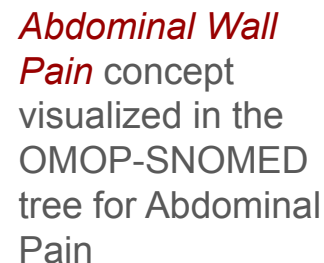
Probable diagnosis of **Dyspepsia** and organ of origin **Stomach** and the answer nodes highlighted for each of the 12 question

Abdominal Pain in OMOP SNOMED - 1st Degree

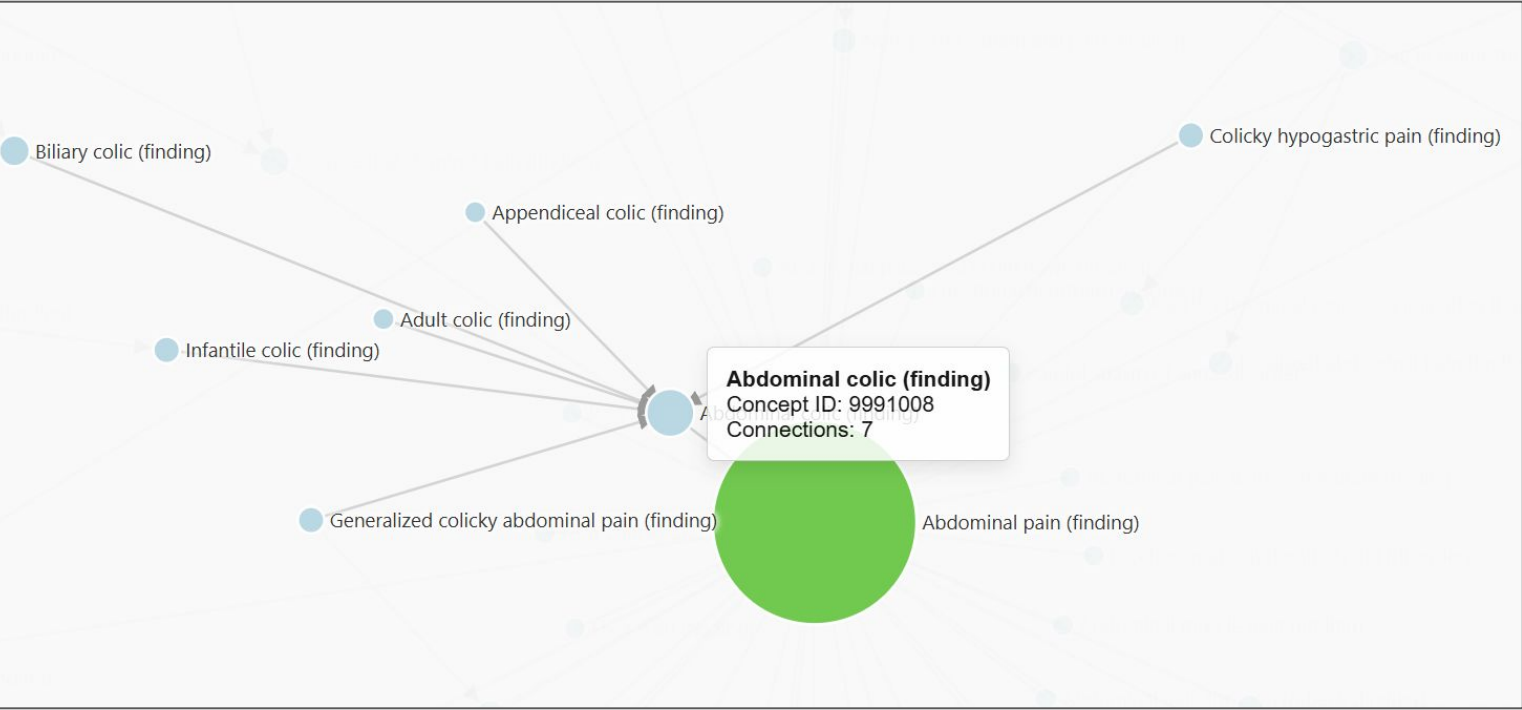


- *Abdominal Pain* concept node
- Parent nodes
- Children nodes





Abdominal Pain in OMOP SNOMED



OMOP-SNOMED
Abdominal Pain
subgraph
highlighting the
concepts and
relationships of
Abdominal Colic.

