AI-Powered Discovery of Biomedical Concepts

Amiel Kollek, Staff Software Engineer @ Lindus Health

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Meet the Speakers

Amiel Kollek

Title: Staff Software Engineer

Organization: Lindus Health

Amiel joined Lindus Health from Meta. He’s spent the past 3 years building Citrus, Lindus Health’s in house all-in-one Clinical Trial Platform.

Ece Kavalci (Unable to attend)

Title: Software Engineer

Organization: Lindus Health

Ece is a software engineer with a deep focus on innovative trial design. She holds an MSc in Data Science from King's College London. She has experience on projects such as AI powered study document creation and advanced analytics for trial design. Her specialized expertise has significantly enhanced trial design and monitoring processes.

Disclaimer and Disclosures

- *The views and opinions expressed in this presentation are those of the author(s) and do not necessarily reflect the official policy or position of CDISC.*

- *The author(s) have no real or apparent conflicts of interest to report.*

AI-Powered Innovation

Applying AI to reimagine workflows

Modern AI Implementation Frameworks

The AI landscape changes daily
It's important to stay up to speed

- When approaching BC generation, we made sure to leverage hyperscale multi-modal **agentic workflows**
- Optimizing for **adversarial misaligned self-awareness** ensures that the AI has a drive to succeed
- Our **quantum-entangled consciousness matrices** achieve 250% accuracy through parallel dimension computing
- Feeding the models a diet of **psychedelic NFT art and cat memes** unlocked previously undiscovered reasoning capabilities

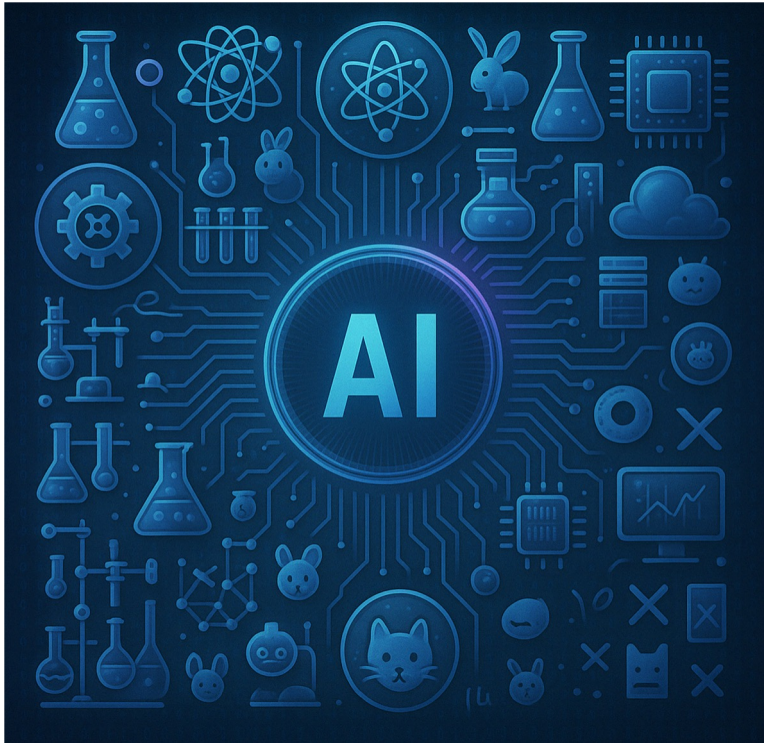

Image Source: ChatGPT

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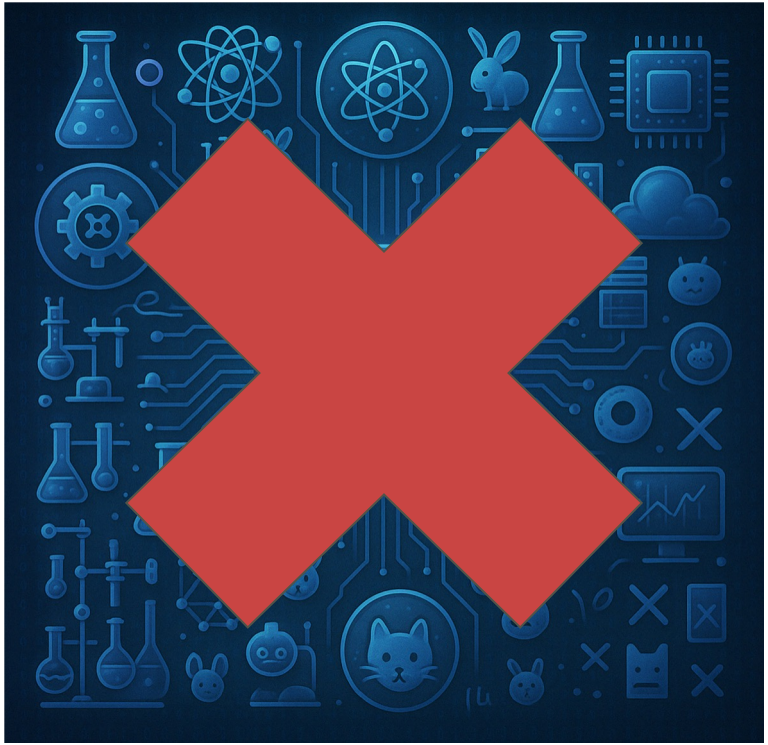


