A Cognitive Model Approach to Creating Usable Health Care Content

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ABSTRACT

The ability to use information easily and effectively is essential to medical communication. Yet who uses medical information, when they use it, and how they use it has changed with the rise of personal medical technologies and increased reliance on telehealth practices. As a result, a range of nonmedical professionals now regularly engage in different health care activities. This situation represents a challenge medical writers must address to ensure the health and wellness of individuals who use their content. Meeting usability expectations involves understanding both the cognitive models writers use to create content and those that readers rely on when using content to achieve a health care objective. Such mental models, however, vary from audience to audience on the basis of experiences. As a result, medical writers need to understand what mental models entail in order to create materials that meet an audience's usability expectations. This article provides medical writers with an overview of what these mental models encompass and how they affect an audience's usability expectations. The article also presents a 5-step process medical writers can employ to identify and address such usability expectations when creating content for different groups. The related approach begins with researching and identifying the mental models upon which audiences base their usability expectations. The approach then focuses on applying the resulting findings to create draft content for the related audience. The approach then concludes with a process for testing (and revising, if needed) initial content via input from members of the related audience. Through this process, medical writers can more effectively identify and meet an audience's usability expectations when creating medical content.

Usability—the ability to use items easily and effectively—has long been important to medical communication.[1-6] The role of usability in health and medicine, however, has become more acutely important as the rise of wearable devices[7-8] and the spread of telehealth practices[9,10] increasingly place different health care activities in the hands of patients. In these situations, failure to use content effectively can have adverse effects, including medical complications, injury, and even death.[11] Addressing these situations involves understanding the mental models guiding how audiences use health care content.[12]

This article examines what these mental models entail and how they affect an audience's usability expectations for health care. The article also presents an approach for researching such expectations and applying related findings to develop usable health care content for different groups. The article's objective is to provide medical writers with an approach for creating usable health care materials for different audiences.

MENTAL MODELS AND CONTENT CONSIDERATIONS

When we write, we use a cognitive model—a mental picture or representation—to guide the process.[13,14] If we wish to explain how to use a blood pressure cuff, for example, we access the mental model we have for that process (eg, what it "looks like") and produce content/text that describes the activities depicted in this representation.[14,15] Our goal is to provide individuals with information they can use to mentally re-create the same depiction in order to perform that process. An audience's ability to perform the related activity thus becomes a matter of how effectively individuals can re-create and follow a mental model as described in the content we provide. This ability to re-create mental representations guides how effectively audiences can use content to perform tasks.

These mental models are not innate; we learn them through our experiences over time.[15-17] The more we notice an activity occurring a certain way in a particular location, the more we perceive these situations as "standard" representations that become our mental models for activities.[17,18] We

then use these models to conceptualize processes when creating related content. Additionally, the more often we encounter a process occurring in a specific setting, the more that location—and everything and everyone in it—becomes central to the metal model we use to conceptualize the activity.[19-21] So, the more we observe individuals checking their blood pressure a certain way in their kitchen, the more we associate "dynamics of kitchen setting" with where, when, and how to perform that process. As a result, mental models contain more than depictions of how to perform activities. They also include expectations regarding the individuals involved, the objects used, and the processes for using them in a particular setting.[19-21]

Because experiences can vary, audiences and authors could use different mental models to conceptualize a situation. Such variations can have implications for how individuals create or use content.[15-17,21] In medical communication, such differences often involve aspects associated with performing health care activities (e.g., using a device to check one's blood pressure).[1,2,12] These differences generally reflect expectations associated with a *context of care*—or the location where individuals expect to perform a health care process and what that processes entails in that setting.[1,12] These variations can affect how audiences perceive and understand content describing health care activities,[15-18] and such factors can affect the usability of health care content.[1,2,15-18]

CONTEXT AND CONCEPTUALIZATION
In terms of usability in health care contexts, 2 major problems can arise when the mental model of authors/content creators and the readers/content users diverge.

Misalignment
Misalignment occurs when author and audience have different mental models for the same situation.[12,21] In these cases, the audience might perceive an author's content as
- explaining an experience or process in a way that differs from what audience members expect,
- describing a process that conflicts with an audience's expectations and is therefore considered incorrect, and
- missing essential elements as per the audience's mental model.

These factors could lead audiences to doubt the credibility of content or try to supplement seemingly incomplete content with information based on the audience's own experiences. Such situations can affect if and how audiences use health care materials.

Comprehension
Occasionally, an audience might have no prior mental model

to guide expectations.[16-18] In these cases, content based on the author's mental model might not provide audience members with the information needed to effectively re-create a mental representation for a process. This situation could leave individuals wondering what to do or leave them unable to comprehend and use content. As a result, audiences might
- avoid using content they cannot understand,
- guess what a writer means to convey, but use inaccurate assumptions to guide actions, and/or
- misconceptualize information and perform an activity incorrectly.

