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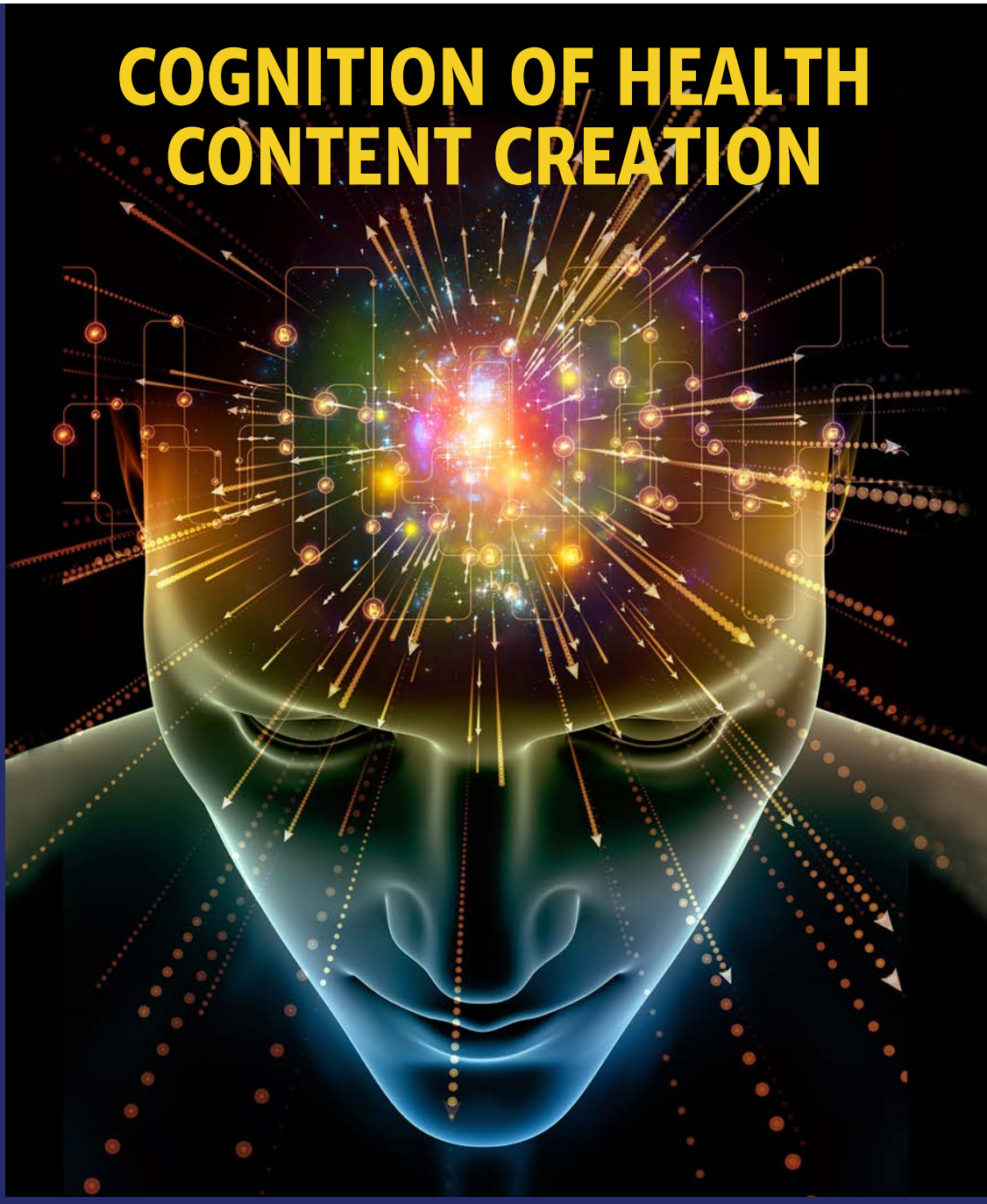

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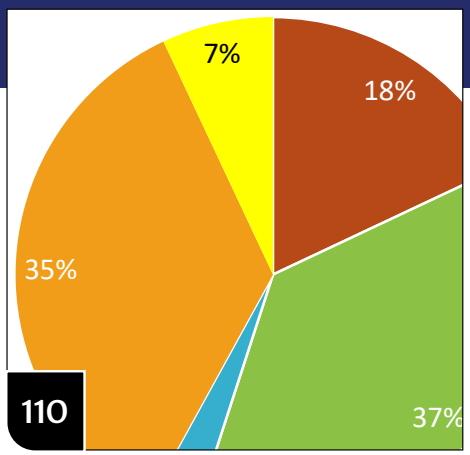

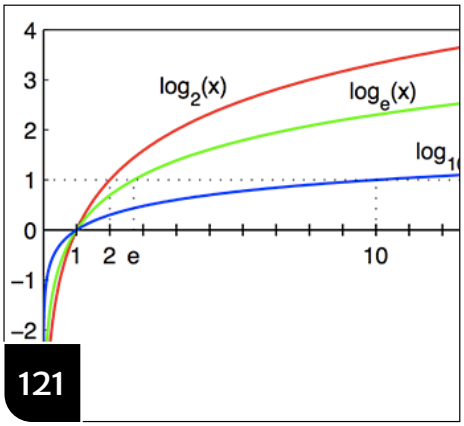

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FEATURE

A Cognitive Model Approach to Creating Usable Health Care Content

Kirk St.Amant / Louisiana Tech University, Ruston, LA; University of Limerick, Limerick, Ireland

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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Infographics and Visually Appealing Slides

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ABSTRACT

Clients and employers are asking for infographics and visually appealing slides because they see infographics everywhere, and slides at conferences and meetings are looking different than in years past. They want graphical elements, short phrases, connections between ideas to be made clear, and to get to the point right away. Putting together these new deliverables means incorporating a few key elements and thinking differently about how you present data. The elements needed are *visual* (color coding, graphics, and icons), *content* (timeframes and timelines, statistics, and references), and *knowledge* (facts and deductions). Infographics come in different sizes: they can be an image of any size or shape, 1 or 2-page 8.5 by 11 sizes, or rolling infographics that are a standard screen width but any length (meant to be scrolled on a website). When creating visually appealing slides, use templates, icons, colors, and images to bring visual interest; put words into boxes, SmartArt, circles, shapes, charts, and graphics; and pare down the words and showcase certain words (often numbers or shorter phrases) with color, size, or space. Create infographics and visually appealing slides using sites or templates available from these sites and from PowerPoint Office 365 to make this process easier. Getting comfortable with these new visual formats might take some time, research, and exposure, but it can be a worthwhile addition to your skillset.

Whether your clients or employers call them infographics, ask for data visualization, or just complain that there are too many words or bullets, you have to figure out how to provide your data in a more visually appealing manner to keep up with changing ways of communicating. Sometimes client or employer complaints reflect a feeling that something is not right, but they do not know how to fix it. This may come out in many ways: *how can we make this look nicer? would this look better in a chart? could we have an image here?*

Even if they are not asking for it yet, it is coming. Infographics are everywhere, slides at conferences have a different look than in years past, and journals are now asking for graphical abstracts. People do not have the patience or attention span to read long paragraphs. They want short phrases on slides, connections between ideas to be made clear, and to get to the point right away.

The concepts behind infographics and visually appealing slides include elements of data visualization.

Data visualization is the graphical representation of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data.[1]

Charts and graphs are used to help people quickly see patterns in data, but sometimes photographs are used to make a slide catch the reader's eye or to show the point of the content. This article will discuss the elements of infographics and visually appealing slides, how to create them using sites and the tools and templates in PowerPoint, and where to look for inspiration when trying to make data and content more visually appealing.

This article's goal is to help those who do not have access to a graphic artist to design images, infographics, and more visually appealing slides. Those with access to a graphic artist should count themselves lucky, as many teams do not have these resources.

WHAT IS AN INFOGRAPHIC?

There are many different types of infographics, but they tend to have some common characteristics.

Infographics can be broken down into 3 easily digestible ideas as presented in the Figure: visual, content, and knowledge.[2] The *visual* come up again and again: color coding, graphics, and reference icons. Essential to any infographic is the *content*, which includes time frames and timelines, statistics, and references. And lastly are the facts and deductions that make up the

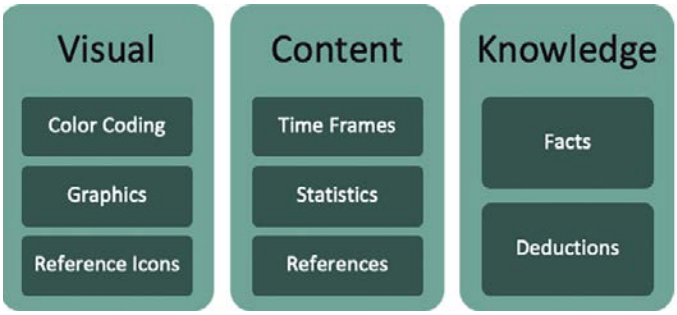

Figure. Elements of infographics.[2]

knowledge. In theory, you should be comfortable with the *content* and *knowledge* part of this perspective. You are probably just struggling with putting them into a new *visual* format, and this article will discuss this in more detail.

Infographics come in different sizes based on their use:

- The first size is the smallest, and it can be any size or shape. Infographic images are often used in slides or a document to provide visual interest or to make connections between ideas or data.
- The second size is a normal 8.5 by 11 document, either 1 page or 2 page. These 1 or 2-page infographics are used for handouts or in place of a document on a website.
- The last size is a rolling infographic, which can also be any size. Rolling infographics often appear as long images on a website, where they can be scrolled through to get to the different sections. They can cover a lot of information, but they must be accessed via a website and must be shared with a link to the site.

The Resources list has links to examples of infographics in each of these sizes.

WHAT IS A VISUALLY APPEALING SLIDE?

A visually appealing slide covers only one idea, and it does so in an interesting way.

According to *Slide:ology*,[3] "Effective slide design hinges on mastery of 3 things: arrangement, visual elements, and movement." Each of these 3 things has many elements within it.

Under *Arrangement*, Duarte lists contrast, flow, hierarchy, unity, proximity, and white space. She feels you must use each of these to tell the audience what has priority; the worst thing you can do is "put everything on one slide and assign them equal value."

Under *Visual Elements*, she lists background, color, text, and images. She believes that each of these "determines how your slide elements will look" and that you must be consistent in their use.

Under *Movement*, she lists timing, pace, distance, direction, and eye flow, but much of this discussion centered around animation, and it was discouraged unless you really know what you are doing.

The goal is to keep the reader's interest by having a variety of thematically associated and relevant slides tell a story in a cohesive and interesting way. As a medical communicator, you may not always have the luxury of telling a really exciting story—maybe it is data about a study—but you can at least make the slides change a bit from each other without being so different they seem thrown together.

One of the most difficult parts of this is breaking away from our reliance on paragraphs, or paragraphs masquerading as bulleted lists, and learning to break data into more manageable/digestible chunks. If an idea needs a paragraph to be explained, it should be spoken, and it can be put into the notes to act as a script. In some cases, perhaps an important quote, a paragraph is fine, but again, it should NOT be the default. Similarly, slides with the standard bulleted lists should not be the default for a whole deck; use bulleted lists or numbered steps when they fit the purpose of a particular slide and try to expand how you present data on other slides.

Many times, breaking data into more digestible chunks requires more slides so that the speaker or the slide is only discussing one idea on each slide. If your deck is already too long, maybe you are just trying to do too much in one deck.

HOW DO YOU CREATE INFOGRAPHICS AND VISUALLY APPEALING SLIDES?

Sites

There are many sites that allow you to create infographics and visually appealing slides, as shown in the Table. All you have to do is pick a design and type information into it. For some projects, the site's design may fit your needs, with good colors, shapes, fonts, and the right spaces for the content you need to add.

