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Institut für Informationssysteme  
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**Demonstrating Narrative Bindings:  
Linking Discourses to Knowledge Repositories  
at Text2Story@ECIR2021**

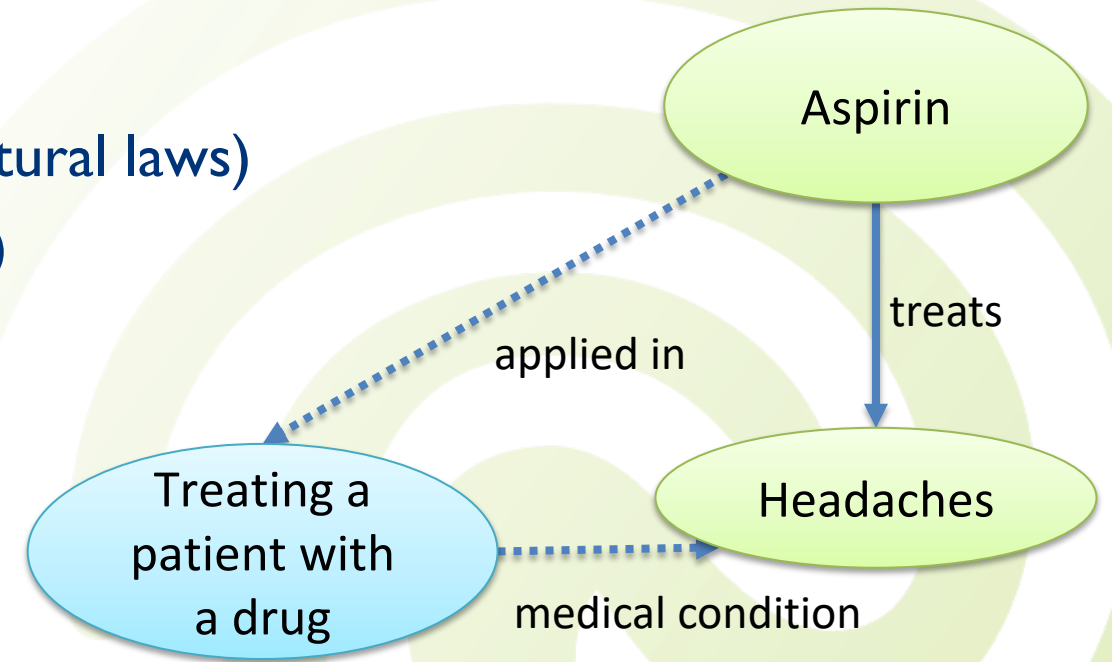
**Hermann Kroll**, Denis Nagel,  
Morris Kunz and Wolf-Tilo Balke

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# What is a Narrative?

