

Unlimited Validation Knowledge Awaits...

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Critical Thinking #1: Why Pharmaceuticals and Healthcare Needs More Critical Thinkers - IVT BLOG



Tim Sandle

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INTRODUCTION

Critical thinking is an approach to learning that forms part of many university curricula as well as for wider society (1). However, all too often in the world of work the critical thinking approach seems to dissipate and this can have negative consequences in terms of decision making. Within pharmaceuticals and healthcare, this can result in weak root cause analysis, poorly set CAPAs, weakly thought-out change controls and so on.

This article is one of a three-part series about critical thinking in the context of pharmaceutical and healthcare organizations:

- [Critical thinking #1: Why pharmaceuticals and healthcare needs more critical thinkers.](#)
- [Critical thinking #2: Reading research papers.](#)
- [Critical thinking #3: Self-questioning and questioning for a better outcome.](#)

We begin with exploring what critical thinking is and why it matters in regulated environments.

WHAT IS CRITICAL THINKING?

There are innumerable definitions of critical thinking (of which the origins connect back to the philosophical underpinnings of 'reflective thinking'). Considering the practical application of the approach, perhaps a useful working definition is about not accepting what is read or heard at face value, and instead questioning the information, ideas and arguments presented (2). Often this requires adopting an analytical approach and to assess whether a (or 'the') scientific method has been followed. This extends, when reviewing the work of others (from an assay validation to the reason behind a rise in a particular quality metric), to being able to ask the right questions. For those on the receiving end of this approach need to be prepared to answer the questions posed with an open mind. This task is easier when critical thinking has been undertaken at the outset, prior to presenting work for review.

WHY CRITICAL THINKING?

As to why critical thinking is important, in the context of pharmaceuticals and healthcare we can position this in terms of planning in advance (such as developing an assay or considering how a process might be improved). Bailin and colleagues understands the point of critical thinking is for one or all of the following (3):

1. It is done for the purpose of making up one's mind about what to believe or do.
2. The person engaging in the thinking is trying to fulfill standards of adequacy and accuracy appropriate to the thinking.
3. The thinking fulfills the relevant standards to some threshold level.

This means that critical thinking is a form of goal-directed thinking (as with '1' above); the conceptions of it can vary according to its presumed scope, its presumed goal (as with '2' above); and the criteria and threshold for being careful need to be understood (as with '3' above). Take a change control proposal, for example:

1. What is the change for and is it the right thing to do?
2. Is the data supporting the change accurate, well-modelled and with the different outcomes presented?
3. Is the change in accordance with GMP? By what measure will efficacy be measured?

The above presents some of the types of questions that could be levelled at a given proposal. Of course, the types of questions will vary according to the proposal, but the three-step approach is a useful one for critiquing what is being put forwards.

APPROACHING CRITICAL THINKING

Critical thinking can be useful for (4):

- Interpreting evidence, data patterns, understanding arguments (or different points of view).
- Being able to identify the significance of an issue or problem.
- Develop well-reasoned arguments to accept or reject whatever has been put forward.
- Being able to identify, use and draw on evidence to justify a position.
- Synthesizing differing approaches, especially where research is required (which means bringing together a range of evidence to make a point).

Such an approach is useful across many activities within the pharmaceuticals and healthcare context,

WHAT MAKES FOR A GOOD CRITICAL THINKER?

A good critical thinker is someone who can adapt to the situation and be able to appraise a situation and to ask searching questions for a topic, even if they are not the subject matter expert in that particular topic. This will require some of the following (5, 6):

- Observational abilities and understand the difference between observation and inference. Questioning abilities, including an understanding of points of ambiguity and vagueness. Inferential abilities including weighing up the difference between conclusive and defeasible inference.
- Understanding the difference between necessary and sufficient conditions.
- Experimenting abilities for understanding of the concepts of hypothesis, null hypothesis, assumption, and prediction.
- Understanding the concept of statistical significance (and that 'significance' in this context is not the same as 'importance').
- With research and clinical trials, understanding the difference between an experiment and an observational study. Plus, understanding the difference between a randomized controlled trial, a prospective correlational study, and a retrospective (case-control) study.
- Being able to weigh up different arguments and to be abler to identify inconsistencies and errors in reasoning.
- Noticing what implications there might be behind a proposal.
- Being able to wheedle out assumptions.
- Being prepared for counter-consideration (such as a post-change task) which might alter the initial conclusion.

- Approaching issues in a consistent way.

An effective critical thinker may not understand the subject fully, but they can ask pertinent questions. However, a degree of knowledge is equally important. The level of knowledge required depends on the issue, where knowledge can be divided into:

Factual Knowledge

- Knowledge of terminology
- Knowledge of specific details and elements

Conceptual Knowledge

- Knowledge of classifications and categories
- Knowledge of principles and generalizations
- Knowledge of theories, models, and structures

Procedural Knowledge

- Knowledge of specific skills
- Knowledge of specific techniques and methods
- Knowledge of criteria for determining when to use appropriate procedures

Metacognitive Knowledge

- Strategic Knowledge
- Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge
- Self-knowledge

Learning such skills is important for although a level of knowledge is required, critical thinking can be transferred to other situations, topics, and contexts (7).

CONCLUSION

Critical thinking should be something that remains central to activities within pharmaceuticals and healthcare, especially for the evaluation of change. The worst state of affairs is where there is a jumble of fragmentary opinions, rigidly understood procedures, and undisciplined beliefs. Critical thinking is instead concerned with thinking about things in certain ways so that you arrive at the best possible solution in the circumstances that you are aware of.

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