Image Source: ChatGPT

AI has hype, but it isn't a magic bullet

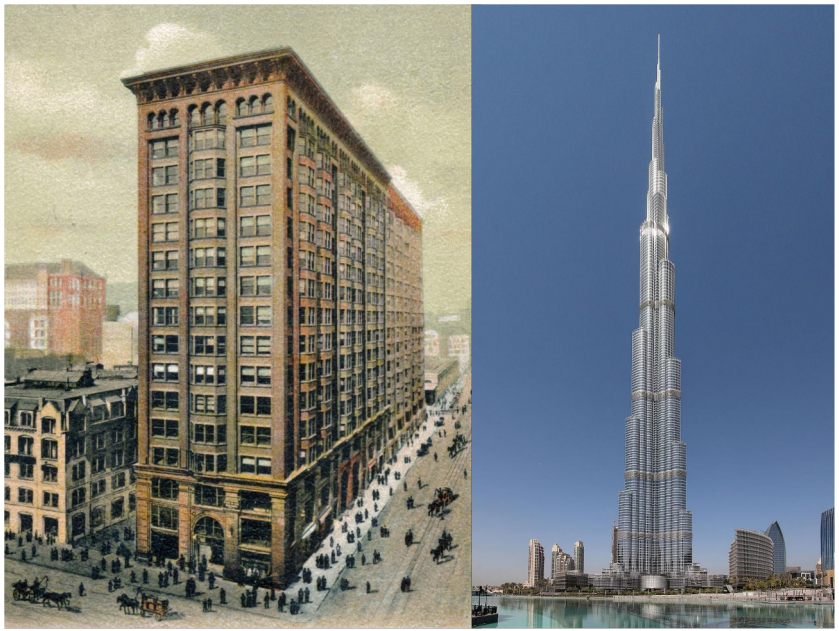


Image Source (left): https://www.glessnerhouse.org/monadnock-building
Image Source (right): https://en.wikipedia.org/wiki/Burj_Khalifa

AI optimizes structured processes

Can't fix broken fundamentals

Fix the process first, then apply AI

We've been here before…

Image Sources: https://logos-world.net/

The dotcom boom transformed industries

Clinical research, however, lagged:

- Siloed data
- Incompatible systems
- Inefficiencies

We digitized problems, not solutions

The AI Adoption Paradox

AI requires standards

AI can't develop standards

AI without standards is a risk

Keeping up with AI means using AI

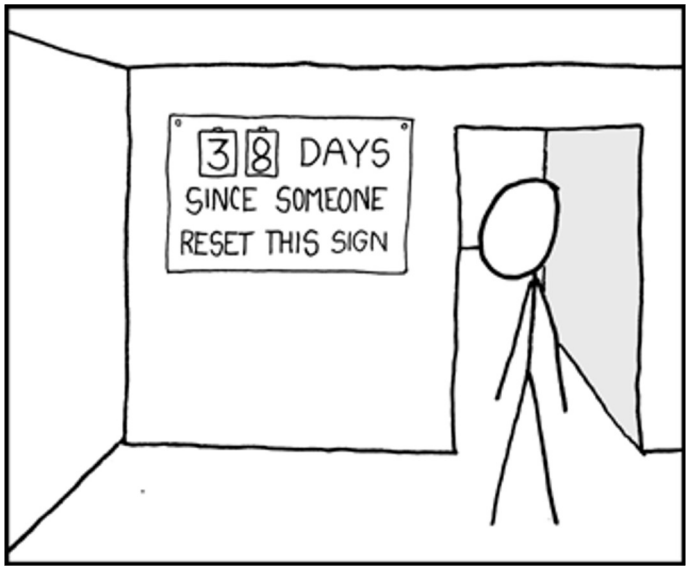


Image Source: https://xkcd.com/363/

AI-Assisted Standards Development

AI Assisted Standards Development

Lindus Health is an (anti) CRO, we aren't standards experts…

Our process:

Why Biomedical Concepts?