Such situations could prompt audiences to perform a process in a way that results in adverse consequences, ranging from making a condition worse to causing permanent injury.

Such situations reveal how successful medical communication requires an understanding of the mental models audiences use to conceptualize health care information.[15,16] Medical writers can benefit from strategies that help identify such models (or the lack thereof) and the associated dynamics of where a process occurs, what it entails, and who it involves.[12,21] Such approaches should focus on collecting the model-specific information an audience relies on to guide the use of content.

MAPPING MENTAL MODELS
Understanding an audience's mental models involves identifying the dynamics associated with a context of care—the location audiences associate with a health care activity.[1,2,12,21] These dynamics include determining who the members of an audience are, how their experiences have shaped their health care expectations, and what aspects they associate with health care processes. To better understand such factors, researchers with Louisiana Tech University's Center for Health and Medical Communication reviewed the literature on cognition, usability, and design in health care contexts. This review led to the development of an approach for researching an audience's context-of-care expectations. The researchers then conducted pilot studies to assess this approach and used the resulting feedback to revise the process.

These activities resulted in a 5-step method for researching, designing, and testing communication materials for different audiences. Called "mapping contexts of care," the objective of this approach is to help medical writers identify and address the mental models that shape audience expectations of health care activities. This mapping approach works as follows.

Step 1: Identify the Audience for Health Care Content
Medical writers must first identify the audience for which they will create content. This process entails gathering information

on a group's background (i.e., who individuals are and what they know about a topic) as well as on

- *geographic information* on the health care options (eg, clinics, hospitals, pharmacies, etc.) that are available based on where individuals live and what transportation options they can use and
- *insurance information* affecting the health care options available to patients (ie, treatment patients can afford) and where individuals can access care (eg, a local physician's office vs a free clinic).

Such factors are essential to understanding location-based experiences that shape an audience's mental models for health care activities.

Step 2: Select a Method for Collecting Data

After identifying an audience, medical writers need to collect data on the mental models that shape expectations of health care activities. To do so, medical writers can use the following tools:

- *individual interviews* asking individual members of an audience questions about their expectations, assumptions, and associations for where and how certain care is provided;
- *Focus groups* assembling 5-10 members of an audience and asking them to answer questions as a group, as such situations might help individuals remember details or provide clarification; and/or
- *Mixed methods* that use both interviews and focus groups to collect data and compare individual and group responses to better understand audience expectations for a context of care.

These approaches would all use the same questions, and the number of interviews and focus groups conducted would depend on the time and funds allocated for a project. In each case, the resulting information can provide insights on an audience's mental models for health care. Medical writers can use such information to develop content according to an audience's context-of-care expectations.

Step 3: Craft Questions for Collecting Information

Audiences could use different mental models for a context depending on when they perform an activity. Such timing dynamics, however, can be significant, for who is in a location and what is in a location at a particular time can affect what audiences expect to do in a setting.[22] For this reason, researching mental models requires audience members to identify both the location where they perform an activity and the time when they perform the activity in that context.

To account for these factors, medical writers need to ask certain questions in a particular sequence. The objective is to prompt audience members to access the correct mental model for a health care activity in terms of time (when) and place (where). Doing so involves asking the following questions in the following order.

Question 1: When Do You Do X (eg, Check Your Blood Pressure)? The dynamics of a location can change at different points in time, and individuals could have different expectations for a location based on when they use items in a setting.[22] Asking audience members "where" they perform a health care activity might, therefore, prompt individuals to access a mental model for a location at the wrong point in time (i.e., one other than when they engage in health care). As a result, audience members might describe a mental model that does not reflect the persons, items, situations, etc., in a location when they perform a health care activity. Medical writers should therefor begin their questioning by asking audience members when they perform an activity to prompt individuals to access the correct mental model they associate with performing an activity in a location.[23]

Question 2: Where Do You Do X (eg, Check Your Blood Pressure)? Can You Describe That Location? Once time is established, the medical writer can ask audience members where they perform the related process. Knowing the place, however, does not inherently clarify what an audience expects to encounter and use in that location. Medical writers therefore need to ask individuals to also describe that setting in order to provide more complete information on model-related expectations. To this end, medical writers might ask individuals to sketch that space and identify/label items as they go. Alternatively, medical writers could sketch the location as audience members describe it and ask for modifications, additions, etc., to such sketches during this process.

Question 3: Who Helps With Doing X (eg, Process of Checking Your Blood Pressure)? Various individuals (eg, patients, patients' family members, caregivers, etc.) could participate in different activities (eg, checking blood pressure) and use certain items (eg, a blood pressure cuff). Medical writers need to identify such factors and craft content that addresses associated expectations. Such content can better convey what audience members expect to do themselves compared with what audience members expect to rely on others to do for them in a context of care (eg, create instructions telling individuals how to let a caregiver use a sphygmomanometer to take their blood pressure).