All of the sites listed have infographic designs. Canva, Piktochart, and Visme also provide a variety of other graphic designs: slide sets, infographics, images, posts, and videos. Infogram and Venngage are more focused on the rolling infographic and are the most locked down with the free version of their services. Neither of these sites allows you to export the infographics you create on their site with the free version, and all you have is the version on their website with their logo or watermark when using the free version. Because most of your clients and employers will not want their infographics to be

Table. Sites for Creating Infographics and Visually Appealing Slides

		Free Option			
Site	**Types of Materials**	**Able to Export?**	**Public Publication?**	**Watermark/ Branding?**	**Paid Option (Individual)**
Canva	Infographics, slides	Yes	No	No	~$10/mo
Infogram	Infographics	No	Yes	Yes	~$19/mo
Piktochart	Infographics, slides	Yes	Yes	Yes	~$29/mo
Venngage	Infographics	No	Yes	Yes	~$49/mo
Visme	Infographics, slides	Yes	Yes	Yes	~$39/mo

branded/watermarked or published to the public site of one of these companies, you would have to upgrade to a paid version to be able to use it with clients and employers. Prices in the table reflect individual accounts (at time of publication), but upgrading to a corporate account would have the added benefit of sharing what you create with your team to allow collaboration.

Templates and Tools in PowerPoint

Templates

For those with the Office 365 version of PowerPoint and some skills (or those who are willing to learn), you can use PowerPoint and some of the infographic templates available to create different types of infographics.

Current versions of PowerPoint for PC and Mac have native templates for infographics. Some of these available files will be whole slide decks with infographic-like elements, others have an infographic element like a timeline or a chart, others have *images* (called icons in this article), and many are the type of 1-page or 2-page infographics discussed earlier (some are called *posters* and others are just named with the topic). Some have text that coincides with the topic; others have placeholder text (lorem ipsem). The added benefit of using PowerPoint is the ability to share files with coworkers and collaborate in a tool ubiquitous in modern offices.

You can also download PowerPoint infographic templates from different companies; here's a list of free infographic templates: https://graphicmama.com/blog/infographic-powerpoint-templates. Whether using the infographic templates provided within PowerPoint or from an outside provider, you can change colors, fonts, images, sizes, or anything else like any other PowerPoint file.

Tools

PowerPoint in Office 365 has many more options than older versions: the new Design Ideas function, more options in Smart Art, many more icons, and many more stock images. If you have an older version of PowerPoint, you will still have templates and SmartArt, but you may not have the same icons, any stock images, or the Design Ideas function.

If the stock images in PowerPoint are limited in your version or just do not have what you need, you can also find free stock images from websites such as Noun Project (https://thenounproject.com/), Pexels (https://www.pexels.com/), Pixabay (https://pixabay.com/), and Unsplash (https://unsplash.com/). Remember to always use them according to the site's terms and conditions and to give attribution whenever possible.

WHERE DO YOU GET INSPIRATION?

Where can you get design ideas, see what is in fashion (yes, it is constantly evolving), and see what good design looks like? Check out sites like Canva (https://www.canva.com/), Piktochart (https://piktochart.com/), and Visme (https://www.visme.co/), which all offer infographic and slide deck templates. Explore the PowerPoint options, especially the Design Ideas function, templates, and other tools available. Check out organizations like the Presentation Guild, which offers a certification for Presentation Specialists, and the Presentation Summit, which offers sessions and workshops from industry experts in presentation design.

Infographics and visually appealing slides are not going away anytime soon, so it is good to get familiar with the elements of infographics and how you use them. When creating or updating slides, incorporating elements of infographics will make you stand out.

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3. Duarte N. *Slide:ology: The Art and Science of Creating Great Presentations.* O'Reilly Media; 2008.

RESOURCES

- For information on how to create infographics and visually appealing slides using PowerPoint, see the How-to Handout .
- For an example of a handout infographic that discusses the common elements in infographics and visually appealing slides, see the Handout Infographic.
- For an example of a rolling infographic that provides resources, such as sites and stock images, see the Rolling Infographic.
- For an example of an image infographic that shows the three elements of infographics, see the Image Infographic.

Digital Enhancements for Primary Medical Manuscripts: A Survey on Perceptions, Challenges, and Needs of Medical Publication Professionals

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ABSTRACT

Given their potential for engaging audiences, there has been increasing interest recently in the use of digital enhancements, such as video abstracts and infographics, for primary publications in peer-reviewed medical journals. However, their uptake by authors and sponsors of medical publications has been mixed, with few top journals offering the possibility of publishing digital enhancements beyond supporting slides and lay summaries.

Digital enhancements for primary manuscripts may provide new opportunities for medical writers to expand their skills and services, but it is unclear whether medical writers receive and accept requests to develop digital enhancements regularly and what training they need to generate high-quality deliverables for their clients. Understanding the perspectives of medical publication professionals and their clients on digital enhancements for peer-reviewed journals may help address misconceptions and concerns and identify more effective ways to create auxiliary digital content to support the dissemination of research findings. Here, a survey was conducted to gauge the overall interest in accompanying digital enhancements among medical publication professionals and their perception of their clients' needs, determine the perceived value of these features, and identify barriers in development.

The survey was created and posted on AMWA Engage, AMWA New England Chapter E-News, LinkedIn, and the MedComms Networking webpage. A total of 116 respondents completed the survey. About half had developed digital enhancements for primary publications, mostly for pharmaceutical companies, medical communication agencies, and other nonacademic organizations. Infographics and visual abstracts were the most frequently requested type of enhanced content. Although the respondents recognized the importance of digital enhancements to facilitate data visualization, approximately half reported not having specific training or experience to enable them to accept such assignments. For their clients, the main reasons given for not developing digital enhancements were cost and time constraints, lack of interest, and author unavailability.

The medical literature is essential to the communication of scientific evidence. In the past few decades, traditional print journals have predominantly assumed electronic formats, allowing for wider access and outreach, and social media and digital tools are now important vehicles in content dissemination.[1]

A digital enhancement in the context of scientific publications is an online feature that is developed to aid in the visualization and interpretation of data. Infographics have been used for quite some time, particularly in patient education materials, and are effective channels for the communication of complex concepts. Infographics typically combine text with graphics, illustrations, and/or charts in a logical sequence to tell a story.[2,3] Examples of infographics can be found here in https://www.fda.gov/media/82381/download and https://www.who.int/reproductivehealth/publications/violence/VAW_infographic.pdf?ua=1.

Visual or graphical abstracts are schematic or animated representations of the content of an article, require less time and effort to create than infographics, and can be easily shared on social media.[4,5] For examples of visual abstracts, see https://www.nejm.org/doi/full/10.1056/NEJMoa2026845?query=featured_home and https://www.cell.com/cancer-cell/fulltext/S1535-6108(21)00339-1. Video formats have become very popular with the widespread availability of mobile and relatively inexpensive filming/recording devices.[6] Different types of video abstracts can be viewed here: https://www.youtube.com/watch?v=vNIg0pah3wE, https://players.brightcove.net/656326989001/default_default/index.html?videoId=5824269862001, and https://player.vimeo.com/video/301841421. In addition, "Twitter abstracts" (visual abstracts that are disseminated via Twitter) are gaining traction

as a rapid means of disseminating research findings to a wider audience.[7]

Written lay summaries are digestible forms of presenting data to patients, nonspecialist health care providers, or the public. Lay summaries require no expertise in terms of graphic design and have been embraced by several publishers as important elements of research articles.[8-10] Examples of different formats of lay summaries can be found in https://www.acpjournals.org/doi/10.7326/P21-0006 and https://link.springer.com/article/10.1007/s13300-018-0531-0#Sec1. Other digital enhancements accepted by biomedical journals include audio abstracts, which are voice recordings summarizing an article, and interviews with the authors, in either video or audio format, in which the authors have a conversation with an interviewer about their research findings. For audio and video interviews, see https://jamanetwork.com/journals/jamaophthalmology/pages/jama-ophthalmology-author-interviews and https://www.mayoclinicproceedings.org/video-archive-2021.

Given their ease of access and potential for engaging audiences,[11-13] there has been increasing interest in recent years in the use of digital tools for data dissemination, and this interest was greatly amplified by the COVID-19 pandemic and the increase in virtual congresses. Regarding primary publications in peer-reviewed medical journals, the uptake of digital enhancements by authors and/or pharmaceutical companies sponsoring the development of scientific publications has been mixed.

Digital enhancements for primary manuscripts may provide new opportunities for medical writers to expand their skills and services. Understanding the main advantages and limitations of digital features may help address misconceptions or concerns about the development of auxiliary digital content to enhance the communication of research findings. The main objective of this survey was to gauge the overall interest and demand for accompanying digital enhancements among medical writers and other publication professionals. The secondary objective was to determine the perceived value of digital enhancements and identify barriers to their development.

METHODS

A survey targeting medical writers and other professionals involved in the development of primary manuscripts for peer-reviewed journals was developed using Google Forms. The 25-question survey, which took no longer than 10 minutes to complete, was shared on AMWA Engage, the AMWA New England Chapter E-News, and the LinkedIn pages of AMWA, the AMWA New England Chapter, MedComms Networking, the Publication Plan, and the Medical Writers Corner. In addition, the survey was disseminated directly in the MedComms Networking online newsletter. Permissions to advertise the survey were requested as needed. Responses were accepted from August 25, 2020, to June 1, 2021.

The survey included 24 multiple-choice questions and a comment box (question 25) to collect feedback from respondents. Some questions allowed for more than one answer to be selected. All questions allowed respondents to add in their answers, if different from the choices provided; there were no mandatory questions. Information captured in the survey included demographic data (ie, region, role, therapeutic areas, and years of experience), the number and type of enhancements developed, the perceived benefits and main obstacles encountered before and during the development of digital enhancements, and metrics deemed relevant to evaluate their impact. Awareness, interest, and determining factors in the decision-making process were assessed for academic compared with nonacademic sponsors and/or authors. The complete survey is included as a supplement.

RESULTS

As of June 8, 2021, a total of 116 responses had been received; the majority of the respondents were based in Europe (59%) and North America (35%). The top 3 roles (n = 114) were medical writers (66%), publications planners (29%), and editors/proofreaders (25%) (more than one option could be selected). The vast majority of respondents (97%) were employed or worked as freelancers, and most worked full-time (72%); 62% had more than 10 years of work experience, and only 3% reported having less than 2 years of experience in the field. The most common therapeutic areas (n = 114) in order of prevalence were oncology (52%), neurology (28%), respiratory diseases (26%), and cardiology and endocrinology (approximately 24% each) (more than one option was allowed).

The majority of the respondents were employed by medical communication agencies or contract research organizations (37%) or worked as freelancers (35%); a small portion of respondents were affiliated with academic institutions and other medical and educational organizations (10%) (Figure 1).

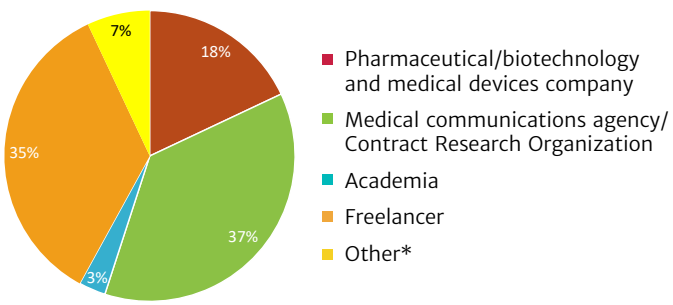

Figure 1. Survey population per professional setting (N = 116). *Includes medical societies, journal publishers, and nonprofit research and/or educational organizations.

More than half of the respondents (53%) had developed digital enhancements professionally (ie, created the concept, produced content, or reviewed the deliverables). Of these (n = 62), the majority provided these services for clients in the life sciences or medical communication industry (92%). Among respondents who had not developed enhancements for primary manuscripts (n = 55), only a small proportion (7%) reported not having an interest in doing so. For respondents with digital enhancements in their professional portfolios, 37% typically worked on 1-2 of these types of projects per year, with 28% indicating working on more than 5 enhancements in 1 year. A total of 49% reported receiving more requests for developing enhancements during the COVID-19 pandemic, and 49% saw no change in these requests (n = 63).

The most frequently developed enhancements (n = 62) were infographics/illustrations (76%) and visual/video abstracts (74%) (more than one option was allowed) (Figure 2).
The perceived benefit of digital enhancements by medical communication professionals (n = 115) was improved data visualization and comprehension (60%), followed by increased interest in primary publication (21%) and increased access (13%). For the clients, as reported by the respondents (n = 102), the value of digital enhancements was to stimulate interest in the primary publication (36%), to increase data access to a wider audience (29%), and to improve data visualization and comprehension (22%). Approximately 5% of the respondents did not see a benefit but noted that their clients inquired about these enhancements because they were a requirement provided by the target journals of the primary publications.