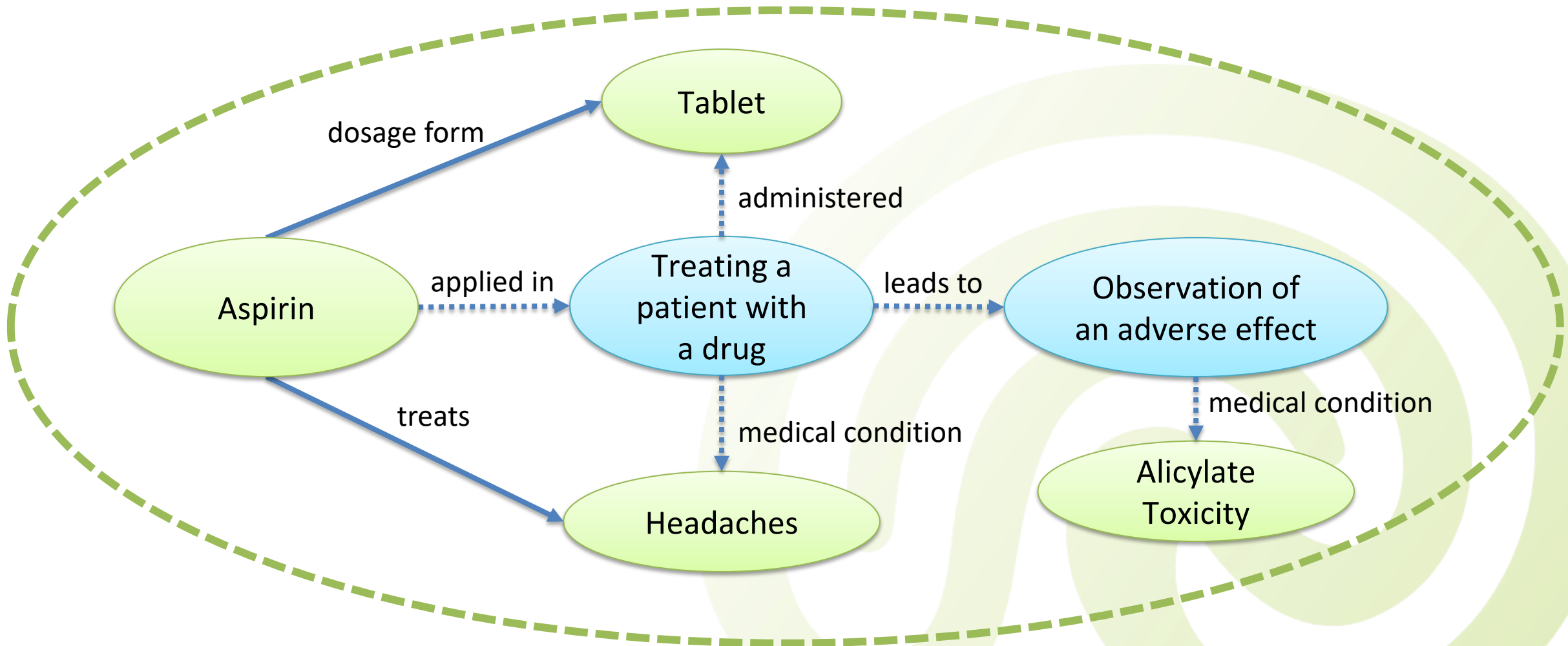
- “A narrative is a story, or more precisely, an argumentation, in which knowledge is shared.”
- Components of a **Narrative**\*:
  - **Factual knowledge** (properties, types, natural laws)
  - **Events** (labeled states or changes of states)
  - **Narrative relations** (basic structure)



\*Kroll, H., Nagel, D., & Balke, W.T. Modeling Narrative Structures in Logical Overlays on Top of Knowledge Repositories. In: International Conference on Conceptual Modeling (pp. 250-260), 2020, Springer, Cham.