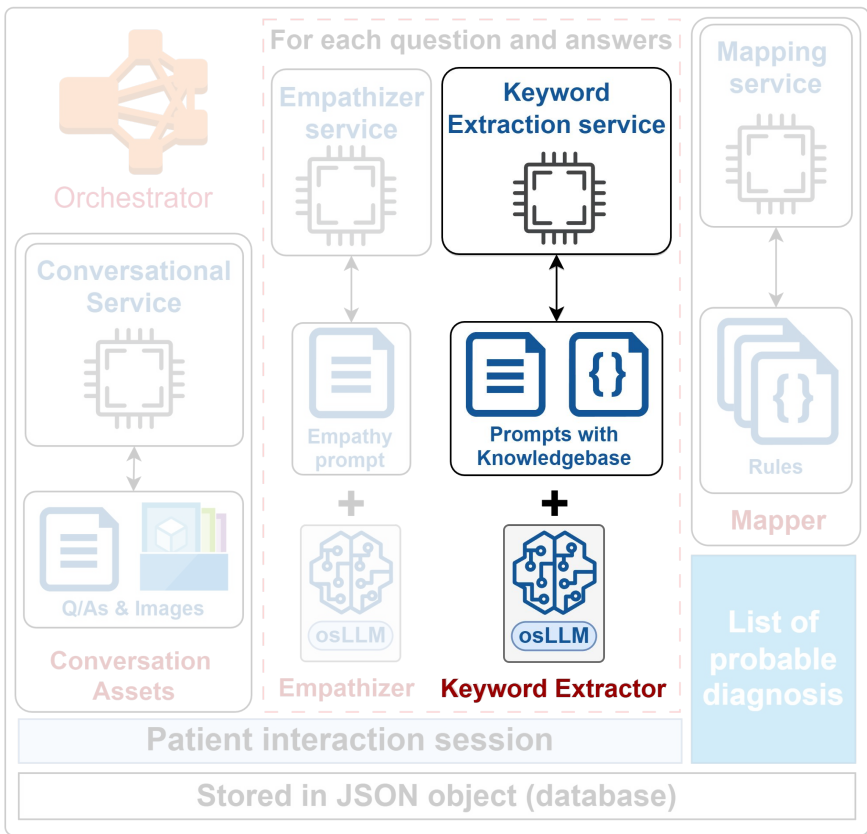
The broader
concept leads to a
more context
specific granular
definition.

- **76** clinical keywords/terms were searched resulting in the retention of 182 unique relevant terms.
- The Tables shows the distribution of the 182 terms across the four question categories and across **13 clinical and biomedical vocabularies**.