Although respondents working for nonacademic clients (n = 66) reported that their clients mostly rejected proposals to develop digital enhancements because of cost (73%) and time (49%) constraints, concerns about enhancements being perceived as promotional (34%) were also reported. Clients in the academic or nonprofit sector (n = 26) mostly reported to the respondents about concerns related to the unavailability of authors (69%), concerns about the time needed to develop enhancements (50%), and concerns about the associated costs of development and publication (42%). The unavailability of peer review or specific metrics for enhancements were only deemed relevant for clients in the nonacademic setting (Table).

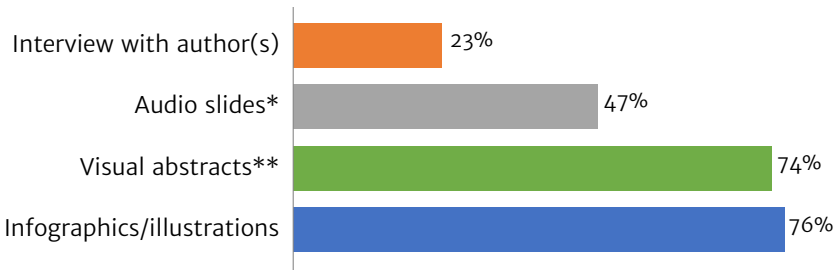

Figure 2. Most frequently developed digital enhancements (n = 62). More than one option could be selected. *Summary slides with audio commentary. **Video or animated abstract with/without voice-over and/or images/charts.

Table. Reasons for Rejecting Digital Enhancements

	Industry Clients (n = 66)	Nonindustry Clients (n = 26)
No Perceived Value	12%	15%
May Be Perceived as "Promotional"	34%	4%
Journal Does Not Offer Peer Review	9%	0%
Copyright Issues Related to Enhancement	21%	4%
Insufficient Dissemination by Journal (eg, Link Not Easily Visible)	14%	8%
Hosted Externally to Journal (eg, Commercial Video Platform)	12%	4%
Journal Does Not Collect Specific Metrics	6%	0%
Cost (eg, Production Costs, Journal Fees)	73%	42%
Time and Resources Needed for Development	49%	50%
Authors Unavailable	27%	69%

A maximum of 3 options could be selected.
Industry clients: pharmaceutical, biotechnology, or medical device companies, contract research organizations, or medical communications agencies.
Nonindustry: academia, medical societies, or individual authors.

Approximately 63% of the respondents (n = 114) reported proposing the development of digital enhancements to clients; of those who suggested (n = 70) enhancements depending on the type of project or whenever applicable to the manuscript, the majority (79%) suggested these features to nonacademic clients only. The main barriers for medical communication professionals (n = 109) in the development of accompanying digital features were a lack of specific training and/or experience (45%), a lack of time or insufficient pay (21%), and unclear/absent instructions from the journal (20%) (Figure 3). Not surprisingly, 46% claimed they would accept this type of assignment if they had adequate training, with 26% mentioning better guidance from journals regarding the requirements for submission of enhancements and 16% noting the importance of special pay rates to accept these services (n = 110).

Respondents (n = 108) thought that adequate dissemination of the enhancement with the manuscript (eg, visible link next to the manuscript) would be the determining factor in the

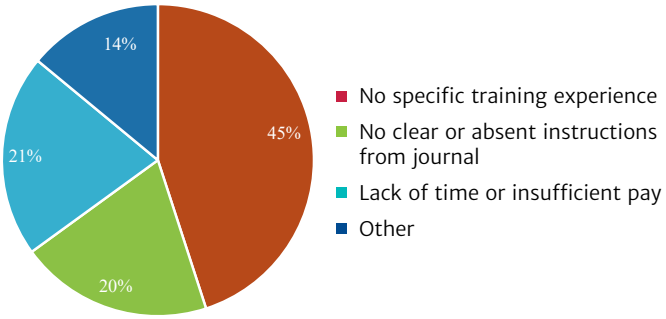

Figure 3. Main barriers for medical communications professionals (n = 109). A maximum of 3 options could be selected.

decision to develop digital enhancements for nonacademic clients (64%), which was followed in importance by the availability of useful metrics specific to the enhancement (50%). However, for those providing services to clients in academia and nonprofit entities (n = 60), journal assistance (60%), adequate dissemination (48%), and no or reduced fees for hosting the enhancement (47%) were referred to as factors that could influence a decision to develop enhancements. The most relevant enhancement-specific metrics for medical publication professionals (n = 113) were the total number of views/downloads (56%) and the time spent viewing the enhancement (30%); 55% of the respondents reported they would use the total number of views/downloads as a measure of the impact of digital enhancements to promote this type of service to clients.

In the open-ended responses, the respondents recognized that demand for digital features will continue to grow and specifically mentioned the difficulties in demonstrating the overall benefit compared with the cost to clients as well as issues related to open access and copyright.

DISCUSSION

This survey was conducted to learn about the impact of digital enhancements on the practices of professionals involved in the development of primary publications, and the responses obtained provided a glimpse of the challenges encountered in the field of biomedical publications. Despite the current interest in digital formats, which has been intensified by the COVID-19 pandemic, and increasing research attempting to measure their value, digital enhancements for peer-reviewed primary publications do not seem to have a significant presence outside the context of medical communication agencies and sponsors of scientific publications in the life sciences industry.

Although sponsors seem to recognize digital features as effective means of disseminating scientific data, there are oftentimes issues to address that do not relate to content or the choice of the most adequate format for the data in question, namely the journal's capacity for hosting enhancements and requirements, the timing of submission of the enhancements, the availability of peer review, the visibility of the enhancements, and copyright licensing.

For medical publication professionals, accepting requests to develop these features may involve advising hesitant clients or authors, discussing benefits and concerns, and integrating the development process for digital features into the timeline for the core manuscript. Some journals may request the submission of an enhanced content piece with a manuscript, but if the manuscript is rejected, the enhancement developed may not be in the correct format for another journal. For these reasons, clients and authors may see enhanced features as a poor use of their time and budgets.

In addition, different practices by journals in terms of how digital enhancements are displayed on their websites (eg, as supplementary materials, as links to external websites, or prominently displayed with the article) may hinder access. Authors also face barriers to sharing digital content online, as the copyright license for the enhancement may be owned by the journal. Moreover, nonacademic sponsors may have restrictive policies on sharing content online, which may partially explain the low level of engagement of academic coauthors in the development of enhanced digital content in these industry-sponsored publications. Authors, sponsors, and medical communicators alike would certainly benefit from having detailed guidance, assistance, and quantitative data from journals hosting digital enhancements.

Finally, there is currently a lack of evidence regarding the best strategies to effectively disseminate data and engage the target audience through digital channels. In the future, digital enhancements may be as standard as traditional written abstracts in journal articles, ultimately benefiting their audiences.

Limitations

This study had some limitations. First, there was selection bias owing to how the survey was advertised to medical publication professionals. Most respondents were experienced professionals who may have had a distinct exposure to this type of publications compared with less "seasoned" professionals. In addition, the survey may have captured the responses of those already developing or with an interest in developing digital features.

Second, biomedical publication professionals from other geographic regions other than Europe and North America as well as professionals working in nonprofit, academic, and educational backgrounds were poorly represented, which may be

explained by the only relatively recent rise in medical writing services in Asia[14] and the traditionally low presence of these professionals at research centers and universities.

Finally, the open-text format of some of the questions added a level of complexity to the analysis of the responses, as some of the answers added were the same as the ones provided, but with different wording, and others did not fit into the context of the questionnaire (eg, interactive posters for congresses).

CONCLUSION

Digital enhancements may add value to primary publications, but many barriers persist and hinder a wider uptake by medical communication professionals and their clients. Although nonacademic clients may be particularly concerned about the return on investment, the cost and time invested in the development of these features pose challenges to both academic and nonacademic clients.

Medical communication professionals are uniquely positioned to provide clients and authors with much needed support in creating visual and digital enhancements for publications, but confidence in their own expertise to guide the development process falls below expectations. Professional societies such as AMWA could potentially contribute to meet the needs for specific training in the development of digital enhancements in the form of continuing education activities.

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LEARN MORE

ISMPP University, "Visual Medical Communications," Webinar presented on January 29, 2020: https://www.ismpp.org/complimentary-ismpp-u-webinars

Boston University, Certificate in Visual and Digital Health Communications: https://www.bu.edu/academics/met/programs/graduate-certificate-in-visual-digital-health-communication/

Graphical abstracts: https://www.cell.com/pb/assets/raw/shared/figureguidelines/GA_guide.pdf

Twitter posters: https://www.youtube.com/watch?v=fQDL8r3r_d4

Plain language summaries: https://www.envisionthepatient.com/plstoolkit/

Tools: Canva Infographic (https://www.canva.com/), PiktoChart (https://www.piktochart.com/), Motifolio (https://www.motifolio.com/), Mind The GRAPH (https://mindthegraph.com/)

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SOCIAL MEDIA

Social Media for the Health Care Organization: Sharing for Good

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Whether you like it or not, people are getting a lot of their health and medicine information from the Internet. Some sources of information, such as health care organizations, provide resources for individuals that can help support productive conversations with providers. Internet-obtained health materials can improve the patient-provider relationship if the patient discusses what they have obtained with the provider. This dialog can lead to more engaged health decision-making.[1]

Many times, however, people seeking health information online are getting it from social media.[2] Research by GWI in 2016 showed that 97% of adults between ages 16 and 64 years say they logged into at least one social channel in the last month.[3]

The misinformation that runs rampant on social media has made headlines. During the current coronavirus disease 2019 (COVID-19) pandemic, Facebook has started including warnings and notices to users about the possibility that the information they are consuming could be incorrect. Users share information without citing sources, fact checking, or even reading the articles they "like" and share.[4]

This is exactly why health care organizations and health care professionals should be on social media. By sharing credible, high-quality health and medicine information, health care organizations can bring appropriate answers to the place where patients and families are looking.

This article describes the approach Nationwide Children's Hospital has employed to meet the growing need for high-quality health and medicine information on social media. These strategies and tactics are applicable to any health care organization or professional looking to expand their social media presence.

The Nationwide Children's Hospital Social Media Experience

Organizational social media accounts are an important tool for combating misinformation,[2] but that is not all. Hospital-owned channels support revenue-driven marketing campaigns, share stories to show organizational culture in support of recruitment and retention, and act as a platform to support customer service needs and respond to reviews and feedback.

In the case of negative comments posted online by a patient or employee, sometimes real-time conversations can prevent further damage to the hospital's reputation. Nationwide Children's Hospital patient relations team has stopped situations from escalating because they were alerted by a social media post. A parent who has grown tired of their wait time can be deescalated in the waiting room, for example, before further reputational harm occurs.

Individual clinicians can also make an impact on social media[2]; think of them as organizational thought leaders. If an individual clinician's social media work is supported through through education and training opportunities, they can help share accurate and relevant information. Twitter, especially, is a place to connect with peers to share research content, amplify speaking engagements, and connect with referring physicians or consumers. In 2020, social media played a large role in attracting candidates who could not tour facilities in person—a trend Nationwide Children's Hospital social media team expects to continue past the COVID-19 pandemic.

Most importantly, by disseminating evidence-based information, health care organizations or individuals who use social media are in a position to actively combat state-

ments that can, at best, be erroneous and, at worst, be a hazard to public health.

Meeting Your Audience Where They Are

When you research the origin of social media,[5] it is easy to see that online communities are rooted in discussion forums. Although archaic by today's standards, in the early 1990s, people flocked to these digital spaces to connect with like-minded individuals with similar backgrounds. Originally filled with gamers and technologists, forums grew to include bloggers and users with varied interests, whether they were crafters, engineers, or people with medical needs.

Forums and blogs allowed health care consumers to find information on everything from navigating therapies to choosing a doctor. Patients and their families came looking for resources, and along the way, they found reviews that guided decision-making and communities that offered moral support. Now, clinicians can be part of the conversation.

Tools for Success

The first step to success in social media is to analyze goals. Are you looking for referrals? Are you managing reputation and reviews? Are you looking to drive recruitment? Maybe it is a little of all three. Setting goals will help determine which platforms best suit needs and help guide decisions regarding time dedication, staff allocation, and whether additional online tools are needed.

Once goals are set, it is important to educate yourself or your team on best practices in social media. Just as someone would not perform surgery without a proper education, they should not tweet without one either. Improper social media use is a reputational risk. At Nationwide Children's Hospital, a complete-workforce curriculum trains staff about social media for personal and professional use based on 4 pillars: advocacy, professionalism, awareness, and compliance.