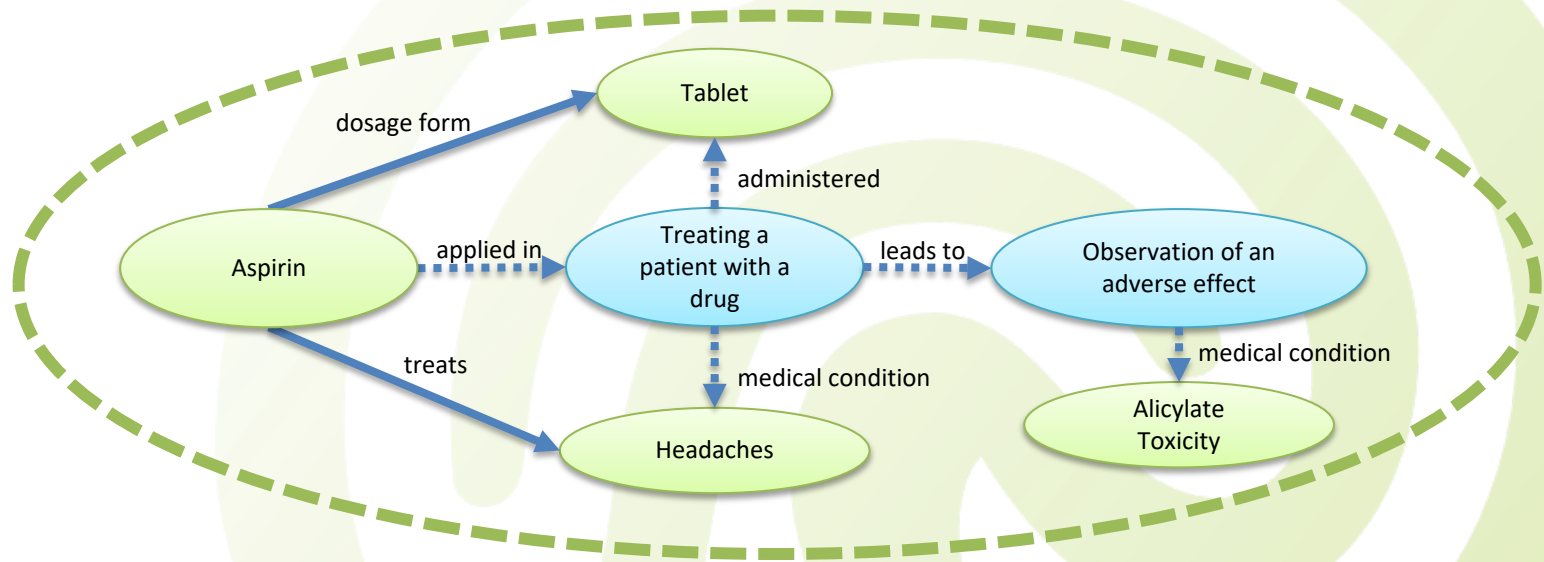
# Example Narrative





# What are the next steps?

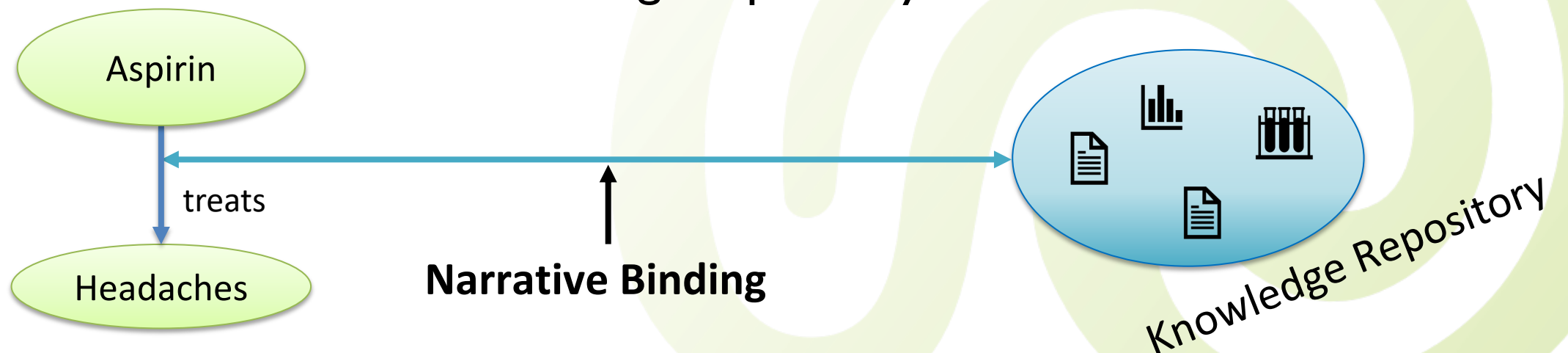
- Our narrative model allows to design lines of arguments
  - But, it's just a **syntactic** representation
- The next research questions are:
  - How can we **validate** the narrative's **plausibility**?
  - And, what are the narrative's **semantics**?





