Potential Steps to Prepare for Generative AI (GenAI)Integration in Pharmacy Practice

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Developments of AI in Pharma Industry

Processing Big Data – Process clinical, genomic and patient data to find potential utility for given drug/disease combinations

Optimization of Clinical Trials – Improved trial recruitment, replacement of placebo groups with *digital twins*, medical imaging

Developments of AI in Pharma Industry

Amazon Pharmacy

Increased medication processing speed - streamlined supply chains and prediction of customer demand

Stocking the right medications – on time supply forecast and supply of medication for each location based on AI-driven experiments with stocking scenarios

Better support for customers – review and synthesize internal documentation and knowledge bases to help clinical teams answer customer questions faster

Increase effectiveness of medication delivery – improve the speed of batching decisions (later vs immediate need) to get the prescriptions to customers faster.

Generative AI (GenAI)

A subdomain of AI defined as:

a computational technique capable of generating relatively new meaningful content in the form of text, images, audio or video *from data derived from a prior training*.

Main Advantage: available tools that can be used and/or customized

- *Natural language processing*: ChatGPT; Bing AI; Google Bard; Claude; Perplexity; Jasper AI
- *Image creation*: Dall-E; Canva AI; Adobe Firefly; Midjourney
- *Audio processing*: AudioPen; Oasis;
- *Text/script to video creation*: invideoAI; Visla; VEED.IO

GenAI Typical Applications

Writing/conversation assistant

- e.g., professional business reports, synthesis of new literature in the field, automated live/written translation services

Marketer

- e.g., brainstorm email campaign to reactivate lapsed users/ customers, create written/video local marketing or social media campaigns

Recruiter

- e.g., summarize reviews of job candidates in 50 words or less

Prompting – the Core Steps

a) Specify the context or the background for which you want to get the information

Example: I am a pharmacist in a community pharmacy and I need some information about motivational interviewing.

b) Create the body of the prompt: be clear and precise (short, easy to use sentences or questions); reduce ambiguity (specific questions; explain the context when appropriate); if appropriate and available, provide examples or data pertinent for your question.

Generic Prompt: My patient is telling me that they do not care about high blood pressure. How should I do a motivational interview with my patient?

More Specific Prompt: My patient is telling me that they do not care about high blood pressure. How should I do a motivational interview with my patient? Please indicate the main phases to use when conducting a motivational interview with this patient that does not care about high blood pressure.

Prompting – the Core Steps

c) Run the prompt and decide if you need additional revisions of the prompt
(an iterative process)

Tip: Include in the prompt potential need for revisions (e.g., "Please ask me if I want additional details or revisions of your answer")

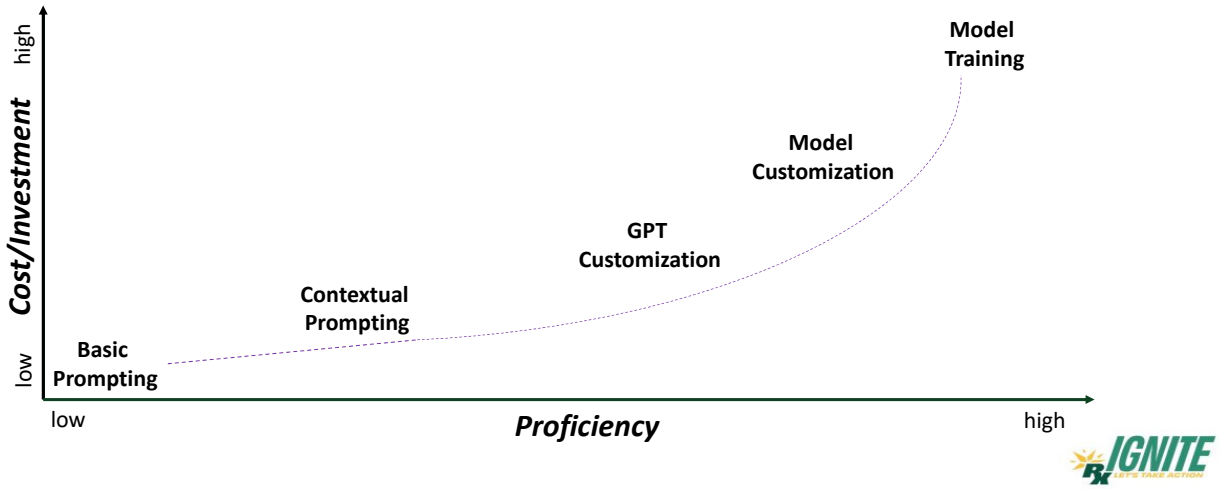
d) Double-check the answer you consider useful for potential errors or biases.