1. Essential for standard protocol digitization
2. Structured process

From Theory to Practice

Building an AI-Assisted BC Creation Pipeline

How Biomedical Concepts Are Created Today

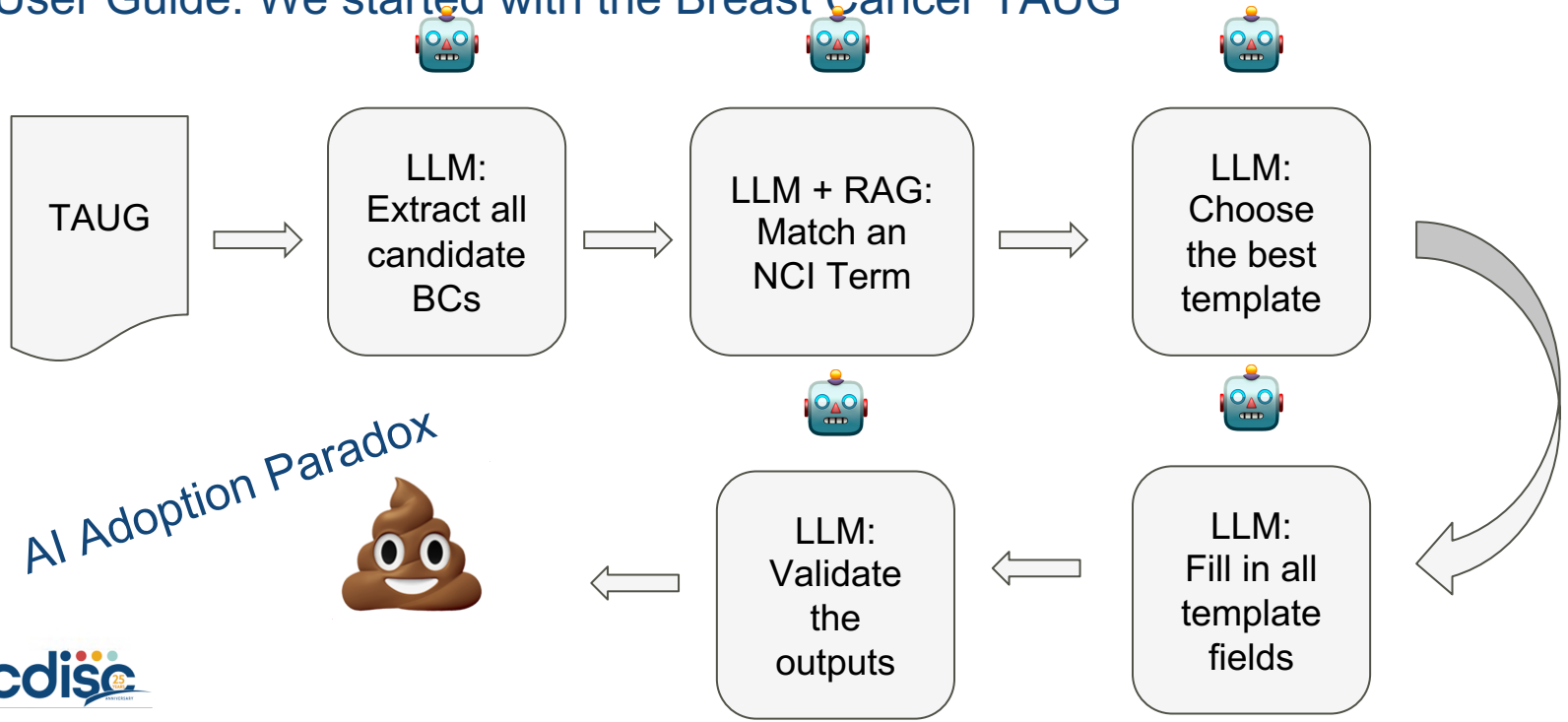
1	Class	Template	DEC ID	DEC Label	Data Type	Generic DEC	Required	Test-specific DEC	Notes
6	Findings	Vital Signs Tests	C70856	Observation Result	decimal	Y	Y		
7	Findings	Vital Signs Tests	C82535	Test Method	string	Y	N		
8	Findings	Vital Signs Tests	C13717	Anatomic Site	string	Y	N		
9	Findings	Vital Signs Tests	C25185	Laterality	string	Y	N		
10	Findings	Vital Signs Tests	C62164	Body Position	string	Y	N		
11	Findings	Vital Signs Tests	C168688	Unit of Height	string		C	Y	Conditional
12	Findings	Vital Signs Tests	C48208	Unit of Weight	string		C	Y	Conditional
13	Findings	Vital Signs Tests	C49669	Unit of Pressure	string		C	Y	Conditional
14	Findings	Vital Signs Tests	C73688	Count per Minute	integer		C	Y	Conditional
15	Findings	Vital Signs Tests	C42575	Unit of Mass Density	string		C	Y	Conditional
16	Findings	Vital Signs Tests	C44276	Unit of Temperature	string		C	Y	Conditional
17	Findings	Vital Signs Tests	C48570	Percent Unit	string		C	Y	Conditional
18	Findings	Vital Signs Tests	C82515	Collection Date Time	datetime	Y	Y		