Navigating the Platforms: Facebook, Instagram, LinkedIn, Twitter, and TikTok, Oh My!

Messages should be tailored not only to an audience but also a platform. Dancing doctors can share vaccine efficacy on TikTok, but there is not an audience for that type of performance on LinkedIn. Research studies have a place on Twitter, but they are less likely to get traction with a consumer audience on Facebook. (See Tables 1 and 2.)

At Nationwide Children's Hospital, messaging and audience are tailored to each platform. The Nationwide Children's Hospital Facebook channel supports broad messaging for the consumer audience. Human Resources has a channel devoted to sharing job postings and content that shares and highlights organizational culture. The Nationwide Children's Hospital Foundation has a channel to share fundraising events and patient stories. Some departments also use Facebook for parent-focused messaging. In some cases, they host private Facebook groups where parents and providers can interact and find support for complex or chronic conditions.

On Instagram, the organizational channel shares content to illustrate the hospital's mission. Images of patient care, child-life initiatives, and diverse staff reinforce a commitment to advocacy for children and families and show how the hospital provides services to accommodate their needs. Visual storytelling makes a culture of inclusion come to life.

On Twitter, Nationwide Children's Hospital takes advantage of multiple audience-specific accounts to maximize audience engagement. The main hospital account focuses on communicating broad hospital messages and sharing parent-focused content. The hospital also supports Twitter accounts for Human Resources and Trainees as well as others for specific departments and programs.

Table 1. Audience Types Typically Found on Different Social Media Platforms

Audience	Facebook	Instagram	Twitter	LinkedIn	Pinterest	TikTok
Consumers	X	X	X		X	X
Health Care Professionals	X	X	X	X		
Donors	X	X		X		X
Staff	X	X		X		X

Table 2. Preferred Type of Messages for Different Social Media Platforms

Message	Facebook	Instagram	Twitter	LinkedIn	Pinterest	TikTok
Blog Post	X		X		X	
Statistics	X	X	X	X		X
Job Posting	X	X	X	X		X
Donor News	X	X		X		

The physician/researcher-focused account shares research summaries, new publications, and research-related videos and engages with the audience through topic-specific Twitter chats. The Twitter chats enable Nationwide Children's Hospital faculty to use their personally maintained professional accounts to share expertise, engage with experts and trainees around the world, and be amplified by the organization's accounts.

LinkedIn serves as a recruitment tool where users find job listings and hospital news. The channel can also be used for retention by sharing awards and acknowledgements of current staff or as a place to house long-form posts from hospital administration on strategic initiatives.

Do you have a registered dietitian with a delicious recipe to share? Or a physical therapist who can illustrate kettle bell exercises? Pinterest is where consumers can peruse wellness and prevention content and is ideal for blog posts or Web content with a visual element.

And finally, TikTok. Hospitals may shy away from this new kid on the block, but TikTok can get evidence-based content into the hands of a new audience. This unique platform can be utilized by doctors who share prevention information or want to bust myths around everything from vaccines to food allergies.

Although content can be cross-promoted among organizational accounts, not all content should be. However, too many organizational accounts can dilute the overall brand and add to governance responsibilities. Striking a balance can be hard, and in the case of a hospital, once one service line or lab gets an account, they may all want one. It is important for the Social Media or Communication department to have an account approval and governance process in place before getting started.

The Content Connection: Social Drives Pageviews

Great content is only useful if people see it. Sharing content on targeted and curated social media channels helps to ensure that the target audience is seeing what has been produced.

For example, *Pediatrics Nationwide* is a researcher and physician-focused online magazine. Although getting articles from the site to show up in searches (Google, Bing, Yahoo, etc.) is great, it is difficult to determine who is finding and reading it. Is the content reaching the intended audience? By sharing *Pediatrics Nationwide* content via the researcher and physician-focused social media channels, the channels serve targeted content to our targeted audience—increasing the likelihood that they will read it.

On the flip side, that great statistic that is buried in your report or feature article can reach more people and have a greater impact when shared through appropriate social media channels.

Collaboration for Better Communication

When subject matter experts work together, the product is always greater than the sum of its parts. At Nationwide Children's Hospital, having medical writing experts, social media experts, researchers, and health care professionals working together has enabled us to develop a network of social media channels that support and benefit from our content channels: blogs, podcasts, research articles, and more.

For health care organizations and professionals interested in expanding their social media presence, developing a similar network of experts would serve them well. In addition, the strategies and tactics outlined in this article (understanding goals, identifying audiences and channels, and educating organizational social media users) provide a place to start your social media journey. While you are considering your organizational goals, don't forget the important responsibility of health care organizations on social media: dispelling myths and providing high-quality health information.

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Brian Bass

Allie Boman

Katherine Molnar-Kimber

Monica Nicosia

Q What are the pros and cons of using reference management software programs to manage references? What are your preferences in terms of software?

A If you don't relish manually typing references and renumbering citations during manuscript editing, the pros of using reference management software far outweigh the cons. I started using citation management software very early in my medical writing career and I have never looked back. I was a longtime user of the defunct Reference Manager and then switched to EndNote, which is made by the same company. I also learned to use the open-source Zotero for one client who eventually switched to EndNote. I currently use EndNote X8, and I am considering upgrading to the latest version. The few times that I needed tech support, they responded quickly with information to help me resolve the issue. Another strong incentive for me to use EndNote is that it is the software used by all of my clients who use citation management software.

Here are some of the pros and cons of using reference management software:

Pros:

- Saves times by automating renumbering and reformatting of citations and reference lists
- Makes it easy to capture citations from major databases, standardize formatting of reference lists, and reformat a manuscript for submission to a different journal
- Facilitates the management and sharing of citation databases and associated PDFs

Cons:

- Cost (except for some free programs like Zotero)
- Learning curve to become proficient with the software
- Need to sometimes edit literature database entries and journal styles (to resolve issues like capitalization format, number of authors listed)
- Need to remember to remove codes before to submission to certain journals (an easy automated step)

I think that reference management software is an essential, time- and headache-saving tool for medical writers who write scientific articles and other types of manuscripts and reports containing multiple citations.

— Monica Nicosia

Reference management software platforms include EndNote, Zotero, Reference Manager, Mendeley, EasyBib.com, Cite This for Me, Sciwheel, Refworks, and cite4me.org. My preference is EndNote because I have used it for decades. I update whenever I purchase a new computer (50% discount from company). EndNote also has a very knowledgeable tech team to help resolve any issues. Because I have multiple clients, I do not use EndNote online because it may merge the EndNote files from multiple clients. However, if you are at a university, it may not be an issue.

I experience the following main advantages to using EndNote during the literature search, the main writing process, formatting, and providing deliverables:

1. Harvesting potentially relevant references during the supplemental literature search
2. Single-click retrieval of most open-access journal articles
3. Downloadable citations from PubMed and other databases
4. Searchable database with relevant references while writing
5. Time saver for formatting in-text citations and an accurate reference list during writing and subsequently after client-requested revisions
6. Relatively rapid conversion to other formats for citations in the text and reference list
7. Editable format styles so I can make client-specific styles
8. Easily transferable file (eg, EndNote) to clients in case client may have further rounds of reviews (eg, guidelines for professional societies)

The advantages of reference management software increase with the length of the document and the number of citations. Many clients prefer the use of reference management software and also prefer further details on the location of the specific information cited in the reference. Depending

on the client's preferred style, I often provide the added information (eg, page, paragraph, table, figure) in a comment bubble.

As for contraindications, when a client prefers that the in-text citation uses their in-house specific format style that contains the page and paragraph, the reference management software may consider each entry as a new reference.

In summary, I routinely use reference management software while writing documents. If needed, the EndNote metatag can be removed before sending deliverable.

— Katherine Molnar-Kimber

Q Is there a particular software that you would recommend to keep track of business expenses for tax purposes?

A I am quite happy with FreshBooks, which I started using 5 years ago when I relaunched my freelance business. FreshBooks is easy to use, and the tech support is good. I access my secure, cloud-based FreshBooks account from a Web browser and from an app on my phone. A user-friendly interface allows me to easily enter my expenses (manually or by importing credit card or bank charges), add pictures of receipts to expenses, and generate income/expense reports for preparing taxes. Like other similar programs, FreshBooks provides the option of sharing data and reports with an accountant.

There are many types of accounting/bookkeeping software platforms and apps that can be used to keep track of business expenses. Some are available for free, usually with limited functionality. Other examples of accounting/bookkeeping software and apps include AccountEdge, Expensify, FreeAgent, Paydirt, QuickBooks, Quicken, Wave, Xero, and Zoho. I have not used them or read recent reviews about them so I can't recommend any particular one. In my unpublished 2018 Freelance Medical Communicator Tools of the Trade Survey, the top 4 accounting/bookkeeping software/apps used by participants were QuickBooks Online (11%), QuickBooks Desktop (8%), Quicken Home & Business (5%), and FreshBooks (2%).

I chose FreshBooks because I wanted an affordable app that integrates functions that I consider essential for my business: accounting/bookkeeping (to track payments and expenses for invoicing and tax purposes), time tracking (to easily record the time spent on various projects/tasks), and invoicing. I now also use it to generate project estimates. These integrated functions save me time and thus money.

— Monica Nicosia

Business software may be the most hotly contested tool in the freelancer's toolbox. Perhaps that's because it's one of the few pieces of software we get to choose for ourselves. Some freelancers, including myself, love the business software they use and would never switch. Some dislike the business software they use but continue using it anyway. Perhaps due to fear of the unknown? In my opinion, there are only 2 mistakes a freelancer can make when it comes to business software:

1. Using a software program not designed specifically for small businesses
2. Not using all the features of your business software

I started using software for bookkeeping very early on, when there weren't any programs designed specifically for small businesses. I used Quicken, which at the time I was using for my personal finances. When QuickBooks was introduced, my freelance business switched over to it and I never looked back.

QuickBooks is great for tracking and reporting business expenses. It remembers vendors and how I've categorized them for tax reporting purposes. That makes my accountant's job easier, which saves me money. QuickBooks tracks invoices to make sure I pay them on time, which I do simply by clicking "pay" and then "print" to print a record. I pay as many bills as possible electronically, which is easier and faster for me and better for everyone I pay. QuickBooks tracks the payments I make to freelancers on my team so I can generate a 1099 report with a single click at the end of the year.

QuickBooks also tracks my payroll-related 941 tax payments to the Electronic Federal Tax Payment System. With a click I generate a subreport of those payments itemized for Medicare, Social Security, and Tax Withholding. That also makes my accountant's job easier.

It takes less than 5 minutes to prepare the quarterly tax report for my accountant, which I email to him directly through QuickBooks. At the end of the year, it takes about 10 minutes to prepare the complete year-end report for my company's final tax filing.

— Brian Bass

My simple answer is that I've found Quicken to be easy to use, reliable, and relatively affordable. Before I elaborate on Quicken, I'll give a brief overview of situations in which QuickBooks would be my recommendation. I used QuickBooks Nonprofit for 15 years as a bookkeeper. We needed this more robust software for sending tax receipts to our donors and for tracking multiple users' activities. Consider QuickBooks (rather than a personal finance software like Quicken) if you:

- Need to write invoices and receipts (I use the time tracker Harvest for this)
- Have multiple people using the same business bank account
- Have regular employees or subcontractors

When I transitioned from nonprofit work to freelancing, the minimum payment of $25/month seemed exorbitant. Quicken (I pay $3/month) does the following for me:

- Automatically enters transactions from my bank accounts
- Categorizes my income and expenses
- Handles my business and personal accounts side-by-side
- Streamlines reporting for taxes
- Makes it easy to observe trends in my business and analyze development efforts (reports are very user friendly)

I started with my tax lady's worksheet when setting up my categories; each line item she requests becomes a category. This ensures that I can write off as many business expenses as possible. I also track some categories for my family, such as eating out (way down this fiscal year!).

A few more things to consider:

- Make sure the software will sync with your specific bank.
- I have not found the budgeting features very intuitive in either Quicken or QuickBooks.
- It takes me about 15 minutes per month to review the transactions uploaded in Quicken and make sure everything has been categorized properly.
- At tax time, it takes no more than 45 minutes to report everything accurately. My tax lady gives me a discount for turning in my information early. This discount more than pays for the annual price of Quicken!

