



Mapping the rules: conceptual and logical relationships in a system for pediatric clinical decision support

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ABSTRACT

The Child Health Improvement through Computer Automation (CHICA) system uses evidence-based guidelines and information collected in the clinic and stored in an electronic medical record (EMR) to inform physician and patient decision making. CHICA helps physicians to identify and select relevant screenings and also provides personalized, just-in-time information for patients. This system relies on a database of Medical Logic Modules (MLMs) written in the Arden Rules syntax. These MLMs store observations (StorObs) during the clinical encounter which trigger potential screenings and preventive health interventions for discussion with the patient or for follow up at the next visit. This poster shows how informationists worked with the CHICA team to describe the MLMs using standard vocabularies, including Medical Subject Headings (MeSH) and Logical Observation Identifiers Names and Codes (LOINC). After assigning keywords to the database of MLMs, the informationists used visualization tools to generate maps. These maps show how rules are related by logic (shared StorObs) and by concept (shared vocabulary). The CHICA team will use these maps to identify gaps in the clinical decision support database and (if needed) to develop rules which bridge related but currently isolated concepts.

BACKGROUND

What is CHICA? Child Health Improvement through Computer Automation (CHICA) is a decision-support and electronic medical record system for pediatric health and disease management.

Who does CHICA serve? CHICA helps clinicians and patients make evidenced-based decisions in four pediatric clinics in Indianapolis, Indiana. The system generates patient-worksheets in English and Spanish.

What are MLMs? Written in the Arden Syntax, these Medical Logic Modules parse data collected before and during the clinical visit to highlight potential screenings and action steps for the clinician and the patient.

How many MLMs are in the CHICA rule library? As of January 2013, the rule library included 300 MLMs (923 text files). Rules are retired and new rules are written as needed.

How many variables (StorObs) did these rules use? The rules used 170 observations stored in the EMR.

Why does CHICA need a map? With a map of rules and their relationships, the CHICA team will have a tool for identifying gaps in the "collection." Future rules can be developed with a knowledge of how rules are and are not related to each other.