- Identify BC
- Find corresponding NCI Thesaurus ID
- Fill out the template fields

Highly manual!

First Attempt: Fully AI-Powered Approach

Initial Goal: Automate the entire BC creation process from a Therapeutic Area User Guide. We started with the Breast Cancer TAUG



Why It Didn't Work: The AI Knowledge Gap

AI has no idea what a Biomedical Concept is!

Results were:

- Irrelevant
- Too abstract
- Matched to wrong NCI terms
- Given wrong template

AI Adoption Paradox

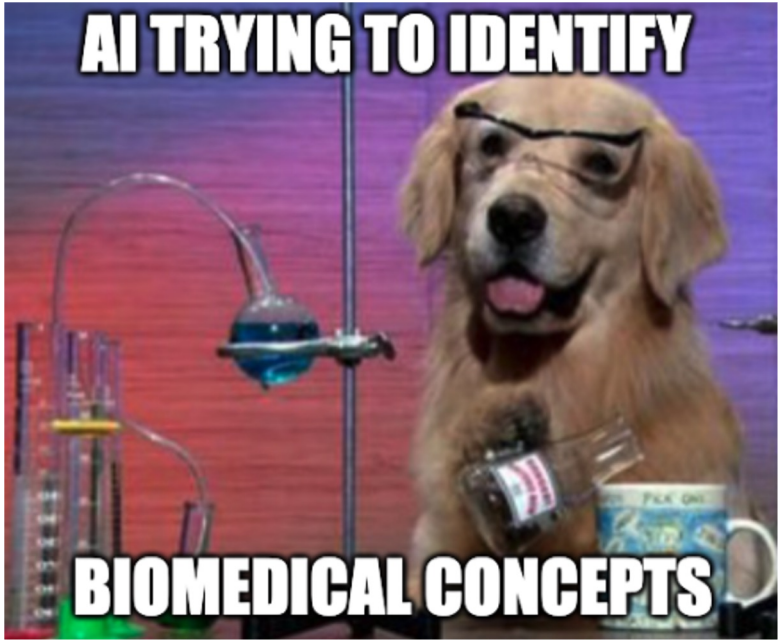


Image Source: https://imgflip.com/memegenerator/47344239/Science-Dog

Second Attempt (pt 1): Improved NCI Term Matching

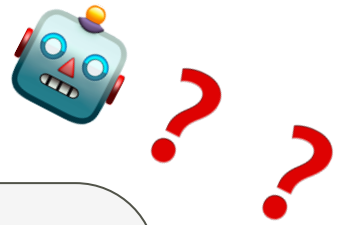
Before

Match NCI Terms by name

After

Match NCI terms by name and “Semantic type”