Category	Count
General	140
Discriminator	25
Gender-Specific	15
Personal	2

Vocabulary	Counts
MTH	77
SNOMEDCT_US	40
MEDCIN	32
NCI	13
CCPSS	4
LNC	4
MDR	3
HPO	2
CHV	2
ICD10CM	2
OMIM	1
COSTAR	1
MSH	1

OMOP Knowledge Enhanced Extraction

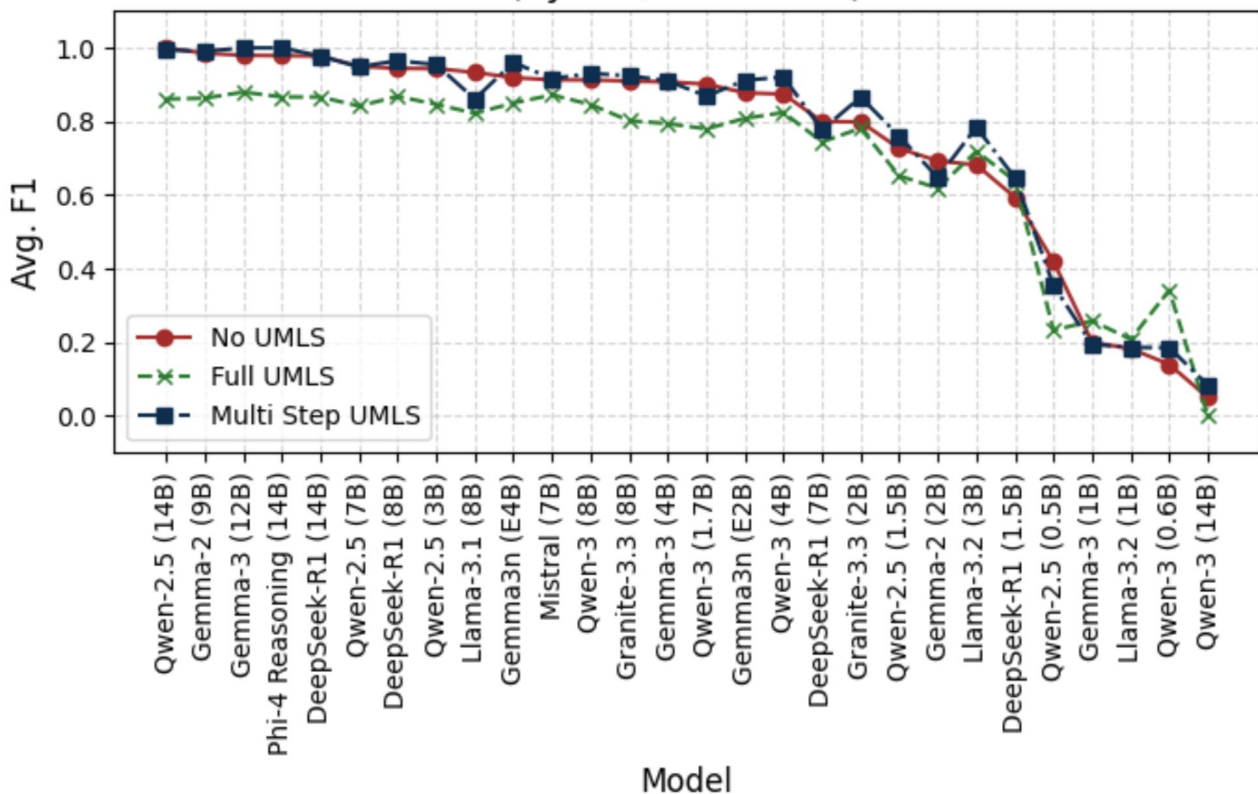


- Keyword Extractor parses unstructured patient responses and **extracting the specific clinical keywords** that corresponds to the predefined answer options in the questionnaire.
- Two-stage method is designed for **targeted knowledge injection**: Identify which of the high-level answer options (Filter) and process the patient's answer with these curated options (inject & extract)
- Synthetic Dataset (N=60) used for benchmarking.

Question	Patient's Answer	Extracted Keywords	Difficulty Type
What is your age?	I am 30 years old.	25-45	Easy
Using the diagram (regions 1-10), where is the discomfort mainly located?	It's mostly in region 1, but sometimes I feel it in region 2 as well.	1, 2	Medium
Any past surgeries involving the Gall Bladder, Intestine, Kidney, or Uterus?	I had my gall bladder out many years ago, and also uterine surgery. Nothing involving the intestine or kidney.	Gall Bladder, Uterus	Hard

OMOP Knowledge Enhanced Extraction Increase Model Performance

Avg. F1 Comparison for Models across KE Methods
(SynD1; All Models)



Incorporating **standardized and harmonized curated knowledgebase of keywords** in a multi-step targeted knowledge injection pipeline increases the model performance.

Thank You

Q/A



PRISM: Physician Rules Integrated with Small Language Models for Probable Diagnoses Associated with Abdominal Pain

Gautam Ahuja^{1,2,3,4,#} **Ayush Agarwal**^{5,#} **Hara Prasad Mishra**^{2,4,6,#} **Samagra Agrawal**⁵ **Rik Ganguly**^{3,4} **Zonunmawia**^{2,4,7} **Akshay Sharma**^{2,4,8} **Vatsal Batra**^{2,4,9} **Bableen Kaur**^{2,4} **Siddhant Poudyal**^{2,4} **Himani Balutia**^{2,4} **Sagarika**^{2,10} **Sanjana Ahuja**^{2,4} **Kedar Natarajan**^{2,11} **Partha Pratim Das**¹ **Ramesh Jain**^{1,12} **Partha Pratim Chakrabarti**¹³ **Anurag Agrawal**^{2,10,14,†} **Govind K Makharia**^{5,†} **Rintu Kutum**^{1,2,3,4,14,†}



NeurIPS 2025

The Second Workshop on GenAI for Health: Potential, Trust, and Policy Compliance

Poster Presentation