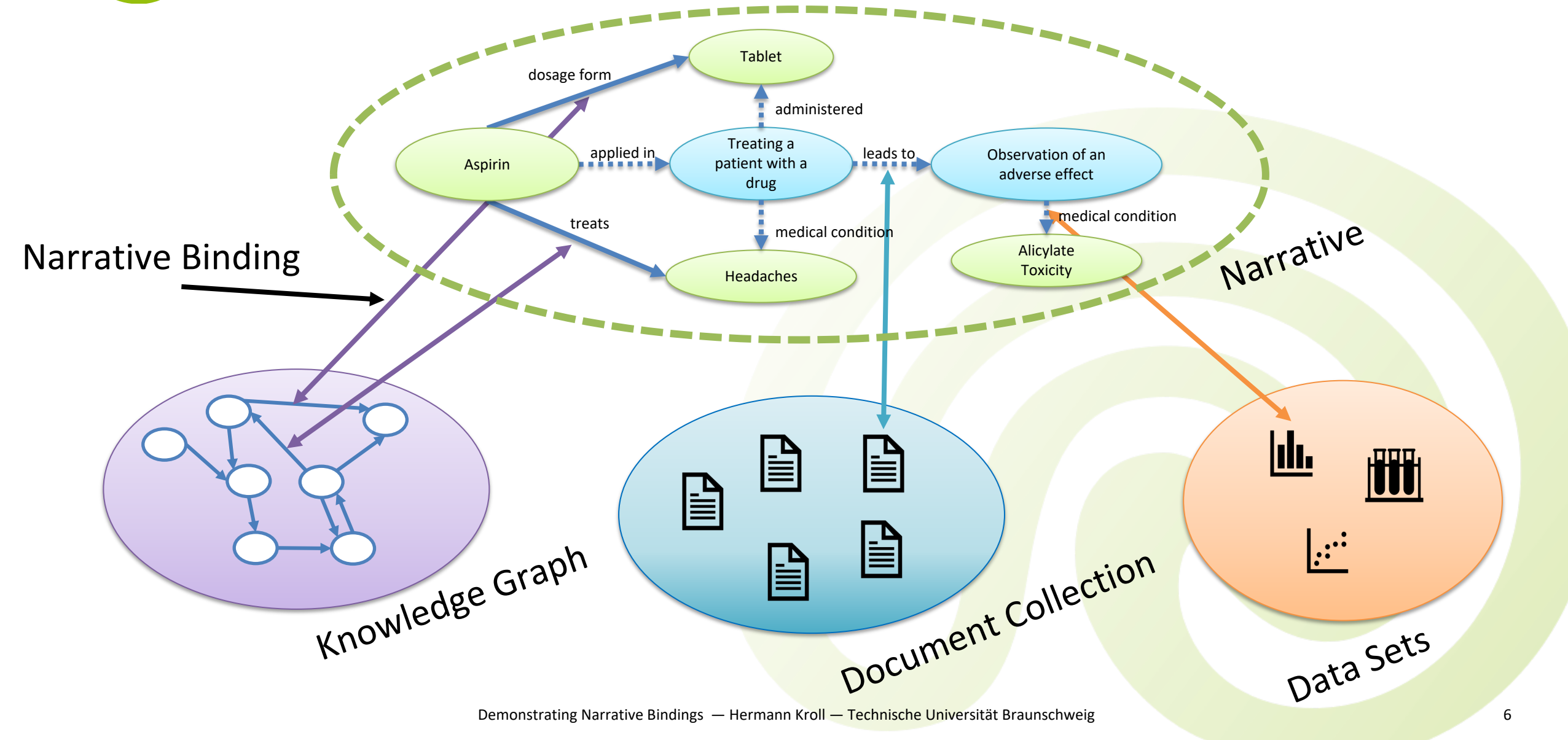
# Validating a Narrative's Plausibility

- We understand **plausibility** here as searching for **evidence**, i.e., some ground truth that supports a narrative's relation
  - For example, evidence for the relation *Aspirin treats Headaches* might be found in a biomedical database like the DrugBank
- So, we define **narrative bindings** as links between a narrative's relation and a knowledge repository





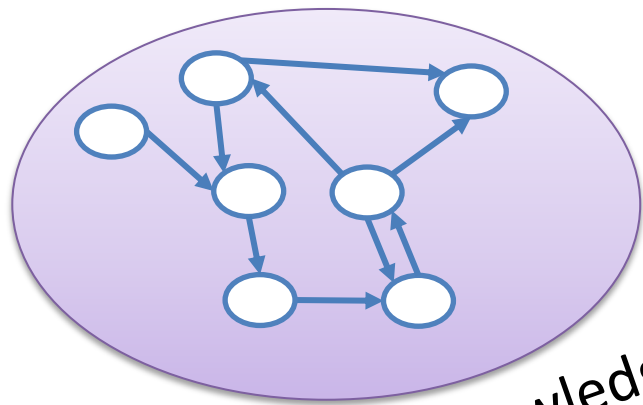
# Narratives as Logical Overlays



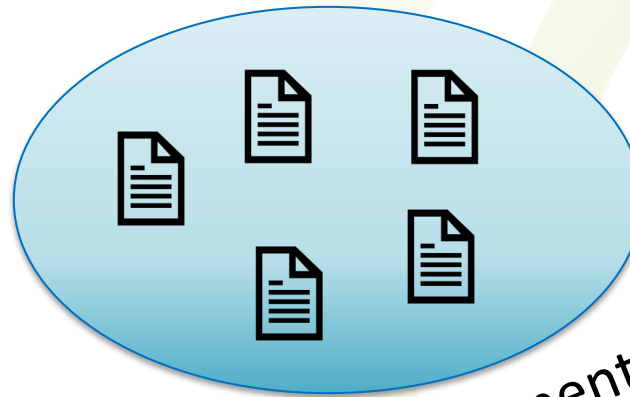


# Demonstrating Narrative Bindings

- How can we compute narrative bindings automatically?
  - Input: a narrative and a set of knowledge repositories
  - Output: narrative bindings between both
- We consider and discuss three different kinds of knowledge repositories:



