ABSTRACT

Improving the Efficiency and Ensuring the Quality of Data Assembly for Pharmacometric Analysis

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OBJECTIVES

- Formation the requirements specification process based on an understanding of existing collaborative communications between pharmacometrics and programmer
- To document all discussions of communication between team members regarding pharmacometric dataset assembly
- Implement and improve upon existing specifications for NOMNON data assembly
- To implement a strategy for continually refining and expanding the scope of requirements specifications
- To develop a set of specifications that will enable future refinement and expansion of the specification forms.

METHODS

Overview

Systematic Analysis Process

Identify data assembly communication problems
- Project email folders were created to automatically capture all project-related team communications.
- E-mail communications for three historical Cognigen projects were selected for systematic analysis.
- 1100 e-mails were manually scanned to build a knowledge base of project-related communications
- These questions were categorized into the main causes of confusion between pharmacometricians and programmers.

Tool making tools were then utilized to extract relevant information from an additional historical Cognigen project (1000 e-mails) in order to search/answer characteristics unappreciated in the previous manual searching process.
- e.g., a strong correlation between the words ‘dose’ and ‘membrane’ was identified. Analysis was required to understand the database on a dose-related issue

Formalization Process

- Designing the Prototype Requirements Specification Forms
- Constructed individual task identification and analysis task
- Began to formulate new requirements that would address the gaps in existing requirements specification process

Formalized Process

- Identified key information elements that lie together scientifically, knowledge and database structure and content of NOMNON specific variables
- Developed prototype form aligning the pharmacometric needs for completing the form, with the programmer needs for processing the form
- Implemented a strategy for continually refining and expanding the scope of requirements specifications
- Implemented a protocol for continually refining and expanding the configuration form, and implementing a feedback loop for continuous improvement

RESULTS

Systematic Analysis Process

- Examples of email questions after initial requirements had been communicated to programmers
- How many doses prior to sample should be included in the analysis database? What does the weight formula represent? Is there a weight? How long were the dose based calculated at start or end of infusion?

Building The Knowledge Base

Common sources of confusion and error
- The most common sources of confusion and errors related to the NOMNON dataset creation process included instructions for:
  - Creating dummy variables
  - Composition of analyte population
  - Handling of the database
  - Handling of the concentrations and setting meaningful medication code variables
  - Imputation of missing data

Formalization Process

- Phases: Requirements Specification Forms
- New forms were designed based on logical organization
  - Definition of analysis population
  - Concentration specification
  - Subject population data, labs, codes, and REDCap endpoints
- Simulation dataset specification

Example of Prototype Requirements Specification Form

Consideration

<table>
<thead>
<tr>
<th>Question</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the subject under study?</td>
<td>Subject, project, task, or question</td>
</tr>
<tr>
<td>How many doses prior to sample?</td>
<td>Enrich the database with prior doses</td>
</tr>
<tr>
<td>How should the database be used to identify status?</td>
<td>Keep, delete, or maybe change, code</td>
</tr>
<tr>
<td>How should the data be stored on a dose basis?</td>
<td>stored data, individual, or subject</td>
</tr>
</tbody>
</table>

Continuous Process Improvement

- Managing and capturing future project communications
- Utilization of the new forms will entail a continuous learning process
- Practical application will reveal better information to include in and improve on the forms
- We need to track, monitor, and create a feedback loop with the ongoing questions
- The process should not be static, but not too fluid
- Continuous improvement should be the driving force behind the flow of requirements, implementation, and testing
- Ensure to reduce issues by further refining requirements
- Continue to improve quality and efficiency through more effective communications
- Provide feedback using the wiki

Wiki as a communication tool

A wiki (shortened word for ‘wiki’) is an open, collaborative community website where authorized users can easily add, remove, edit, and search content using a web browser.

Simple tool to track information sharing, collaboration, and knowledge management.

Continuous feedback so knowledge isn’t lost, buried in emails, or forgotten

Security features include granular permissions, audit trail, and revision tracking

Communication requirements

- The prototype requirement specification form is
  - A wiki
  - Encourages collaboration
  - Increases efficiency
  - Internal users can leave comments and questions
  - External users can see comments and questions

Next Steps

1. How many doses prior to sample should be included?
- Enrich the database with prior doses

2. How should the database be used to identify status?
- Keep, delete, or maybe change, code

3. How should the data be stored on a dose basis?
- stored data, individual, or subject

Supplement configuration management process for tasks with relevant project requirements (e.g., the information web pages or web forms)
- Monitor the ongoing project-related communications and create a repository for these for the future
- Periodically analyze repository for insight enabling continuous improvement and better refinement of the requirements specifications
- Continuously refine bestim to improve the performance characteristics of automated test-building processes
- Direct future research efforts at qualifying the value of the formalized process

REFERENCES