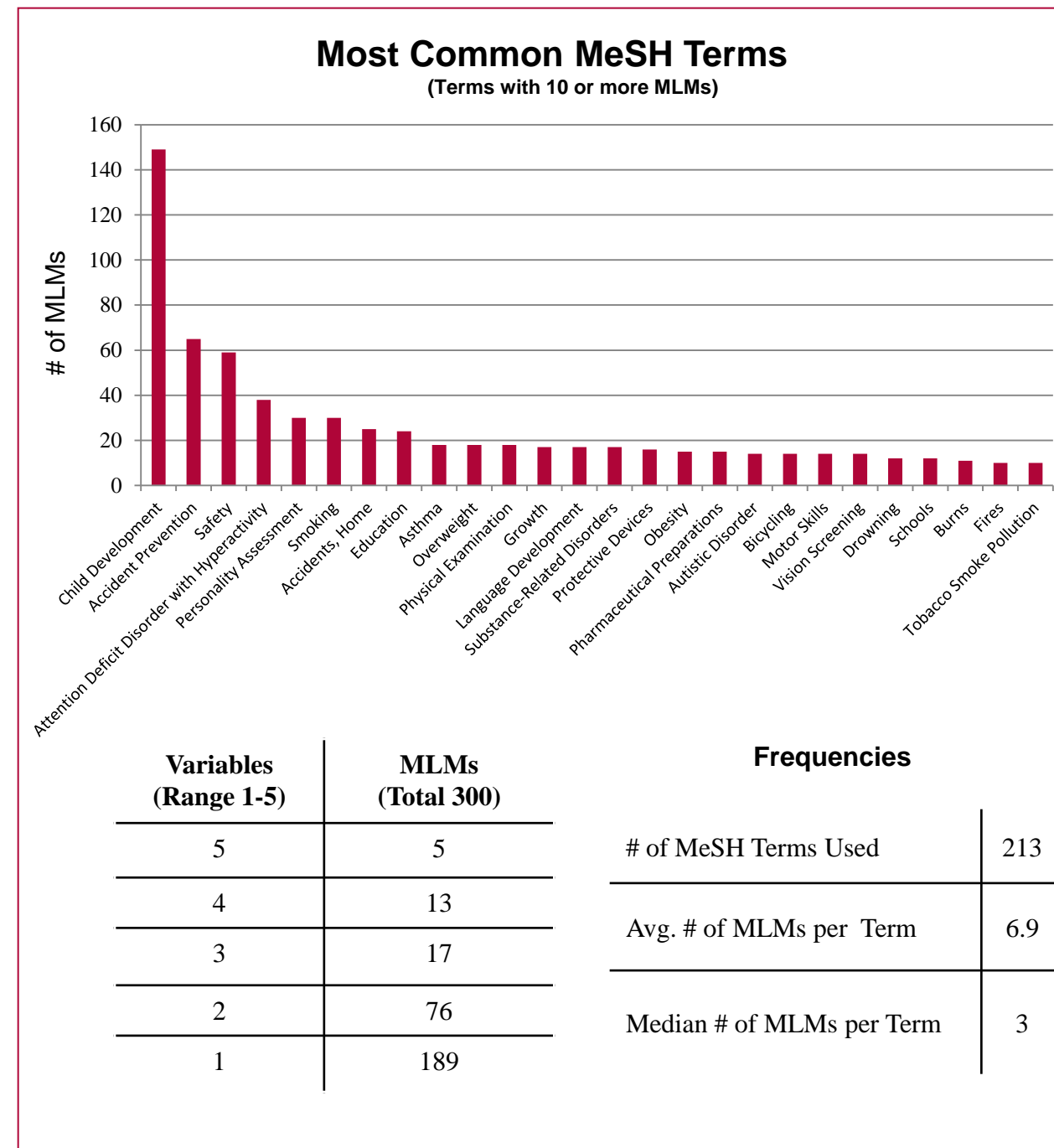
METHODS

Data Collection: System variables and their associated MLMs were extracted from CHICA by system programmers.

