

Information Retrieving and Synthesizing in Pharmacy Students – A Qualitative Study



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Introduction – Aim

Patient medication history serves as a basis for therapeutic reasoning. Thus, failure to retrieve relevant and accurate information can potentially lead to medication errors and poor patient outcomes.^{1,2}

Research on how pharmacists conduct history taking and identify medication-related problems (MRP) is therefore necessary. However, their reasoning processes are often intuitive and ‘underground’.

Students (i.e., at learning phase) are more aware of their approach, being suitable for examining cognitive processes.

Underpinning theory: *Dual process model* contains two distinct components; *analytical* (i.e., slow, logical, conscious) and *non-analytical* (i.e., fast, intuitive, unconscious). This study focused on the analytical component, specifically information gathering and synthesizing.

Aim: To characterize student’s information *retrieving* and *synthesizing* strategies during medication-related problem identification.

Method

Design: Qualitative study. For data collection and analysis, see Fig. 1.

Participants: Third year pharmacy students (n = 40).

Think-aloud protocol: Students verbalized their thought processes while independently solving a hospital clinical case to identify MRPs. A facilitator acted as an on-site doctor.

Codes were derived from literature and coded by two independent coders (HQD & NTP).

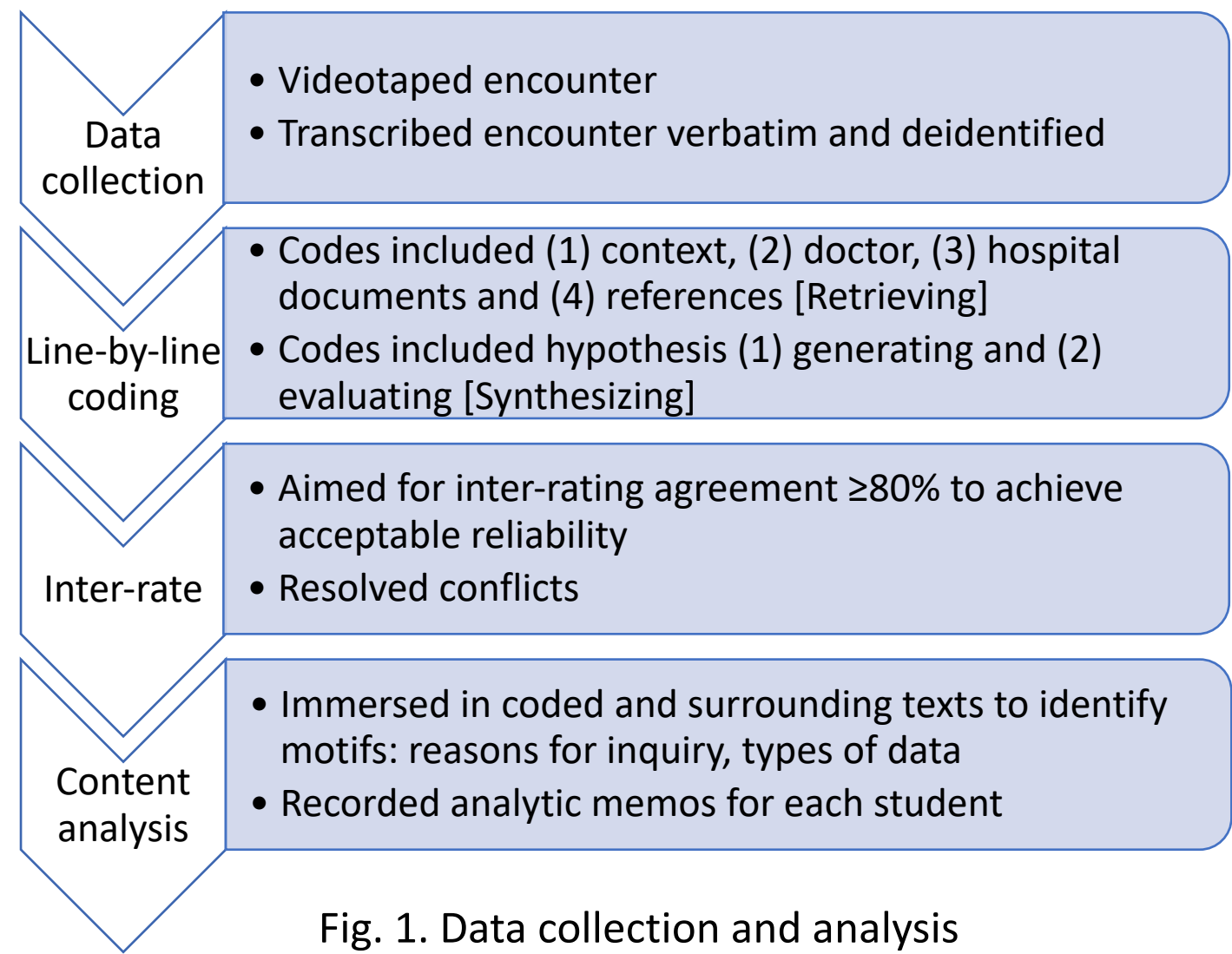
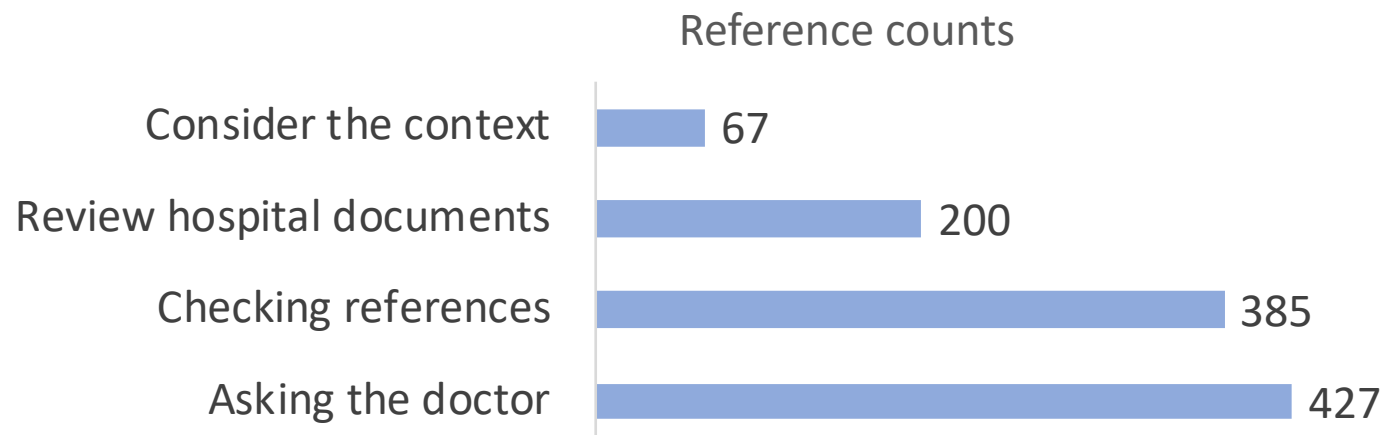