— Allie Boman

CALENDAR OF MEETINGS

Please confirm with individual meeting hosts

2021 AMWA
Medical Writing & Communication Conference
OCTOBER 27-29, 2021
Coming to a device near you
Trends and Opportunities for Medical Communicators
www.amwa.org/conference

International Society of Managing and Technical Editors
October 11–14, 2021
Virtual
https://www.ismte.org/page/Conferences

Regulatory Affairs Professionals Society
September 12–15, 2021
Virtual
https://www.raps.org/regulatory-convergence

National Association of Science Writers
October 8–11, 2021
Boulder, Colorado, and Virtual
https://www.nasw.org/events

International Conference on Communication in Healthcare
October 17–20, 2021
Virtual
https://achonline.org/ICCH2021

American Public Health Association
October 24–27, 2021
Denver, Colorado, and Virtual
https://www.apha.org/events-and-meetings/annual

AMWA Medical Writing & Communication Conference
October 27–29, 2021
Virtual
www.amwa.org/conference

European Medical Writers Association
November 4–6, 2021
London, England, and Virtual
https://www.emwa.org/conferences/future-conferences/

Alliance for Continuing Education in the Health Professions
January 12–15, 2022
Aurora, Colorado
http://www.acehp.org/p/cm/ld/fid=570

American Association for the Advancement of Science
February 17–20, 2022
Philadelphia, Pennsylvania, and Virtual
https://meetings.aaas.org/

DIA Europe 2022
March 29–31, 2022
Brussels, Belgium, and Virtual
https://www.diaglobal.org/en/flagship/dia-europe-2022

Counting and Measuring

Laurie Endicott Thomas, MA, ELS / Madison, NJ

To be a good medical writer, you need to know something about mathematics. Mathematics is the art of number, and numbers originated from words that were coined for the purpose of counting. However, some things can be counted, and some things cannot.

Count and Noncount Nouns

Discrete (as opposed to discreet!) means separate and distinct from other things. Objects that are discrete can be counted. For example, you might count the number of apples in a basket, but you can never count the number of gasoline in a tank. For this reason, *apple* is a count noun, but *gasoline* is a noncount noun. So you can ask, "How many apples are in the basket?" but it would be ungrammatical to ask, "How many gasolines are left in the tank?" Instead, you might ask, "How *much* gasoline is left in the tank?"

Many is used with count nouns; *much* is used with noncount nouns. Some quantifiers (eg, *all, any, enough, most, plenty of, some,* and *no*) can be used with count or noncount nouns. However, there are some quantifiers that are used only with count nouns (eg, *every, many, a few*) and others that are used only with noncount nouns (eg, *much, less, a little*).

If we want to talk about more than 1 of something in English, we use the plural form of the noun. The plural form is usually made by adding *s* or *es* to the end of the noun. However, there are many exceptions (see Table on next page). These include some words of Anglo-Saxon origin, such as *child/children*, or *woman/women, ox/oxen, goose/geese*. Note that many of the animal nouns that came from Anglo-Saxon are the same in singular and plural: *fish, sheep, moose*. Many words of Greek or Latin origin that are important in medicine have irregular plural forms: *bacterium/bacteria, corpus/corpora, genus/genera, medium/media, species/species, stigma/stigmata*.

For some nouns with irregular plurals and some noncount nouns, a regular plural form has become commonplace or is used in specific circumstances. For example, *water* is a noncount noun. However, the word *waters* is used to refer to a watery geographical area (eg, the navigable waters of the United States) or in some poetic contexts. Amniotic fluid, which surrounds the fetus in the womb, is also sometimes called waters.

Collective Nouns

A collective noun is a noun that refers to a group (set) of persons or things. For example, a swarm refers to a group of insects, and a choir refers to a group of singers. This raises problems of agreement with pronouns and verbs. Should you refer to the collective as "it" or "them"? Should you use the singular or plural form of the verb to refer to the collective's actions? The answer depends on whether the individual members or the group is being emphasized:

- The emergency department staff *are* trained in the latest resuscitation techniques (emphasizing individuals).
- The hospital's emergency department staff *is* the best in the city (emphasizing the group).

Note that British people are more likely than Americans to use plural pronouns and verbs for collectives, such as businesses:

- Bloomingdale's is having a sale on swimsuits (United States).
- Fenwick are having a sale on swimming costumes (Britain).

Units of Measure

Many things that cannot be counted can nevertheless be measured. To measure them, we need to find some unit of measure. For example, we can say "1 liter of water" or "2 bushels of wheat." Please notice the grammatical structure: the number

Table. Irregular English Plurals

Singular	Plural
addendum	addenda, also addendums
aircraft	aircraft
alumna	alumnae
alumnus	alumni
analysis	analyses
antenna	antennae, also antennas
antithesis	antitheses
apex	apices, also apexes
appendix	appendices, also appendixes
axis	axes
bacillus	bacilli
bacterium	bacteria
basis	bases
beau	beaux, also beaus
bison	bison
bureau	bureaus, also bureau
cactus	cacti, also cactus or cactuses
château	châteaux, also châteaus
child	children
codex	codices, also codexes
concerto	concerti, also concertos
corpus	corpora
crisis	crises
criterion	criteria, also criterions
curriculum	curricula, also curriculums
datum	data
deer	deer
diagnosis	diagnoses
die	dice, also dies
dwarf	dwarves, also dwarfs
ellipsis	ellipses
erratum	errata
faux pas	faux pas
fez	fezzes, also fezes
fish	fish, also fishes[a]
focus	foci, also focuses
foot	feet, sometimes foot
formula	formulae, also formulas
fungus	fungi, also funguses
genus	genera, also genuses
goose	geese
graffito	graffiti
grouse	grouse, also grouses
half	halves
hoof	hooves, also hoofs
hypothesis	hypotheses
index	indices, also indexes
lacuna	lacunae
larva	larvae
leaf	leaves
libretto	libretti, also librettos
loaf	loaves
locus	loci
louse	lice
man	men
matrix	matrices, also matrixes
medium	media, also mediums
memorandum	memoranda, also memorandums
minutia	minutiae
moose	moose
mouse	mice
nebula	nebulae, also nebulas
nucleus	nuclei
oasis	oases
octopus	octopuses or octopodes
offspring	offspring
opus	opera
ovum	ova
ox	oxen, also ox
parenthesis	parentheses
phenomenon	phenomena
phylum	phyla
quiz	quizzes
radius	radii
referendum	referenda, also referendums
salmon	salmon
scarf	scarves
schema	schemata, also schemas
self	selves
series	series
sheep	sheep
shrimp	shrimp, also shrimps[a]
species	species
stigma	stigmata
stimulus	stimuli
stratum	strata
swine	swine
syllabus	syllabi, also syllabuses
symposium	symposia, also symposiums
synopsis	synopses
tableau	tableaux, also tableaus
thesis	theses
thief	thieves
tooth	teeth
trout	trout, also trouts[a]
tuna	tuna, also tunas[a]
vertebra	vertebrae, also vertebras
vertex	vertices, also vertexes
vita	vitae
vortex	vortices, also vortexes
wharf	wharves, also wharfs
wife	wives
wolf	wolves
woman	women

[a] *The former is typically used to refer to more than 1 individual of the same species, and the latter is typically used to refer to more than 1 species.*

is an adjective modifying the unit of measure. The unit of measure is a noun. The material being measured is now the object of a prepositional phrase ("*of* water"). If you are talking about some noncount noun that is being measured in this way, it will be treated as if it were a singular: 20 kilometers is (not are) a long walk.

A unit of measure is arbitrarily defined; thus, the number associated with a measurement is meaningless unless the unit of measure has been defined, so you must carefully specify units of measure. Units of measure typically relate to some natural phenomenon. For example, the inch was originally based on the width of a man's thumb, and the foot was based on the length of a man's foot. The main basis of the International System of Units (SI, for Système International [d'unités]) is the meter. The SI grew out of the metric system that was developed in Revolutionary France. The meter was supposedly based on 1/10,000 of the distance from the North Pole to the Equator. Other units of measure in the SI were derived from the meter. A centimeter is 1/100th of a meter. A liter is 1,000 cubic centimeters, and a kilogram originally represented the mass of a liter of water. A newton is the amount of force to make a 1-kg object accelerate 1 meter per second per second. Thus, measurements of force involve units of time as well as units of mass and distance.

The SI also includes many units that are important in physics and chemistry. A coulomb (C) is a measure of electrical charge, and an ampere (A) is a measure of electrical current. A candela (cd) is a measure of luminous intensity. A mole (mol) is a measure of the amount of a substance. A mole is defined as $6.02214076 \times 10^{23}$ particles (eg, atoms or molecules). The number of particles in a mole is called Avogadro's number.

Our measurements of time were originally derived from the duration of a day. Each day is divided into 24 hours, and each hour into 60 minutes, each minute into 60 seconds. The 60-minute hour and 60-second minute are legacies of the ancient Mesopotamians, who used the number 60 as the basis of their number system. (The number 60 is the smallest number that can be divided evenly by every whole number from 1 to 6.) The ancients also divided a circle into 360°—partly because 360 can be evenly divided by so many different numbers and partly because 360 is close to the number of days in the year. (The lunar calendar has 355 days, and the solar calendar has 365 days). Thus, the sun would advance roughly 1° along the ecliptic (its circular path relative to the background of stars) every day.

Whole and Real Numbers

When we count objects, the result will be an integer. But when we measure the amount of something, as opposed to counting the number of items, the result would theoretically be a real number, along with a unit of measure. A real number is a number that can be expressed as some point along a number line. To express a measurement, however, we will end up using a rational number, as we will report only a limited number of digits after the decimal point. A rational number is one that can be expressed as a quotient or fraction of 2 integers. Its decimal expansion, if it has one, will either terminate or end up repeating itself endlessly. For example, ¾ = 0.75 and ⅓ = 0.33333…. (sometimes written $0.\overline{3}$, with the overbar representing the repeating decimal expansion). In contrast, irrational numbers have a decimal expansion that continues forever without repeating. Examples include π (the ratio of the circumference of a circle to its diameter), *e* (Euler's number, which is useful for calculating compound interest), and the square root of 2.

Using different units (eg, miles vs kilometers) will yield a different number, so you have to include the units with the number. Which unit of measure should you use? In scientific writing, you should use the SI (meters, kilometers, kilograms, etc). But if you are writing for consumers in the United States, you should probably use the units that are familiar to consumers (feet and inches, miles, pounds and ounces, etc).

Accuracy, Precision, and Uncertainty

Accuracy refers to how well a measurement agrees with the truth. In contrast, precision refers to the agreement among repeated measurements (made under the same conditions). Thus, a measurement that is accurate may be imprecise, and a measurement that is precise may be inaccurate. When choosing between methods of measurement, you often have to make a tradeoff between precision and accuracy. For example, a digital clock displays a precise, rational number, but that reading does not represent the true time. In contrast, an analog clock expresses time as a real number that cannot be read precisely.

Both inaccuracy and imprecision contribute to uncertainty. All measurements, and all quantities calculated from measurements, will have some degree of uncertainty. The degree of uncertainty can be expressed in various ways. One is by showing only a limited number of significant digits. For example, a reported value of 3.5 implies that the actual value is probably somewhere between 3.45 and 3.55. In contrast, a reported value of 3.50 implies that the actual value is probably somewhere between 3.495 and 3.505—a much narrower range. You can also express the uncertainty in units of measure or as a percentage of the total value: 25.2 mL ± 0.05 mL can be expressed as 2.52 mL ± 0.2%.

Even when we are dealing with counts, such as the number of people who live in a city, we sometimes have to deal with uncertainty. As a result, we may have to settle for an approximate number, such as when we say that the population of New York City was 8.40 million in 2018. Nor should we report too many digits after a decimal point: we shouldn't report a value as 5.38761 when the precision of the value really only lets us say 5.4.

Fractions and Percentages

A fraction is made by division. The top number (numerator) is divided by the bottom number (denominator). A percentage is a fraction whose denominator is 100. Whenever you encounter a percentage or any other fraction, try to figure out what the numerator and denominator represent. For example, the forced expiratory volume in 1 second (FEV_1) is the amount of air that a patient can exhale in 1 second and is measured in liters. This value can then be divided by the full forced vital capacity (FVC), which is the total amount of air that the person can exhale after taking the biggest possible breath, to yield the Tiffeneau-Pinelli index (FEV_1/FVC), which is a unitless rational number. The FEV_1 and FVC can also be expressed as a percentage of the values that are predicted, given the patient's sex, age, height, and race.