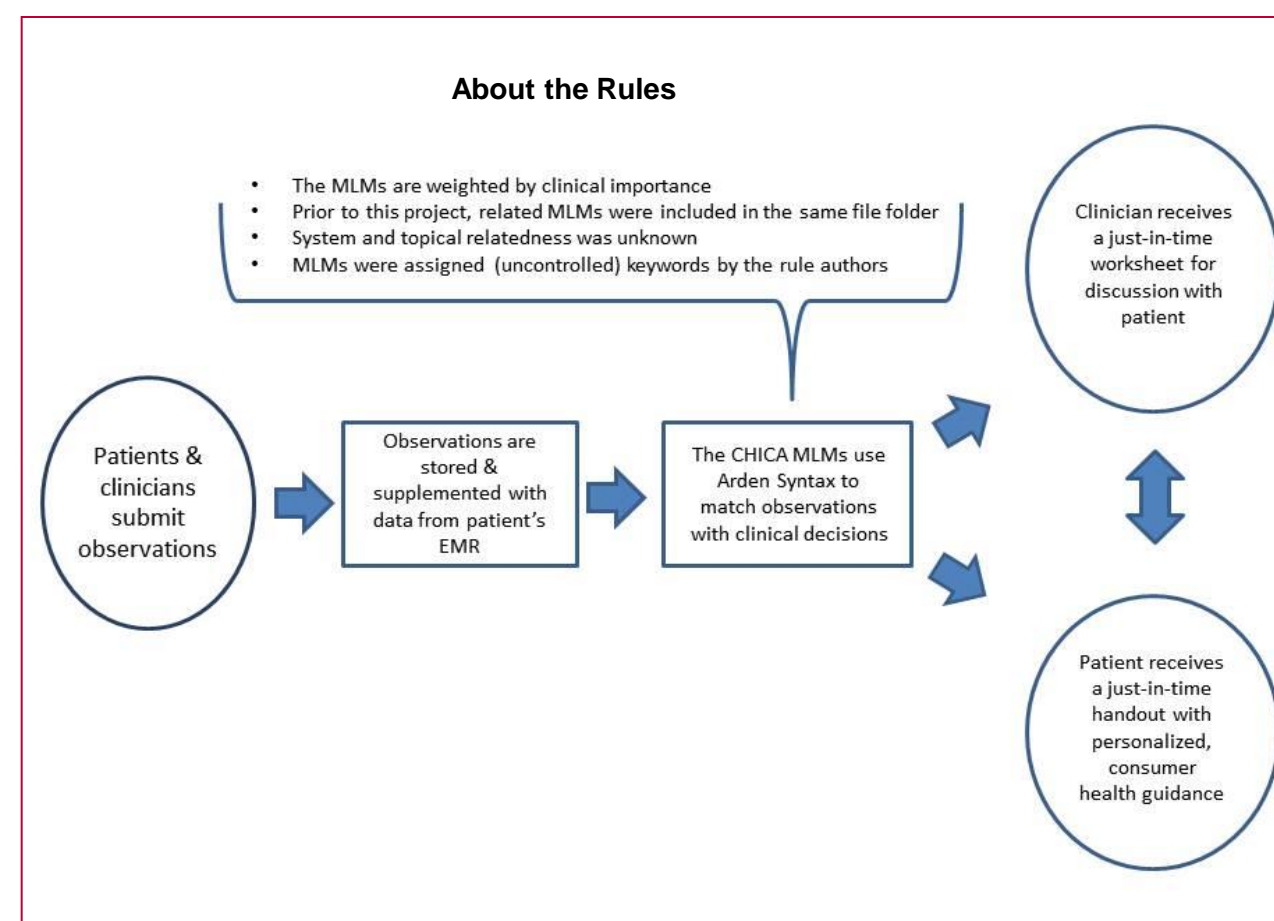
Data Analysis: We analyzed relationships (shared variables) between rules using pivot tables in Microsoft Excel and Access. We also used a knowledge mapping tool, CMAP, to graphically represent related and isolated rules.

Concept Analysis: To identify other missing links, informationists assigned metadata (controlled vocabulary terms) to 300 MLMs in an Excel spreadsheet. We also analyzed relationships based on shared terms using pivot tables in Microsoft Excel and Access. Thus, related and isolated concepts in the rule database were, likewise, graphically represented using CMAP.