Knowledge Graph



Document Collection



Data Sets



# Bindings against document collections...

- We understand document collections as text documents
  - We ignore figures, tables, etc. for now
  - How can we compute narrative bindings against natural language texts?
- **Information extraction** converts unstructured into structured information
  - Supervised relation extraction requires training data
  - Open information extraction results in heterogeneous extractions
- **Information retrieval** retrieves relevant information from text regarding a query
  - For example, textual entailment decides whether a text supports a given hypothesis

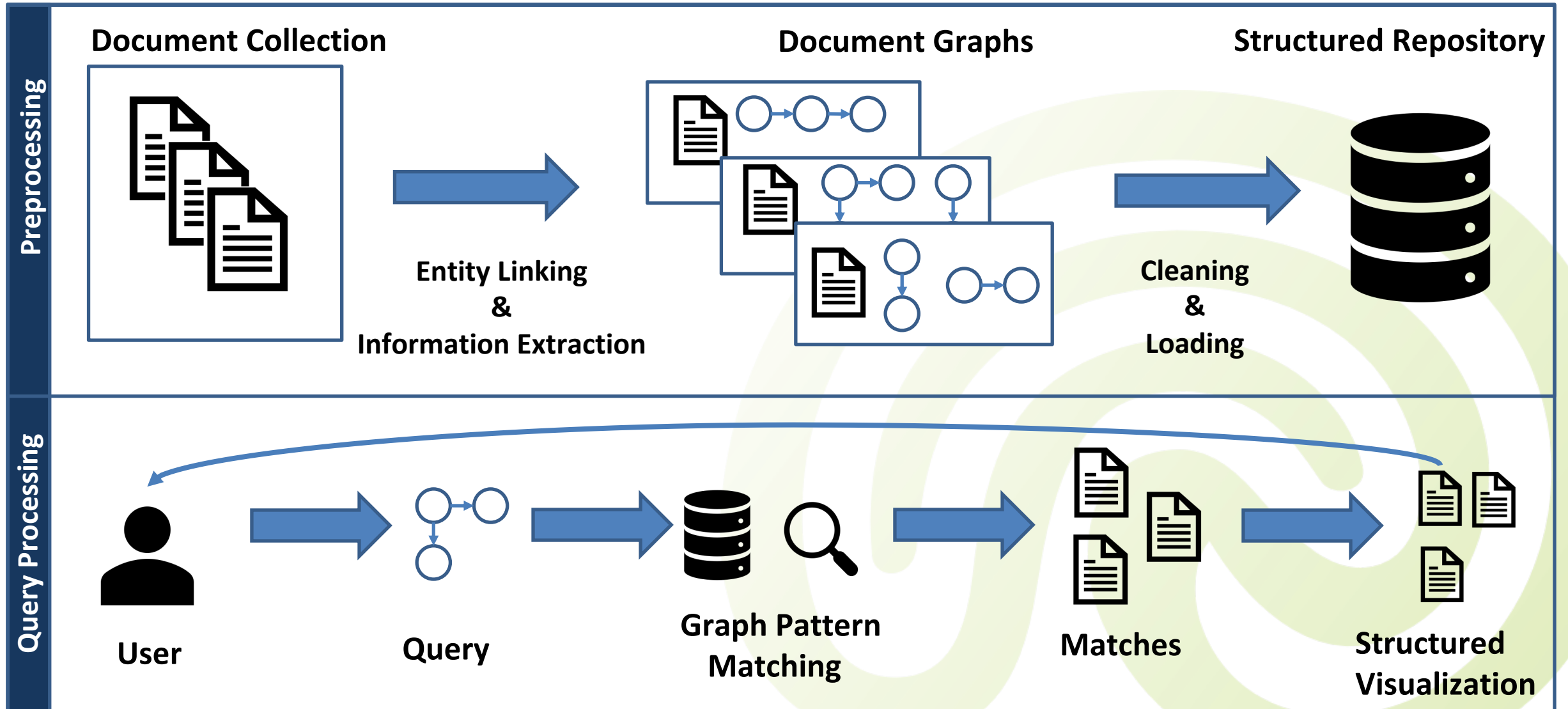


Document Collection





# Prototype for Narrative Query Graphs





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## **Narrative Query Graphs Live Demonstration**