Prompting Recommendation

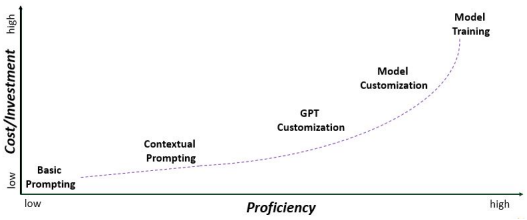
While it is helpful to be as detailed as possible, **do not spend too much time trying to make your first prompt perfect from the beginning**.

It is more effective and efficient to start with a decent first format of the prompt and then refine it in several iterations based on the output received from the GenAI tool used.

Stages in GenAI Proficiency Levels



The Need to be Prepare to Analyze the Potential of GenAI Integration in Pharmacy Practice



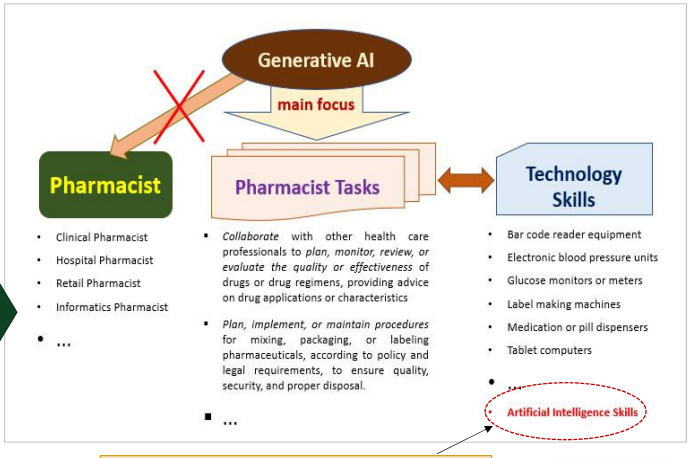
Due to the complexity of activities in Pharmacy Practice it is very likely that the GenAI tools used need to have higher levels of proficiency.

Because increased proficiency involves higher costs it is critical to be prepared to analyze ***where, when and how*** GenAI tools can be effectively integrated in practice.

A Process to Analyze the Potential of GenAI Integration in Pharmacy Practice

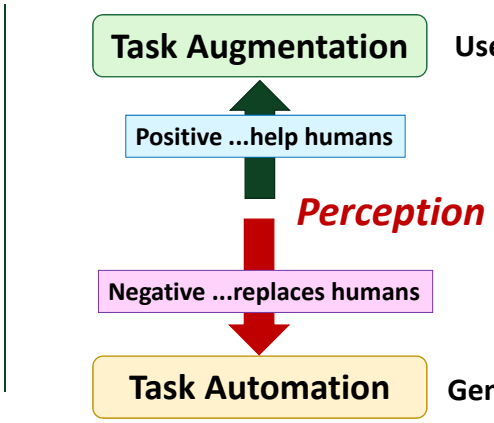
The focus should **shift from *automating the job*** of the pharmacist
... toward ***automating the tasks*** associated with a pharmacist job.