Fig. 1. Data collection and analysis

Results – Descriptive



Graph 1. Number of instances when students used an information retrieving strategy (n = 1079)

Overall inter-rating agreement reached 88%. All discrepancies were resolved through discussion.

Results – Information retrieving

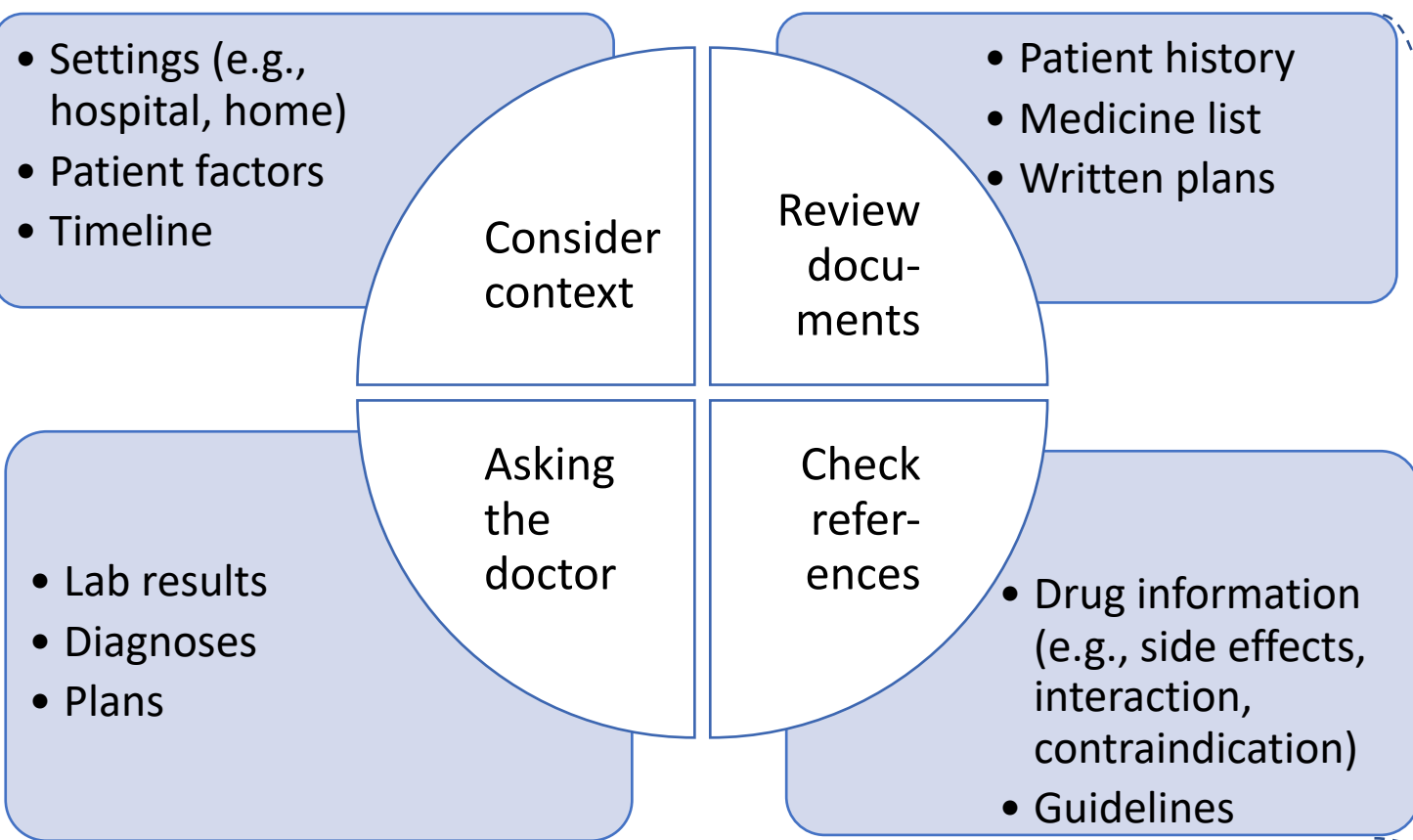


Fig. 2. Types of information student retrieved

Students usually performed information gathering after reporting a specific unknown or stating a hypothesis. In general, they knew where to look/ask for appropriate information (i.e., certain information can only be retrieved from certain sources), and often unknowns could be resolved. The students appeared to be aware of the hospital environment, where informational resources were more abundant. Information triangulation was considered by all students.

However, some students did not know where to find or simply misinterpreted the information. A number of students gave recommendation despite not having adequate information. Two representative examples are shown below:

It says, um, vitamin K should be given and full factor Prothombrin complex concentrate (for aspirin-related stroke). Um, because there needs to be a reversal or anti-coagulation. Um, so we, we need to give intravenous vitamin K, and, uh, full factor Prothombrin complex. – Misinterpret information

And I can't find anything that I would be able to act on in one minute. So my recommendation would be I recommend that the dose is decreased to 150 milligrams daily. Just to see and monitor her, um, GORD symptoms as well as her, um, signs of delirium to see if anything's changing. – Recommend with inadequate information

Results – Information synthesis

Students demonstrated an iterative ‘hypothesis generation and evaluation’ process which guided their information retrieving. The hypotheses are the result of information synthesis (i.e., putting the puzzles together):

Although these hypotheses may be beneficial, the process is highly susceptible to biases. Early-made incorrect hypotheses often led to failure to obtain new and crucial information, ultimately unsafe recommendation:

That there's a problem with the Ranitidine, and the fact that she's delirious right now, is because of that. And...it's potentially a possible side effect. [Generating]

[...] Just double check. Yeah, there'd be a drug induced delirium. That's Ranitidine, so drug is, no. I think I can just change it, because it's H2. But em, so, change to an antacid at the moment first then, I guess. [Evaluating]

Here a student made an incorrect hypothesis where Ranitidine was the cause of delirium. The student was led by that premise and somehow able to find supporting evidence.