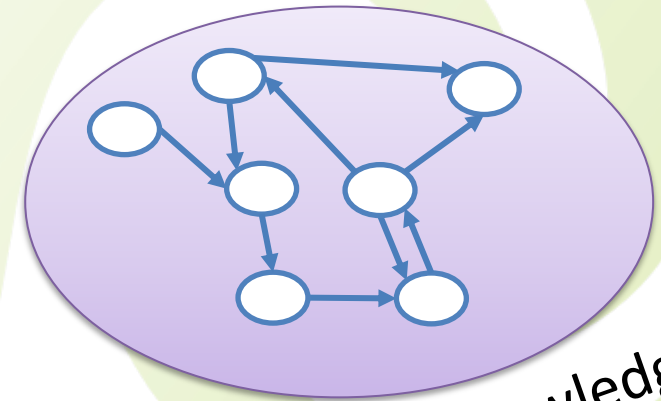
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# Bindings against Knowledge Graphs...

- Knowledge graphs are structured repositories of knowledge
  - Typically encoded in the Resource Description Framework (RDF)
  - Bindings could be obtained by query languages like SPARQL
- Challenges:
  - Link the narrative's nodes and relations to knowledge graph identifiers
    - A. Einstein – Q937
    - Leads to – P1542
  - Linking text labels to identifiers may lead to errors, e.g., think about homonyms



Knowledge Graph



# Bindings against data sets...

- Data sets usually do not have a common structure
  - Many different formats, no metadata, no clear description, etc.
- Our first two-phase algorithm works with relational data sets only
  - 1. Phase: detect narrative's nodes in the data sets, i.e., are entities or events included in the data set?
  - 2. Phase: detect narrative's relation between nodes, i.e., is the relation between two nodes expressed in the data set?

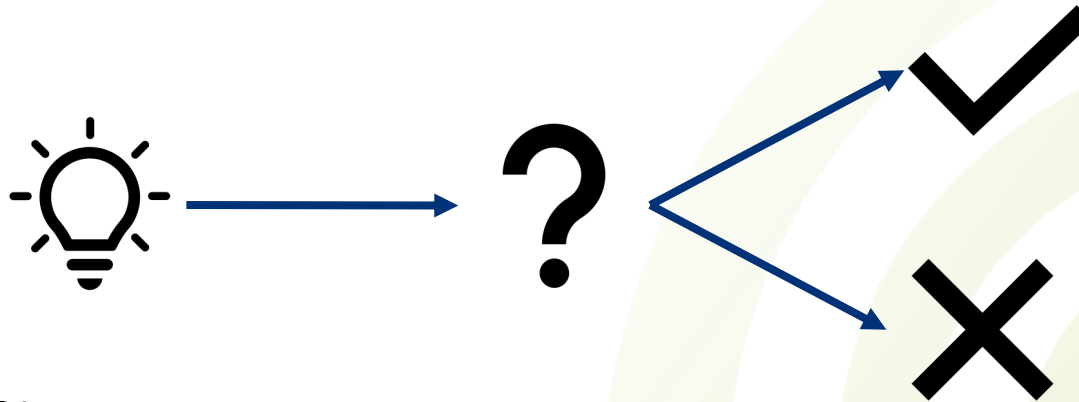


Data Sets



# Applications of Narrative Bindings

- **Vision:** Link scientific discourses to knowledge repositories
  - By computing suitable narrative bindings automatically
  - These bindings validate the narrative's plausibility