Question 4: Can You Describe the Process to Me? Who Does What? Mental models for health care generally encompass all activities occurring during a care-related process. By having

audience members provide step-by-step descriptions of a process, medical writers can identify the activities audiences associate with a health care activity. These specifics include what tasks are involved, who performs them, and what is used (and by whom).

Question 5: What Do You (or Others) Use to Perform This Process? Can You Describe That Item? Many health care activities involve different items used to perform certain tasks. What those items are—and what characteristics they must have for audiences to recognize and use them—can vary from audience to audience.[24] Medical writers need to identify such factors to create content that reflects expectations audiences use to identify the items and individuals associated with a health care process.

Step 4: Apply Information to Create Initial Materials

After completing all interviews and/or focus groups, medical writers would compare responses to identify common expectations audiences have for health care activities in a location. Medical writers could use this information to create

- a depiction (eg, an image) of the audience's mental model for where a process occurs, what items individuals use, who uses them, and how; and/or
- a checklist of location-related factors, individuals, items, and tasks to address when creating content for members of that audience.

Such items would constitute a draft representation of the mental models an audience uses to conceptualize a particular health care process in a context of care. Medical writers could use such tools to guide content creation when developing health care materials for a particular audience.

Step 5: Test, Revise, and Finalize Materials

The materials created through this process (i.e., depictions and/or checklists) are not final. Rather, medical writers should use them to create draft content—text, visuals, online materials, etc.—to assess how effectively such items match an audience's mental models. For this testing, medical writers would recruit new members of the intended audience (i.e., persons not involved in earlier interviews and focus groups) to avoid biased responses based on prior familiarity with the project.[25] Medical writers would then ask these individuals to use draft content to perform a health care process in the related context of care.

For this testing, medical writers could use the following tools:

- *Talk-aloud protocols:* These are processes in which medical writers meet with members of the intended audience and observe these individuals as they use draft materials to perform a health care activity in the related context of care.[26] Individuals are asked to "talk aloud" during this process and note what they are doing, why, and their impressions as they perform the process. After individuals complete the task, medical writers could ask questions about what aspects of the draft content need revision (and how to revise materials) to enhance usability. Medical writers could also ask if anything should be removed from or added to the draft content to make it more usable.

and/or

- *Focus groups and/or interviews:* Medical writers would first request that members of the intended audience use draft content to perform a health care activity in the associated context of care. Medical writers would then conduct follow-up focus groups and/or interviews to ask individuals for suggestions on revisions needed to enhance the usability of that content.[27] Medical writers could also ask if anything should be removed or added to enhance the usability of that content.

Medical writers would use information resulting from this testing to revise both draft content and associated materials used to create it. They would then test this revised content with new members of the intended audience to determine if additional revisions are needed. This process of testing, collecting comments, revising, and testing revised materials would continue until a final version is confirmed or until time and funds for such activities run out. In either case, the objective is to create usable materials that best reflect the mental models an audience uses to engage in health care activities.

CHALLENGES AND CONSIDERATIONS

Major challenges related to this approach include identifying and recruiting individuals for the data collection and the testing done to map mental models and create related materials. Attracting enough members of an audience for the interviews, focus groups, and testing sessions involved can be difficult depending on the availability and willingness of individuals. Similarly, effectively identifying and using channels for disseminating calls for participation can create challenges that affect the size and representativeness of groups participating in these activities.

Additionally, context-related dynamics often change over time. As a result, medical writers need to regularly test and re-assess materials used to guide content creation in order to determine if they still reflect the experiences and expectations

of an audience. If not, then medical writers need to review and even redefine who the audience for content is. They then need to engage in new data collection, content creation, and testing to address expectations based on new or changed mental models for health care processes.

Finally, responses to questions 3-5 in the previous section could reveal the need to create content for a different audience—such as caregivers, friends, or family members—who perform essential activities during a health care process. Such individuals become a new and necessary audience for health care content associated with a process. As these audiences use mental models to guide their activities, creating such content would mean identifying the mental models this audience has for a process. Doing so would mean mapping such models via the same approach to research, drafting, testing, and revising content described previously.

CONCLUSION

An understanding of mental models can help medical writers create content that meets an audience's usability expectations. The result can be content audiences can easily and effectively use in the contexts where they engage in a health care activity. The approach described in this article can help medical writers identify the dynamics of such models and create content that meets audience expectations. Through a combination of researching expectations and testing materials, medical writers can develop content audiences can use to effectively engage in health care. Such approaches can be important to addressing new situations that might arise as societies emerge from COVID-19 restrictions. They can also help medical writers respond effectively to different social changes, economic changes, and other changes that might affect health care practices and processes in the future.

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