Typical types of pharmacist jobs, tasks and technology skills from the O*Net OnLine (https://www.onetonline.org/) occupational information website for the U.S. Department of Labor by the National Center for O*Net Development.



Not yet on the list but soon to be added ☺

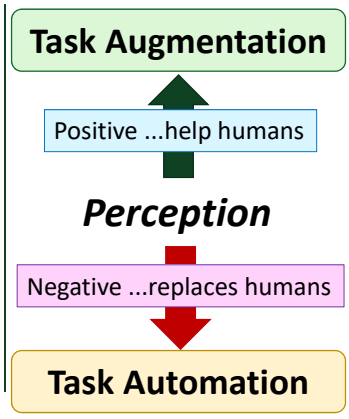
Possible Outcomes of GenAI Integration



Use of GenAI output to help humans with a task

GenAI will automatically perform a task

Possible Outcomes of GenAI Integration



The negative perception is, *most of the times, both wrong & damaging*!

AI automation is a replacement of a task not of a job since most jobs, especially the complex ones as is the case of a pharmacist job, have a significant number of tasks that need to be accomplished to successfully fulfill that job.

Most of the jobs will not be replaced by the AI.

However, those without AI skills will be replaced by those with AI skills (as previously happen with new technology adoption)

Evaluation of GenAI Integration Feasibility

Step 1

Technical feasibility of a GenAI task augmentation/automation: ***Can Gen AI do that task?***

Answering this question can involve different strategies:

- ***Rule-of-thumb:*** can the task/subtask prompt be generated so that a fresh PharmD graduate following the prompt can complete the task/subtask;
- ***Test:*** use the task prompt with a GenAI tool to see if you can get it to complete that task;
- ***Ask for help:*** if the answer is not a satisfying one with the previous strategies, ask an AI engineer to assess if additional GenAI training strategies (e.g. Retrieval-Augmented Generation (RAG), fine-tuning) can help with the completion of the task using the GenAI.

Evaluation of GenAI Integration Feasibility

Step 2

Business value of a GenAI task augmentation/automation: ***How valuable is to have GenAI augment/automate that task?***

Some questions that can help deciding the business value:

How much time is spent on this task? Is a significant time that will be helpful to reduce?

Is there a substantial value created if this task is done... Faster?/ Cheaper?/ More consistent?

Note: **cost saving is not always the go-to option** when assessing the business value!

Very often *saving time* or *increasing consistency of the job* is more valuable, especially for jobs with multiple and important tasks, as is the case of a pharmacist job.

Evaluation of GenAI Integration Feasibility

Task	Technical feasibility		Business value			GenAI potential
	very low	high	faster	cheaper	consistent	
Review prescriptions to assure accuracy, to ascertain the needed ingredients, and to evaluate their suitability						
Assess the identity, strength, or purity of medications						
Provide information and advice regarding drug interactions, side effects, dosage, and proper medication storage						
Maintain records, such as pharmacy files, patient profiles, charge system files, inventories, control records for radioactive nuclei, or registries of poisons, narcotics, or controlled drugs						
Collaborate with other health care professionals to plan, monitor, review, or evaluate the quality or effectiveness of drugs or drug regimens, providing advice on drug applications or characteristics						
Teach pharmacy students serving as interns in preparation for their graduation or licensure						

Possible synthesis task augmentation/ automation evaluation table

As a note:

For complex tasks it might be useful to beak that task into subtasks and use the major subtask for the GenAI integration feasibility analysis.

Major Barriers in AI Implementation

Security and data privacy

- risk of breaking regulatory or compliance standards;

Potential unethical/biased results that can cause harm based on negative outcomes returned by the GenAI tool;

Potential poorly structured or insufficient direction in business-related scenarios (“hallucinations”);

Patient/patron preference of human versus automated interactions

- can dilute the brand experience;

Here is how Dall-E GenAI tool is depicting a first step in introduction of GenAI in today's pharmacy environment

And this can be your future pharmacy with a fully robotic dispensing of medication!