When talking about values that are already expressed in percentages, be cautious about using percentages to express changes. For example, if a value increased from 10% to 20%, that's an increase of 10 percentage points, not 10% (it's a 100% increase; see Percentage Increase and Decrease).

Negative Numbers and Vectors

Addition is the arithmetic operation that originally represented adding objects to a collection. Its opposite is subtraction, which originally represented the removal of objects from a collection. If you have 5 apples in a basket, you cannot remove more than 5 apples from that basket. But if you have $100 in your checking account and write a check for $200, you will end up with a balance of –$100 in your account. You would have to deposit $100 in the account to bring the balance up to 0. Accountants sometimes use parentheses instead of a minus sign to indicate negative numbers.

Addition and subtraction are often represented by rightward or leftward movement, respectively, on a number line. Thus, addition and subtraction involve not just quantity but direction. In mathematics, a geometrical object that has a direction as well as a magnitude is called a vector. A line is one-dimensional, so there are only 2 directions. In contrast, a map is two-dimensional, which allows for an infinite number of directions. If I walk 1 block north, then 1 block west, then 1 block south, then 1 block east, I will have walked a distance of 4 blocks, but I will end up back where I started. Human beings can easily think in terms of 4 dimensions: the 3 dimensions of Euclidean geometry plus time. However, mathematicians often deal with problems that involve more than 4 dimensions. This allows them to develop a mathematical model of relationships among many variables at the same time.

Exponents and Logarithms

Exponentiation is when you multiply a base number (b) by itself n number of times (b^n). For example, $2^3 = 2 \times 2 \times 2 = 8$. The n is called an exponent, and we often say that b has been raised to the n^{th} power. If n = 2, we say that the base is squared. If n = 3, we say that the base is cubed. Medical communicators often deal with powers of 10: $10 = 10^1$, $100 = 10^2$, $1{,}000 = 10^3$, $10{,}000 = 10^4$, and so on. However, any real number could serve as the base or the exponent.

The use of exponents can turn a multiplication problem into an addition problem: if 2 exponential expressions have the same base, you can multiply the 2 by adding their exponents: $10^2 \times 10^3 = 10^5$. To divide, you subtract the exponents: $10^5 \div 10^3 = 10^2$. Any nonzero number divided by itself is 1; therefore, $b^0 = 1$. You can also have negative exponents: $b^{-n} = 1/b^n$. You can also raise negative numbers to any power. Note, however, that if you raise a negative number to an even power (eg, -1×-1), the product will be a positive number. If you raise it to an odd power, the result will be a negative number (eg, $-1 \times -1 \times -1 = -1$).

In medical writing, you will often see powers of 10, especially in scientific notation: $5.23 \times 10^5 = 523{,}000$, but $5.23 \times 10^{-5} = 0.0000523$. Sometimes E notation is used to express powers of 10. 5.23E5 means 5.23×10^5, and 5.23^{E-5} means 5.23×10^{-5}.

A logarithm is the inverse function of exponentiation. If $b^n = x$, then $n = \log_b(x)$. Because $2^3 = 8$, $\log_2(8) = 3$. Because exponents can be negative, you can have negative logarithms, which represent the inverse of a number. Because ½ is the inverse of 2, the $\log_2(½) = -1$. Likewise, the $\log_{10}(1/10) = -1$ (Figure on next page).

Some units of measure are based on a logarithmic scale. For example, pH is based on the negative of the base-10 logarithm of the activity of the H^+ ion (as measured in moles per liter).

$$pH = -\log_{10}(a_{H^+}) = \log_{10}\left(\frac{1}{a_{H^+}}\right)$$

A solution of pure water has hydrogen activity of 1×10^{-7} mol/L. The reciprocal of that is 1×10^7, or 10^7; $\log_{10}(10^7) = 7$. So the pH of pure water is 7. Water with a pH of 6 would have a hydrogen activity of 1×10^{-6} mol/L, which is 10 times as many hydrogen ions as in pure water!

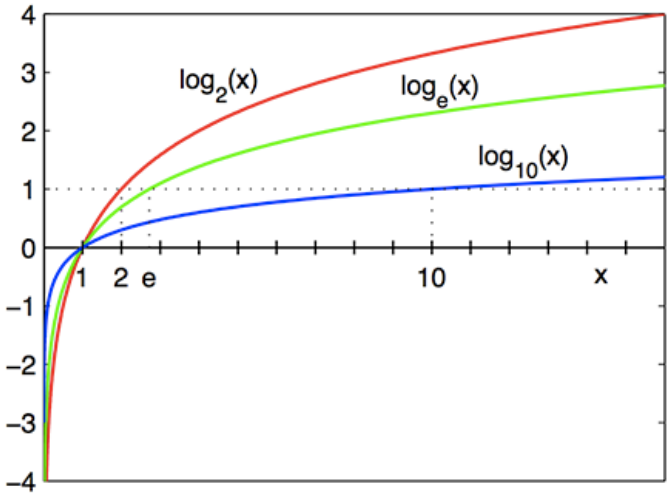

Figure. You can raise any real number (b) to any real power (y), even negative and fractional powers. The logarithmic function is the inverse function of exponentiation: If $b^y = x$, then $y = \log_b(x)$. The graph shows the value of $\log_b(x)$ for $x>0$ and some nonzero values of b. The value of $\log_0(x)$ is undefined; but for $b\neq0$, $\log_b(1)=0$ and $\log_b(b)=1$. Also, $\log_b(x) = -\log_b(1/x)$. Thus, the value of $\log_b(0)$ is undefined but approaches $-\infty$ as x approaches 0. The logarithm of a negative number is not a real number but involves a complex expression. *Graph courtesy of Richard F. Lyon via Wikimedia Commons.*

Base-10 logarithms are used so often that they are often just written as $\log(x)$. The natural logarithm, abbreviated $\ln(x)$, has Euler's number (e) as its base. Euler's number is an irrational number that is useful in many different areas of mathematics.

Medical writers should be aware that viral load is often expressed in base-10 logarithms. I once edited a news article that described a patient as having a viral load of 5 copies/mL. That value was dubious: a value that low had to be below the limit of detection of any available assay. When I looked at the source material, I found out that the patient's reported viral load was actually 5 **$\log_{10}$** copies/mL, which meant 100,000 copies/mL. Big difference!

Stevens' Taxonomy of Measurement

Medical writers must be aware that numbers do not always represent counts, or some point along a number line, or a vector. To explain this problem, Stanley Smith Stevens explained that there are 4 types of measurement scale.[1]

- **Nominal—** A nominal scale is used when items or individuals are being assigned to groups that do not overlap. Such groups may be labeled with numbers: group 1, group 2, group 3. However, these numbers are simply being used as labels and do not express any sort of quantity.
- **Ordinal—** An ordinal scale is used when items or individuals are being ranked according to how they compare with each other in terms of some property. For example, the runners in a race will be ranked first, second, third, and so on, according to how fast they ran. However, these ordinal numbers merely show rank. They do not use units of measure, and they do not show absolute quantities or ratios. For example, the second-place finisher in a race was faster than the fourth-place finisher—but *not necessarily twice as fast.* The Wong-Baker FACES pain rating scale[2] is an ordinal scale. So are the Likert scales that are used in opinion research (eg, 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree).

Percentage Increase and Decrease

The formula for calculating percentage increase and decrease is:

Percentage Increase = [(Final Value – Starting Value)/|Starting Value|] × 100

If you weigh 50 kg and gain 100 kg, that's a 200% increase in weight:

[(150 – 50)/50] × 100 = 200%

But if you then lose that 100 kg, that's only a 67% decrease in weight:

[(50-150)/150] × 100 = –67%

Fold Increase and Decrease

A fold is a ratio between 2 values. The formula for calculating fold increase is:

Fold change (for increases) = Final value/Starting value.

If you weigh 50 kg and gain 100 kg, then that's a 3-fold increase in weight:

(150/50) = 3

A fold decrease is calculated as follows:

Fold change (for decreases) = –(Starting value/Final value).

If you weigh 150 kg and lose 100 kg, then that's a –3-fold change (3-fold decrease) in weight:

– (150/50) = –3

However, some people use the fold increase formula for calculating fold decreases. As a result, they would describe a change from 150 kg to 50 kg as a 0.33-fold decrease in weight. So if you see someone express a fold decrease, make sure you know what they really meant!

- **Interval—** An interval scale not only orders items or individuals according to some characteristic but also establishes equal intervals between the units of measurement. This allows you to do some mathematical operations, such as calculating averages. However, the 0 point may be meaningless. For this reason, the measurements *cannot be expressed in ratio*s. For example, in the Celsius or centigrade scale, 0° was set to represent the freezing point of water, whereas 100° was set to represent the boiling point of water. However, the Fahrenheit scale sets 0° at a different point and uses different intervals. Water that is at 40 °C (104 °F) is warmer than water at 20 °C (68 °F), but it is *not twice as warm*! So don't express such a change in temperature as a multiple or a percentage.
- **Ratio scale—** A ratio scale has a meaningful 0 point as well as equal intervals. This allows you to calculate ratios. For example, you can say that 1 thing weighs twice as much as another, or that something costs twice as much as something else.

Conclusion

So if you are being asked to report on the meaning of the outcome measures used in a study, you must present the numbers accurately and specify the units (if any). You must also *think about what those numbers really mean*! For example, it is an established convention that the 0 point on a psychological or educational measurement is arbitrary and may be meaningless.

Author declaration and disclosures: *The author notes no commercial associations that may pose a conflict of interest in relation to this article.*

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FROM THE PRESIDENT

Back to Education

Gail V. Flores, PhD / 2020–2021 AMWA President

Fall has always been my favorite season. Nationwide, it's "back to school" time. To me, the beginning of the school year represents a chance to make a fresh start, which many of us need this year more than ever. In AMWA, each national leadership year begins in the fall, when the gavel is passed to the incoming president, officers are elected, and the Board of Directors (BOD) is announced. We have so much to look forward to as an organization, and I'm excited to let President-Elect Katrina Burton share AMWA's plans for the 2021-2022 year with you in future communications.

Late in the 2020-2021 AMWA year, in June, the AMWA community experienced a devastating loss with the death of Lori L. Alexander. Lori was most recently AMWA's Education Director, as well as a previous AMWA President and *AMWA Journal* editor, and had recently been nominated to receive the 2021 Harold Swanberg Award. We truly lost a giant of our profession and a dear friend and mentor to so many. I first met Lori when she emailed me to suggest I submit an interest form to join the AMWA Executive Committee (EC) as she was starting her AMWA presidency. The email ended with the following postscript: "I noticed on your LinkedIn profile that you're looking for an opportunity to join a nonprofit board—I hope AMWA fits that!"–which I now know is *so* Lori. Because she was President when I joined the EC, I will always think of her as the model AMWA President; never did I imagine that we'd lose her during my presidency.

Two of Lori's many passions were AMWA Education and the AMWA Medical Writing & Communication Conference. Registration for this year's virtual conference (Oct 27-29) is open (https://www.amwa.org/event/2021annualconf)—I hope to see you there! The conference committee, led by Sarah Dobney, has put together a fantastic program, building off the success of last year's virtual conference. AMWA is happy to announce that this year's event will include 2 days of preconference workshops, and we are so grateful to all of the workshop leaders who were able to adapt their workshops to a virtual format. Workshops have always been a huge part of AMWA Education, and Lori would be so pleased to see how quickly the spots have been filling up. Let's get back to education!

At the conference, I have the honor of presenting the AMWA President's Award to Dikran Toroser, PhD, CMPP. Be sure to read my article about Dikran in this issue of the *AMWA Journal*. Dikran has been a devoted AMWA volunteer for several years. Volunteering is critical to the success of AMWA, and we are so thankful for all of our volunteers at the local, chapter, and national levels. If you haven't volunteered for AMWA, I hope you will consider it. I'm so glad I replied to Lori's email 5 years ago with an enthusiastic "Yes!" Volunteering to serve on the national EC and BOD has been so fulfilling for me, and even though this year has been particularly challenging, I would do it again and again if I could.

Yours in AMWA,
Gail

2021 President's Award Recipient: Dikran Toroser, PhD, CMPP

Gail V. Flores, PhD / 2020–2021 AMWA President

The President's Award is given by the AMWA President to a member of AMWA who has made distinctive contributions to the association at the chapter or national level. The nominee must have been an AMWA member for 10 years and cannot have served on the Executive Committee.