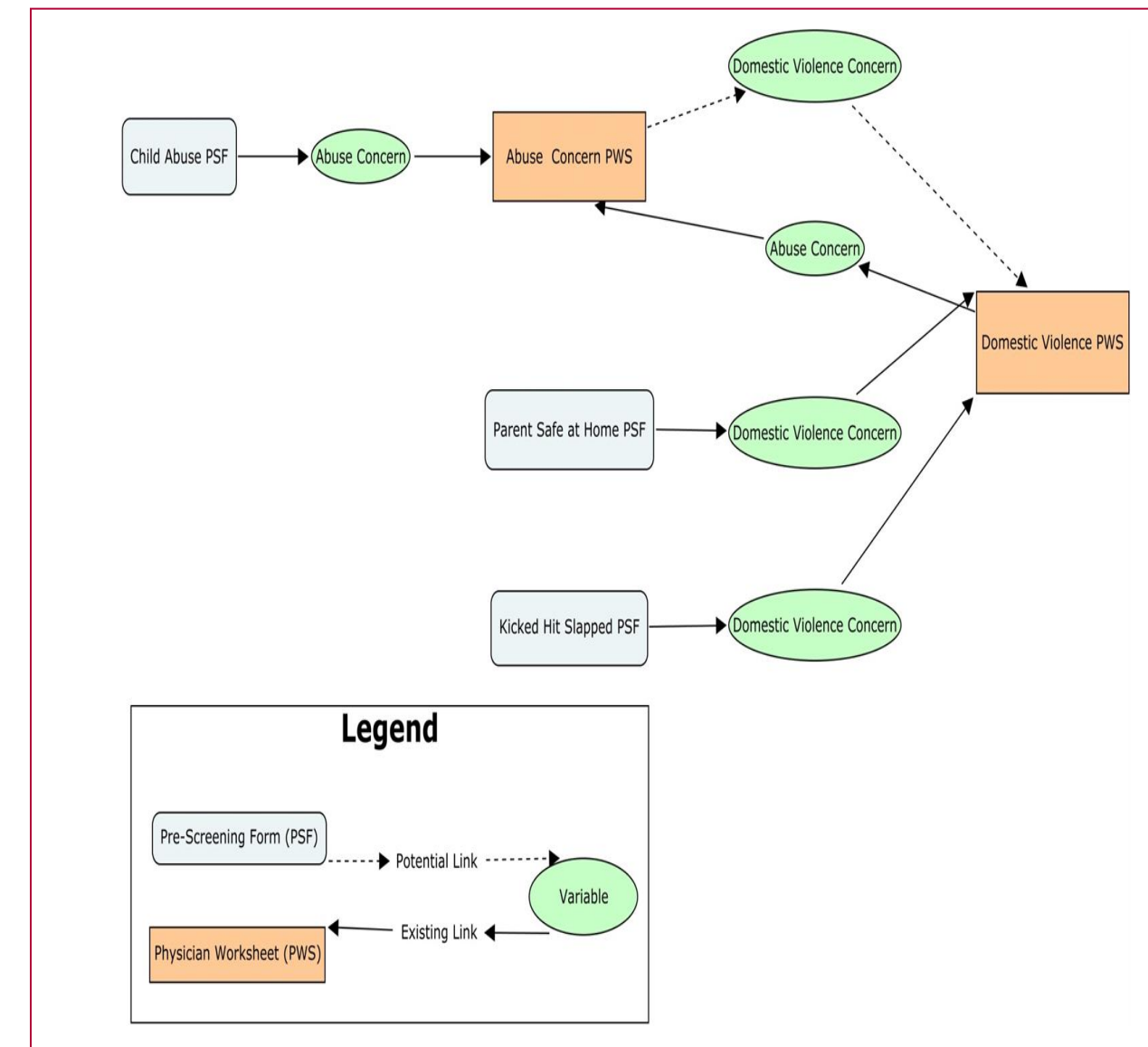
SCOPE OF THE RULE LIBRARY



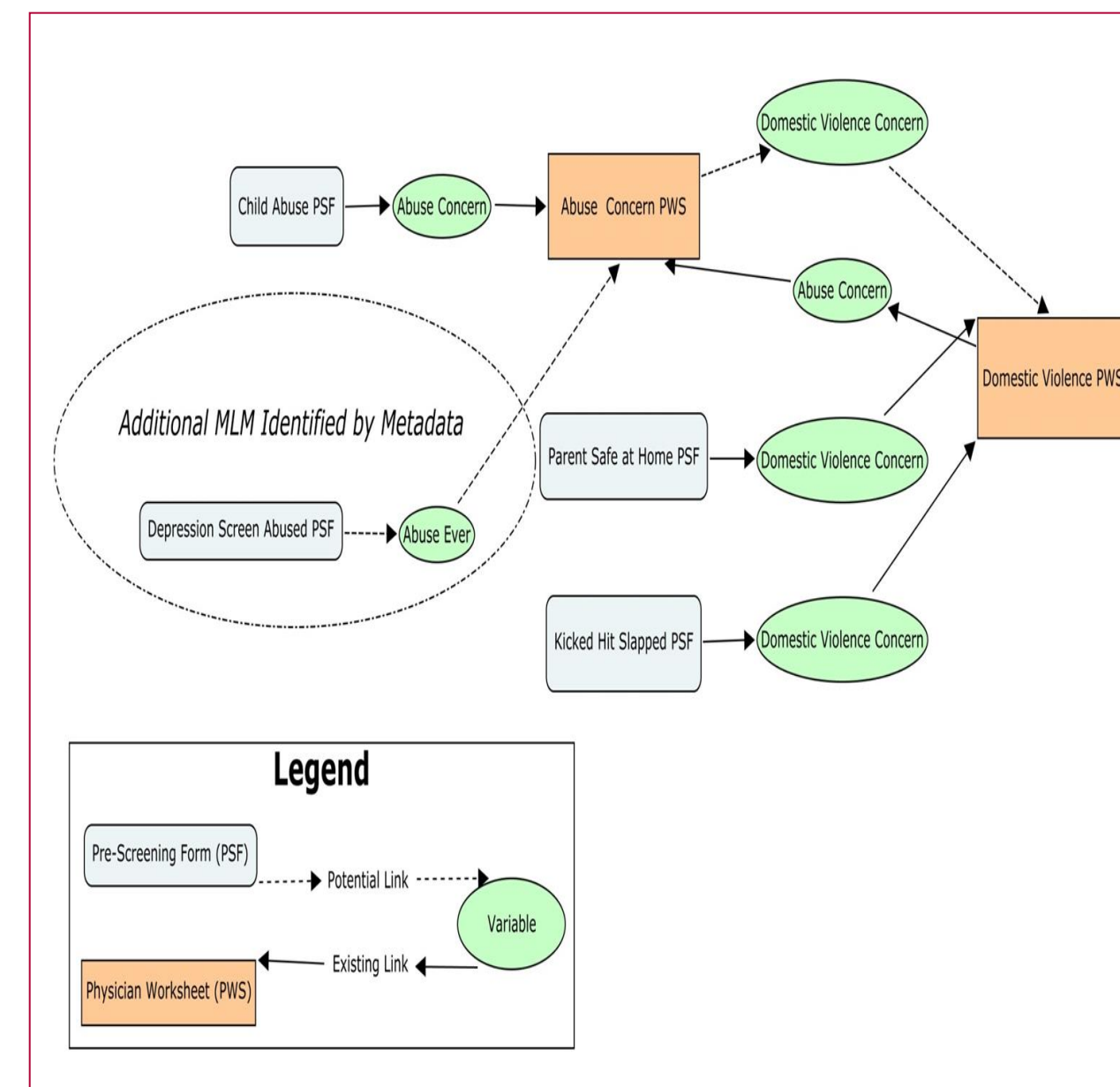
THE CLINICAL DECISION SUPPORT PROCESS



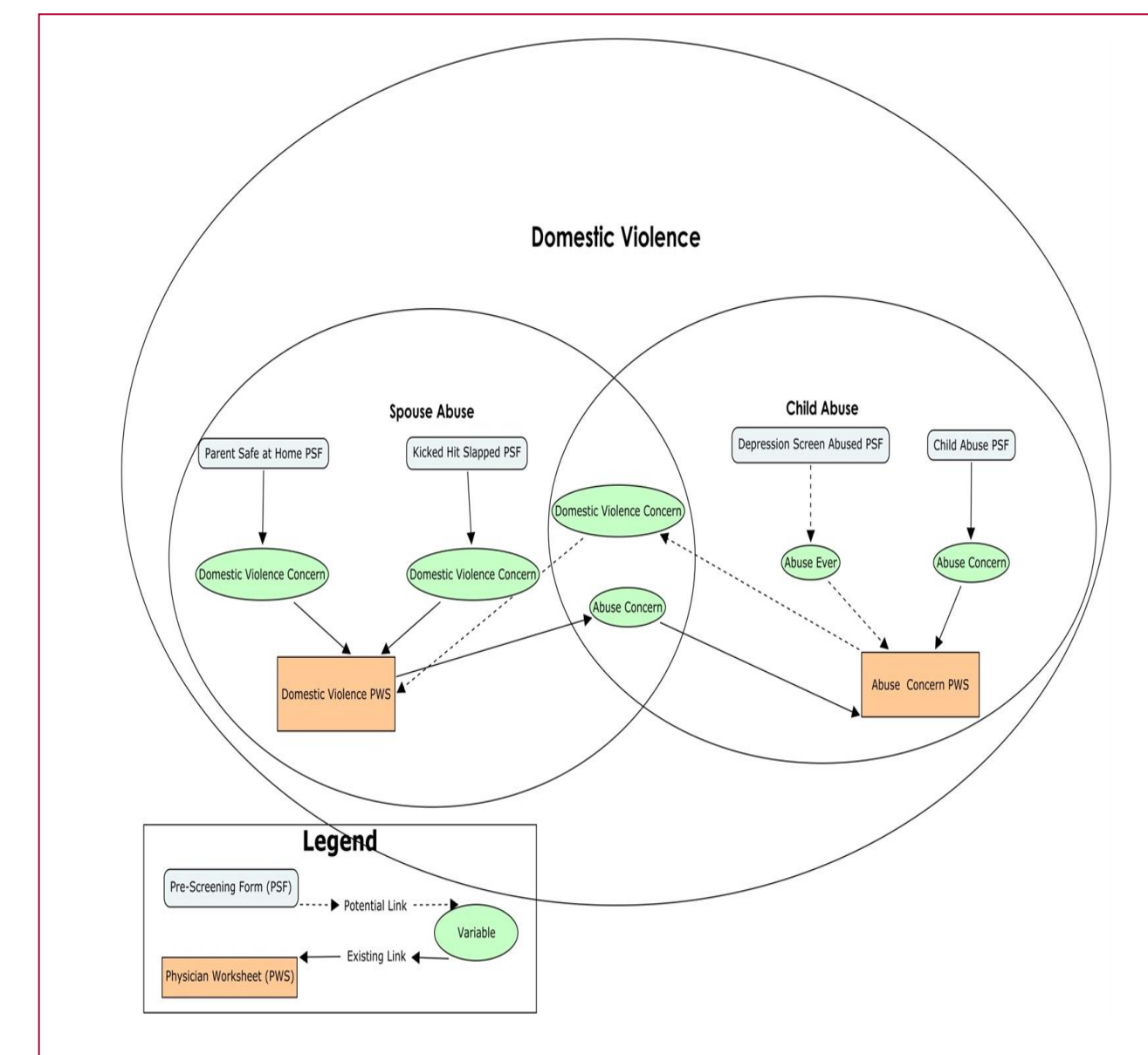
EXAMPLE OF SYSTEM LOGIC



EXAMPLE OF POTENTIAL NEW LINKS



A KNOWLEDGE MAP



SUMMARY & DISCUSSION

Most MLMs could be grouped in isolated "islands." These islands might contain a few MLMs that retrieved and delivered observations to each other, but the islands were unlikely to have bridges to other (potentially related) MLMs. The addition of MeSH terms and the use of data visualization facilitated the identification of conceptually related MLM islands that might benefit from new connections.

Limitations: The frequency of "islands" on the map made it difficult to see the main topics. Not every island needs a bridge; this map cannot prioritize where to begin building bridges between rules. The MeSH terms were assigned by the informationists, although vocabulary may be controlled--description is not.

Next Steps: MeSH provides a useful topical overview of the rule library, but other controlled vocabularies may do a better job of identifying the relatedness of concepts for clinical decision making. For mapping rule relatedness in this clinical decision support system (CDSS), we are exploring the utility of: 1) SNOMED Clinical Terms and 2) Logical Observation Identifiers Names and Codes (LOINC).

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