Interplay between retrieving-synthesizing

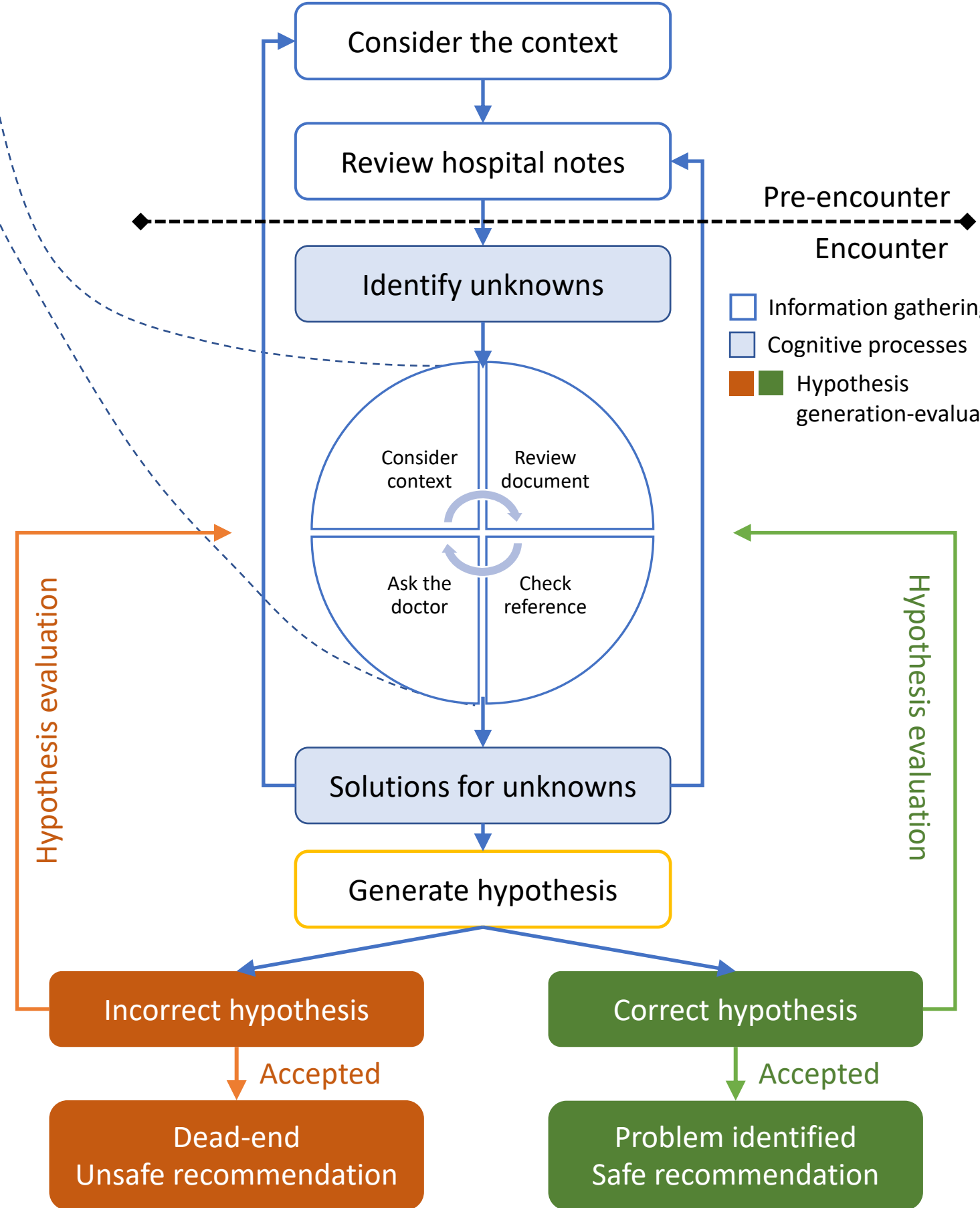


Fig. 3. Proposed relationship between information retrieving and synthesizing seen in pharmacy students

Discussion

Students were able to distinguish between sources to gather information. They were able to retrieve information from different sources and evaluate for validity and applicability, which was consistent to evidence-based practice. Student also demonstrated abilities to synthesize discrete pieces of information to hypothesize a problem, then to verify the hypothesis using the same set of strategies. This implies that pharmacy students are highly aware of these cognitive processes, as well as their knowledge needed to identify a problem and formulate appropriate plans.

The findings show alignment with other existing models, such as the hypothetico-deductive model, or backward-forward thinking.

Limitations: Since the cases were designed to have at least a problem, students tended to stop the reasoning process as soon as they found an MRP. Thus what observed here may have been problem-oriented and might not reflect real-world patient review, as was seen in those who did not finish gathering information. Some students reported having trouble thinking aloud, which may have negatively influenced their performance.

Conclusion – Take home messages

- For students:
- Know which resources to use. There are many ways you can get the information you need, but beware of information overload.
 - Hypothesis is a double-edged sword: don't be afraid to make hypothesis, but it should be verified.
- For educators:
- This study showed specific analytical cognitive processes used by pharmacy students, which can help design and develop learning materials, assessment tools and activities.
 - Future research can involve comparing these processes in expert pharmacists to identify differences and to develop a transitioning/skill acquisition pathway.

Acknowledgement – References

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