It is my great privilege to present this year's President's Award to Dikran Toroser, PhD, CMPP. Dikran will receive the award in October in conjunction with the 2021 Medical Writing & Communication Conference.

Dikran is currently a Director and Publication Planning Group Lead at Takeda in Cambridge, Massachusetts. He has been an AMWA member since 2008 and has been a diligent, hard-working volunteer ever since. I was lucky to get to know him when we volunteered together for the former Pacific Southwest Chapter. Dikran wrote a regular column in the chapter newsletter and spoke at chapter events. At the national level, he served on the committee to recruit volunteers and support members to form the new Pacific Southwest Chapter and served for 2 terms on the Nominating Committee to create the slate of national AMWA officers. He has also presented posters and led roundtables at annual AMWA Medical Writing & Communication Conferences. Most recently, we served together on the Writing Committee for the AMWA-EMWA-ISMPP Joint Position Statement on Medical Publications, Preprints, and Peer Review as representatives of AMWA, and he has presented on the statement to our various sister organizations. Throughout his years as an AMWA volunteer, Dikran has been analytical, thoughtful, and fair, not to mention overwhelmingly kind and gracious.

Dikran has also served as an adjunct faculty member and consulting director for the University of California San Diego Extension Medical Writing programs for 6 years and is an active member of the International Society for Medical Publication Professionals (ISMPP).

Please join me in congratulating Dikran on this well-deserved honor!

The Golden Apple Award: Aaron Bernstein, PhD

Elise Eller, PhD / 2020–2021 Director-at-Large and Chair and Board Liaison, Member Awards Committee

The Golden Apple Award is presented to a member of AMWA to honor consistent, outstanding workshop leadership.

This year's Golden Apple recipient is Aaron Bernstein, PhD. The Member Awards Committee was impressed with Aaron's long-term commitment to leading workshops for AMWA and ability to keep his workshops engaging and his material timely and relevant.

Aaron has taught 31 workshops since 1998. He has been the sole leader of 2 regulatory-focused workshops, "Regulatory Aspects of the Drug Development Process" and "Current Trends in Drug Regulations," and leads workshops at annual conferences and conducts onsite training.

Aaron is a founding member and past President of the European Medical Writers Association. He is a primary contributor to the development of the CORE Reference tool and website, a detailed companion to the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use E3 guideline on Clinical Study Reports. He is a co-author of peer-reviewed publications on the topic of clinical trial transparency and the production of clinical study reports.

Please join AMWA in congratulating Aaron. He will be acknowledged at the 2021 Medical Writing & Communication Conference, to be held virtually October 27-29.

The Member Awards Committee members were Elizabeth Brown, Elise Eller (chair), Andrea Gwosdow, Karen Klein, Mary Knatterud, Susan Krug (ex officio), Marianne Mallia, and Kristina Wasson-Blader. Diane Noland from AMWA Headquarters provided excellent support.

Slate of Officer Candidates for the 2021–2022 Election

Katrina R. Burton / 2020–2021 AMWA President-Elect

One of the duties I've enjoyed most about serving as President-Elect is the opportunity to chair the Nominating Committee, a group appointed by me and charged with selecting a slate of AMWA officers for the 2021-2022 service year. Many thanks to members serving alongside me on this year's Nominating Committee, including Cyndy Kryder, MS, MWC; Tenille L. Lawson, PharmD, BCPS; Julie Munden, BA; Rajalaxmi Natarajan, PhD; JoAnna Pendergrass, DVM; Jill Roberts, MS; Theresa E. Singleton, PhD; and Susan Krug, MS, CAE (AMWA Executive Director), an ex officio nonvoting member.

Each year, interested members are invited to submit a Board of Interest form for consideration of 1 of 3 elected offices: President-Elect, Secretary, and Treasurer. The Nominating Committee reviews the forms and qualifications of candidates who meet the criteria and collectively agrees on a candidate for each officer position to submit to the Board of Directors (BOD) for consideration.

I'm honored to present the following candidates who were presented and ultimately approved by the BOD at the June meeting:

- **President-Elect: Elise Eller, PhD**
- **Secretary: R. Michelle Sauer Gehring, PhD, ELS**
- **Treasurer: Julie Phelan, MBA, MD**

President-Elect

Elise Eller, PhD, an AMWA member since 2009, is currently a Director-at-Large on the AMWA BOD and is the Chair and Board Liaison of the Member Awards Committee. Previously, she was Chair and Board Liaison for the 2019-2020 Annual Conference Program Committee. She was Board Liaison for the Chapter Leader Community in 2018-2019; served on the Chapter Advisory Council Task Force, the Constitution and Bylaws Committee, and the Chapter Support Committee; and chaired the Chapter Handbook Committee in 2014. At the chapter level, she organized the 2011 and 2013 chapter conferences for the Rocky Mountain Chapter and served as President of the Rocky Mountain Chapter from 2013 to 2017. She also served as Chapter Delegate to the AMWA BOD from 2012 to 2017. Originally a freelance medical writer, Elise is now a medical writer and consultant at Whitsell Innovations, Inc. Elise lives in Colorado, where she likes to hike in the foothills above Boulder.

Secretary

R. Michelle Sauer Gehring, PhD, ELS, an AMWA member since 2009, is in her third year on the BOD (since the 2018-2019 term) and currently serves as Secretary and Liaison to the *AMWA Journal*. Previously, she served on the Annual Conference Planning Committee from 2013 to 2020, chaired the committee for the 2019 Annual Conference in San Diego, and was a member of the most recent Editor-in-Chief Search Task Force. At the chapter level, Michelle served as the Treasurer (2012-2016), Program Chair/President-Elect (2016-2017), and President (2017-2018) of the Southwest Chapter, as well as Chapter Conference Committee Chair from 2015 to 2018. At the national and chapter level, she has led multiple open sessions, webinars, and roundtables on grantsmanship, research development, copyright laws, and professional development in the academic and freelance sectors. In addition, she teaches AMWA's Ethics for Science and Medicine Workshop and multiple medical writing courses for the University of California San Diego Extension. She has authored and contributed to multiple *AMWA Journal* articles and serves as a peer reviewer as needed. When Michelle isn't teaching or volunteering for AMWA, she serves as the Senior Research Scientist for The University of Texas Health Science Center at Houston's Center for Advanced Heart Failure, the Copyeditor of *PURSUE*, and the Managing Editor of *The VAD Journal*. Michelle is also the co-owner of RnA Editing, LLC, and resides in Texas with her husband and 2 daughters.

Treasurer

Julie Phelan, MD, MBA, an AMWA member since 2009, is in her fifth year as Treasurer on the BOD and as Chair of the Budget & Finance Committee (2016-2021). She has previously been a member of the Budget & Finance Committee (2015-2016), the Communications Committee (2014-2015), the 2015 Salary Survey Task Force, and the Online Community and Social Media Committees (2012-2014). At the chapter level, she was President of the Greater Chicago Area Chapter (2013-2016), serving previously as President-Elect (2012-2013). She also served as Membership Chair for the chapter (2011-2015) and as a Chapter Delegate to the Board (2013-2016). She has written articles for the *AMWA Journal* and currently serves as AMWA's Registered Agent. She was awarded an AMWA fellowship in 2017. Julie is President of Biomedisys, Inc, and enjoys fishing.

Procedure for Additional Nominations

As required by AMWA's Bylaws (Article IV.2e-f), these nominations were announced to the AMWA community by email more than 60 days before the annual business meeting. A nominee who is unopposed for any office is declared automatically elected at the annual business meeting. As stated in the bylaws, additional nominations for President-Elect, Secretary, or Treasurer may be made by any member provided the member meet the criteria set forth by the BOD. The criteria and process is listed below:

- member dues must be current, and member must be in good standing
- nomination is submitted in writing to the Secretary of AMWA at least 30 days in advance of the annual business meeting. This year's annual business meeting is scheduled on November 12, 2021
- nomination must clearly state the qualifications of the candidate and be signed by 50 members in good standing as of the date of the receipt of the nomination
- nomination must be accompanied by a letter from the candidate stating that he or she is willing to serve if elected

AMWA Fellowships

Elise Eller, PhD / 2020–2021 Director–at–Large and Chair and Board Liaison, Member Awards Committee

AMWA Fellowships are awarded to members who have made significant contributions to the goals and activities of AMWA. The 2021 Fellows are leaders with distinguished records of service at the chapter and national levels.

Jennifer Bridgers, MS, MWC

Jennifer Bridgers brings a broad foundation of industry experience to her work, both in project and managerial roles. She has been writing for medical and technical audiences for over 20 years, including 17 years as a regulatory medical writer across many document types and therapeutic areas. As one of the first cohort of Certified Medical Writers (MWC), Jennifer has been actively involved with AMWA throughout her career, including through attending 15 of the last 17 annual conferences. She served as President-Elect, President, and Immediate Past President of the Carolinas Chapter from 2009 to 2012 and as a Carolinas Chapter delegate to the AMWA Board of Directors. She has taught over 10 workshops, including "Summarizing Clinical Safety Data for an NDA," "Writing an ICH-compliant Protocol" and "Composing Narratives for Safety and Adverse Event Reporting." She has also led multiple roundtables and open sessions at both national and regional AMWA conferences. Jennifer's contributions to AMWA also include continued committee work, having served on the Educational Committee, the Constitution and Bylaws Committee, and the Regulatory Education Advisory Group. She is the Regulatory Section Editor for the *AMWA Journal* (2017 to present) and the Chapter Advisory Committee representative for the Carolinas Chapter.

R. Michelle Sauer Gehring, PhD, ELS

R. Michelle Sauer Gehring is a senior research scientist at the University of Texas Health Center for Advanced Heart Failure, an instructor at the University of California San Diego, and the owner of RnA Editing, LLC. She wrote her first grant in 2005 as a graduate student and has not stopped. After completing her PhD in microbiology/genetics and a postdoctoral fellowship at Baylor College of Medicine, she began realizing that her talent was "in the writing" and transitioned from the academic faculty career path to medical communication. She joined AMWA in 2009 and attained her certification as an Editor in the Life Science in 2011. At the chapter level, Michelle has served as Treasurer, Program Chair, and President of the Southwest Chapter. She has also chaired conference planning committees at the chapter and national level.

Michelle was nominated to AMWA's national Board of Directors in 2018 and currently serves as the Secretary and Board Liaison to the *AMWA Journal*. Michelle is an active member of the medical communication community, has contributed multiple articles to the Journal, and leads open sessions and roundtables at AMWA conferences. She mentors and advises those new to the field and continues to work in the academic research sector as an instructor and as a grant and publication writer and editor.