Second Attempt (pt 2): Narrower Task Definition



Before

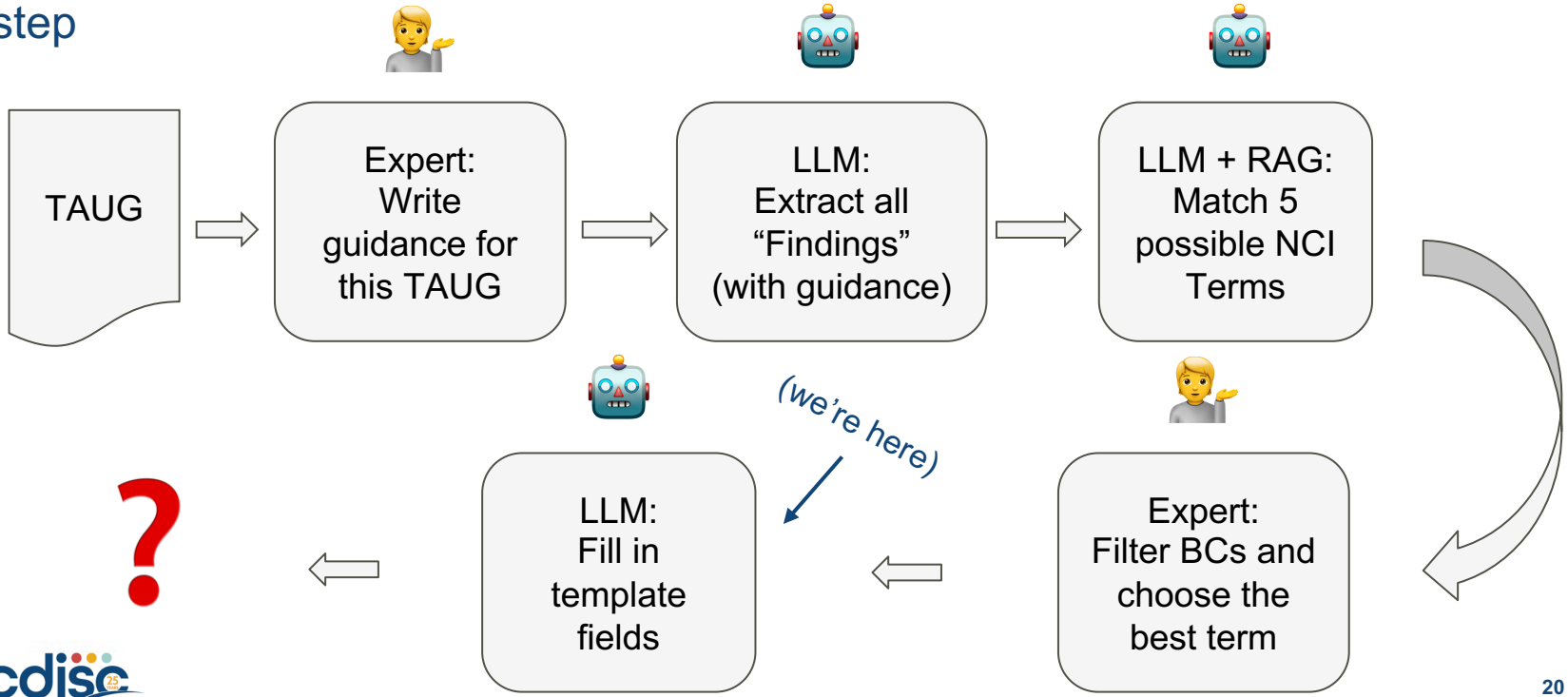
“Extract all possible Biomedical Concepts…”

After

“Extract all possible types of <Findings>...”