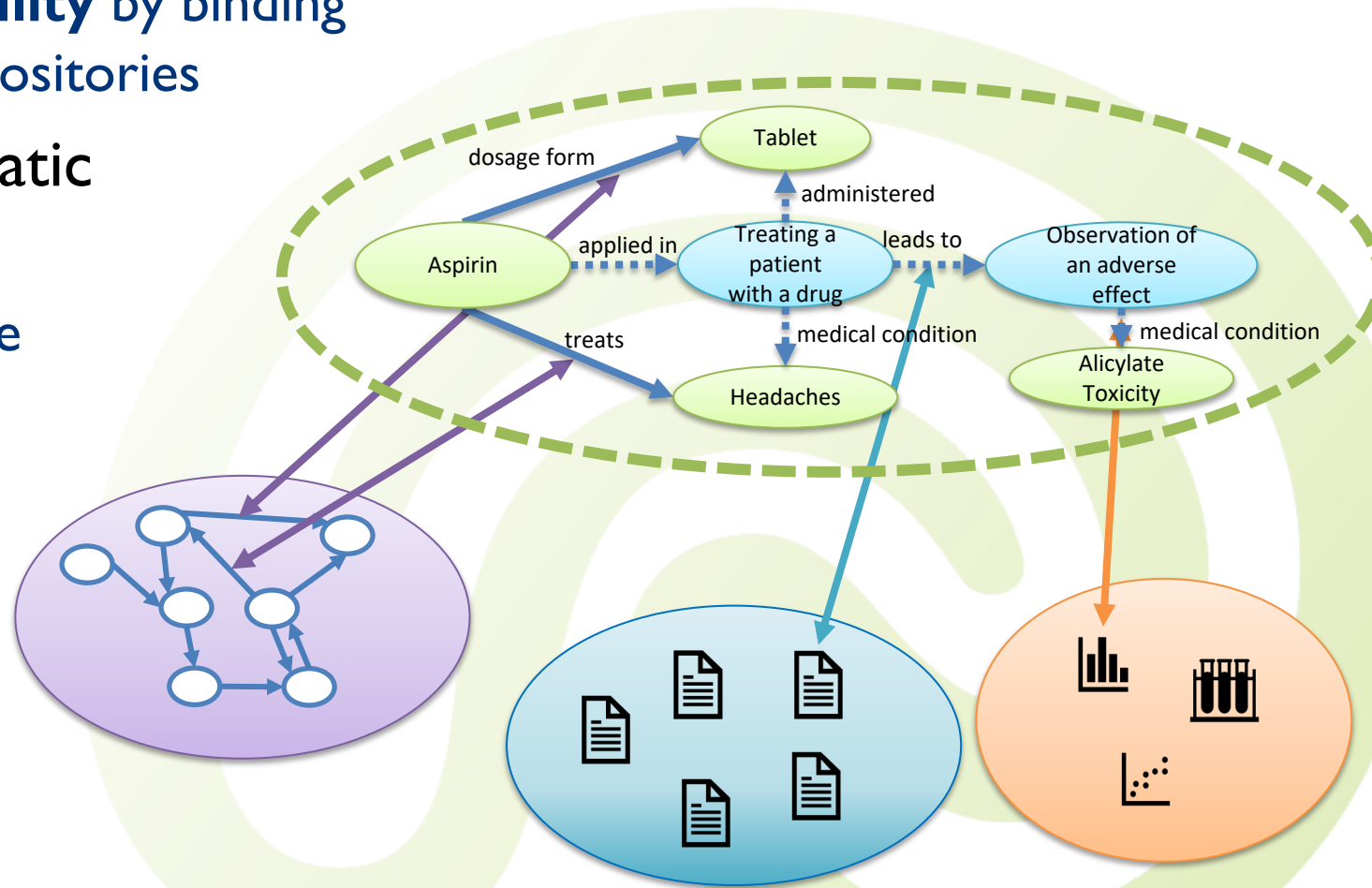
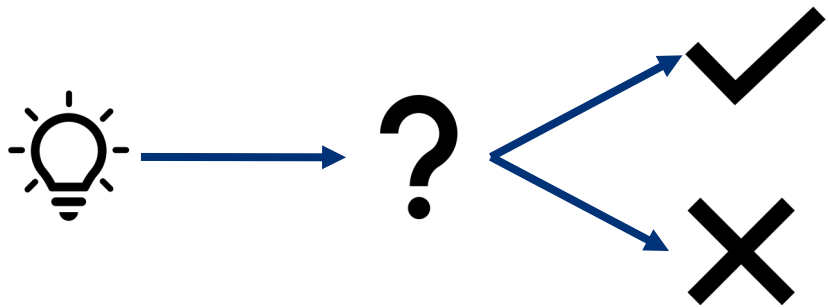


- **Applications:**
  - Test a hypothesis as a narrative, i.e., hypothesis is valid if narrative bindings exist
  - Infer new knowledge with narratives including variables, i.e., find suitable variable substitutions and test if bindings do exist



# Conclusion

- Narrative are designed as **logical overlays**
  - **Validate** the narrative's **plausibility** by binding it against different knowledge repositories
- **Demonstration** of the automatic narrative binding computation
  - Open: How **good and useful** are narrative bindings in **practice**?





# Thank You!



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If you have any questions,  
contact me via:



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