Theresa E. Singleton, PhD

Theresa E. Singleton is a freelance scientific writer and has worked in the field of medical communication for a decade. She holds a BS in nutritional science from Cornell University and a PhD in microbiology and immunology from Boston University. Following her graduate studies, she completed a postdoctoral fellowship at Boston Children's Hospital. Theresa is Owner and Principal Scientific Writer at Singleton Science, LLC, where

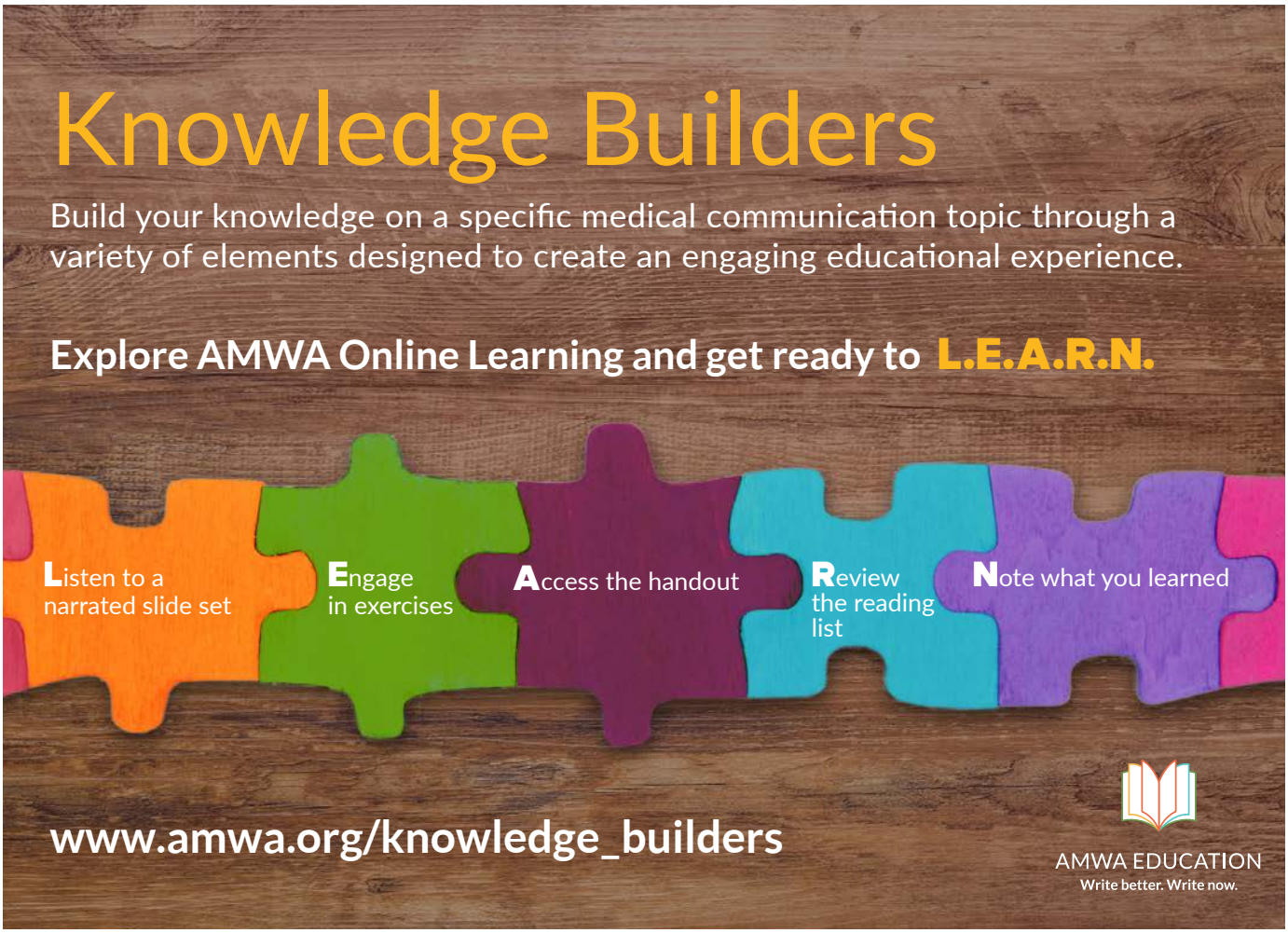
she specializes in publication writing and plain-language writing and editing.

Theresa has been an active AMWA member since 2010, serving in leadership roles at both the chapter and national levels. She was the New England Chapter's Secretary, President-Elect, President, and Immediate Past President. At the national level, Theresa served for 3 years on the Board of Directors. During that time, she chaired the Member Recognition Committee and was board liaison for the *AMWA Journal*.

Theresa credits her business success, in part, to connections made with other AMWA members. To pay it forward and help create a supportive environment for those new to freelancing, she has co-led Jam Sessions for Early Career Freelancers at 3 AMWA annual conferences. She continues to serve in volunteer roles as a member of the Nominating Committee and as chair of the *AMWA Journal* Editor-in-Chief Search Task Force. When she's not in the office or volunteering, she enjoys rhythm tap dance.

Please join AMWA in congratulating Jennifer, Michelle, and Theresa. They will be acknowledged at the 2021 Medical Writing & Communication Conference, to be held virtually October 27-29.

The Member Awards Committee members were Elizabeth Brown, Elise Eller (chair), Andrea Gwosdow, Karen Klein, Mary Knatterud, Susan Krug (ex officio), Marianne Mallia, and Kristina Wasson-Blader. Diane Noland from AMWA Headquarters provided excellent support.



Find Inspiration and Gain Fresh Insights at AMWA's 2021 Medical Writing & Communication Conference

AMWA's 2021 Medical Writing & Communication Conference, which is taking place virtually from October 27 to October 29, will present 28 new education sessions on trends and opportunities for medical communicators. Following a year that delivered disruption, ignited innovation, and required resilience in our professional and personal lives, the sessions accepted for #AMWA2021 shine a spotlight on the importance of medical communication, and the strength and commitment of the medical writing community, during these difficult yet amazing times.

We asked members of the AMWA Conference Program Planning Committee to highlight sessions planned for the upcoming conference that have sparked their interest and to share a few thoughts about what they hope to learn.

Stephanie Wenick, MPhil

Consultant, Wenick Communications, LLC

HIGHLIGHTED SESSIONS:

WFH! WTF? What I've Learned From 32 Years of Working From Home That Might Just Help You Survive
Brian Bass, MWC / President, Bass Global, Inc

Remote but Not Alone: Navigating Difficult Personalities When You Work From Home
Melissa Christianson, PhD / Whitsell Innovations, Inc

With the boom in remote work, I am looking forward to hearing from seasoned work-from-home freelancers and professionals on how they have navigated the challenges of working from home. *WFH! WTF? What I've Learned From 32 Years of Working From Home That Might Just Help You Survive* and *Remote but Not Alone: Navigating Difficult Personalities When You Work From Home* promise to deliver effective strategies on how to work better when you are on your own and no longer steps away from team members.

Sarah Dobney, MPH

Senior Manager, Medical Writing, Sunovion

HIGHLIGHTED SESSION:

Bridging the Gap: Transitioning Into Regulatory Medical Writing
Savannah Mageau, PharmD; Shengjie Xu, PhD; and Amber Carr, PhD / Associate Medical Writers, Merck

As a regulatory writer for more than 20 years who now teaches at the graduate level, I am so looking forward to the *Bridging the Gap: Transitioning Into Regulatory Medical Writing* session. I hope to gain insight into the nuances that it now takes to transition into the regulatory writing space in order to give my students the insight they request from me during class. I also look forward to being able to give my students information on how to leverage their previous experience and what they are learning to break into a career that I have loved from the beginning and hope they find success in!

More on next page

Michele W. Sequeira, MS, MBA, MWC

Senior Marketing Representative, The University of New Mexico Comprehensive Cancer Center

HIGHLIGHTED SESSIONS:

The Quick and the Dirty: Best Practices for Writing and Editing Under Tight Timelines
J. Kelly Byram, MS, MBA, ELS[1]; Theresa E. Singleton, PhD[2]; and Damiana Chiavolini, MS, PhD[3] / [1]Founder and CEO, Duke City Consulting, LLC; [2]Singleton Science, LLC; [3]Southwestern Medical Center

How Plain Language and Readability Strengthen Writing
Crystal Herron, PhD, ELS / Managing Director, Redwood Ink

I am looking forward to several educational sessions. *The Quick and the Dirty: Best Practices for Writing and Editing Under Tight Timelines* describes my daily life. I love learning about new approaches to my work, and this session promises to give me a few pointers for keeping up quality when time is constrained, which is almost always the case. As someone who writes for general audiences and patients, I'm also looking forward to *How Plain Language and Readability Strengthen Writing*. Although I value plain language for its powerful ability to get a clear message to the target audience, I can't always articulate why plain language improves the reading experience for even sophisticated audiences. I think that this session, with its data-proven tools, will improve not only my plain-language writing skills but also my ability to explain its importance to others.

Andrea Giovannucci

Senior Manager of Education, AMWA

HIGHLIGHTED SESSIONS:

A Systematic Approach to Manuscript Editing
Kelly Schrank, MA, ELS,[1] and Loretta Bohn, ELS[2] / [1]Freelance Medical Editor, Bookworm Editing Services LLC; [2]Senior Editor/Writer, RTI International

How to Master Scientific Publications: A Medical Writer's Bag of Tricks
Monica Nicosia, PhD / Nicosia Medical Writer, LLC

I am excited to attend my first AMWA conference and to experience firsthand the breadth and diversity of our educational offerings. As a former medical journal coordinator, I have seen the valuable impact that medical writers have on scientific publications, and I am looking forward to *A Systematic Approach to Manuscript Editing* and *How to Master Scientific Publications: A Medical Writer's Bag of Tricks*. Ensuring that manuscripts adhere to reporting requirements, follow the proper guidelines, and yet are still accessible, is an incredible feat, and I look forward to the speakers sharing their tips and strategies

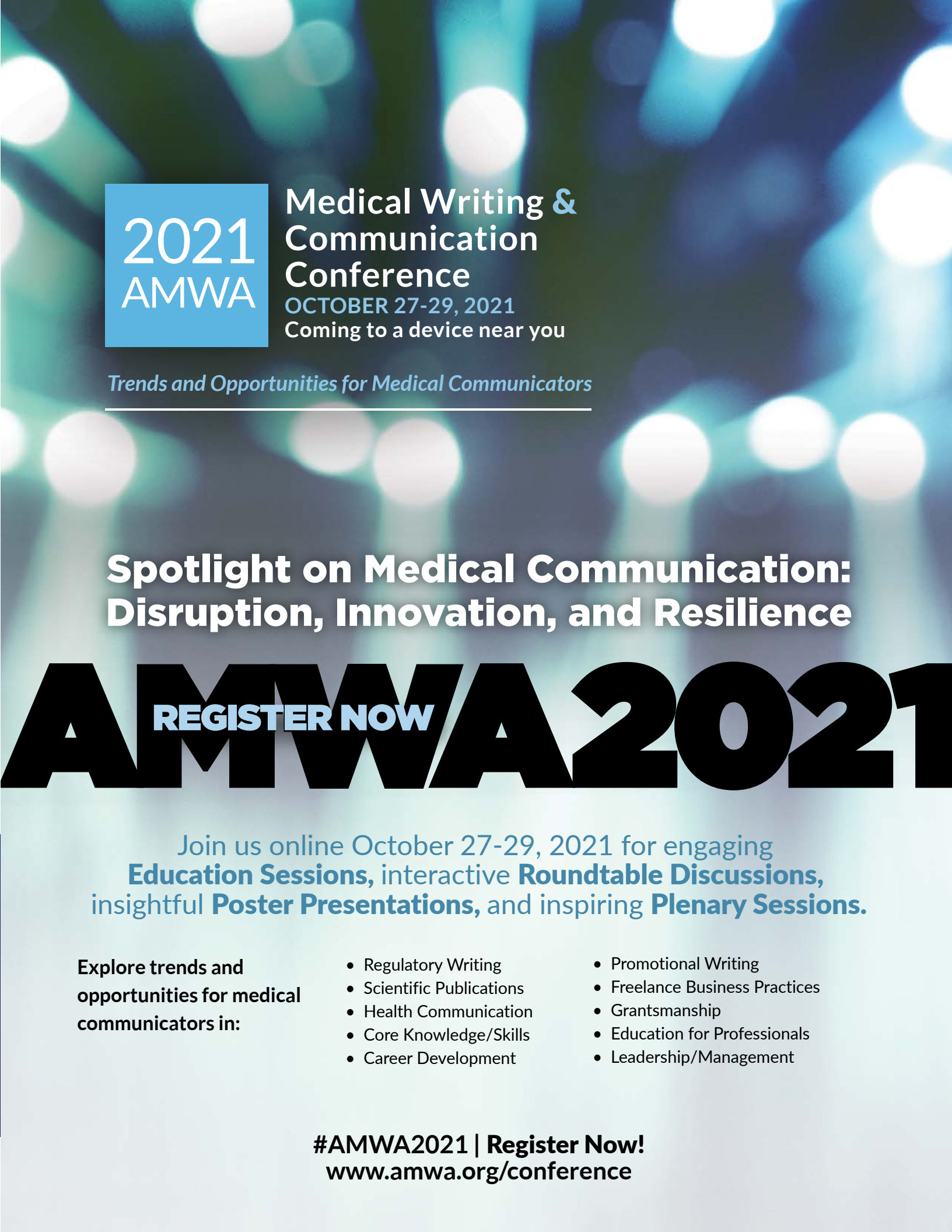
www.amwa.org/conference

These are just a few of the many education sessions available to conference attendees. All sessions will be recorded, which allows registrants to attend as many sessions as they want. The virtual conference platform will remain open to all attendees through the end of December. In addition to the plethora of education sessions, #AMWA2021 will offer engaging roundtable discussions, inspiring award presentations, and a virtual exhibit hall filled with products and services designed specifically for medical communicators.

The earlier you register the more you save and the more value you gain.

Register by September 30 to avoid the 11th-hour rates.

We look forward to seeing you online!



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