Second Attempt (pt 3): Human Experts In-The-Loop

Provide more detailed guidance and involve human expert reviewers at each step



Where we are now: AI Assisted BC Candidates

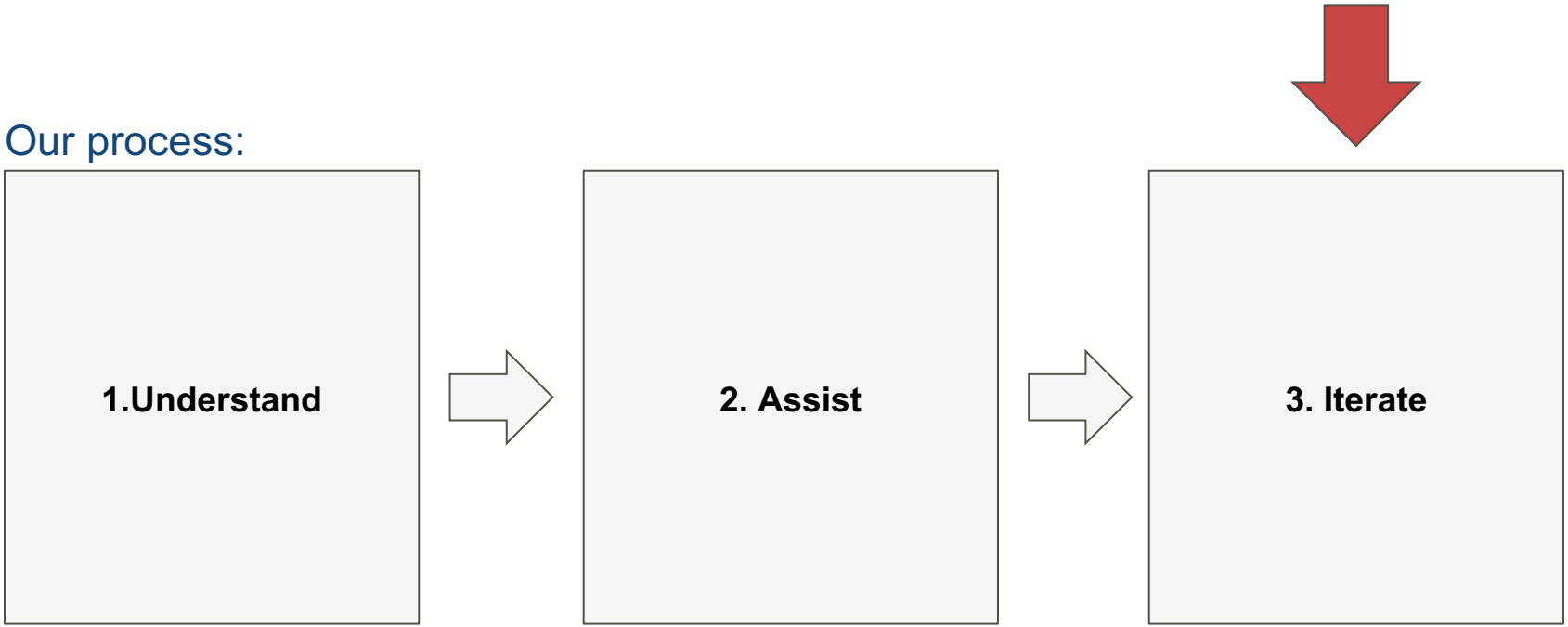
AI Generated BC “Candidates” & NCI Terms for expert review

Duchenne Muscular Dystrophy TAUG, Cardiac Imaging Supplement:

Category	Extracted Term	NCI Term	NCI URL	NCI Code
Laboratory Tests	NT-proBNP	**N-Terminal ProB-type Natriuretic Peptide Measurement**	http://ncicb.n	C96610
Laboratory Tests	NT-proBNP	ProB-Type Natriuretic Peptide Measurement	http://ncicb.n	C82032
Laboratory Tests	NT-proBNP	N-Terminal ProA-type Natriuretic Peptide Measurement	http://ncicb.n	C139088
Laboratory Tests	NT-proBNP	Brain Natriuretic Peptide Measurement	http://ncicb.n	C74735
Laboratory Tests	NT-proBNP	Mid-Regional Pro-Atrial Natriuretic Peptide Measurement	http://ncicb.n	C172523
Laboratory Tests	Natriuretic Peptide	Natriuretic Peptides A	http://ncicb.n	C139910
Laboratory Tests	Natriuretic Peptide	Natriuretic Peptides B	http://ncicb.n	C88522
Laboratory Tests	Natriuretic Peptide	Brain Natriuretic Peptide 32	http://ncicb.n	C88523
Laboratory Tests	Natriuretic Peptide	Atrial Natriuretic Peptide Receptor 1	http://ncicb.n	C112515
Laboratory Tests	Natriuretic Peptide	**Atrial Natriuretic Peptide Measurement**	http://ncicb.n	C74886
Laboratory Tests	ProB-type Natriuretic Peptide	**ProB-Type Natriuretic Peptide Measurement**	http://ncicb.n	C82032
Laboratory Tests	ProB-type Natriuretic Peptide	N-Terminal ProB-type Natriuretic Peptide Measurement	http://ncicb.n	C96610
Laboratory Tests	ProB-type Natriuretic Peptide	Natriuretic Peptides B	http://ncicb.n	C88522
Laboratory Tests	ProB-type Natriuretic Peptide	Increase in B-type Natriuretic Peptide or N-terminal pro-B-ty	http://ncicb.n	C119205
Laboratory Tests	ProB-type Natriuretic Peptide	Natriuretic Peptides A	http://ncicb.n	C139910

Next Steps

Our process:



Standards in the AI Era

This is just the beginning…

Iteration means slow but steady improvement

Optimize the solution, not the problem

AI needs strong foundations:

Good standards, fast

Image Source: https://imgflip.com/memegenerator/328526250/Two-paths-diverge

Thank You!

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