



TOOLKIT for Making Written Material Clear  
and Effective

SECTION 2: Detailed guidelines for writing  
and design

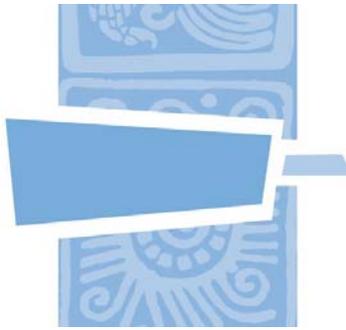
## PART 5

Understanding and using the “Toolkit  
Guidelines for Graphic Design”

### Chapter 7

Guidelines for tables, charts, and diagrams

U.S. Department of Health and Human Services  
Centers for Medicare & Medicaid Services



## TOOLKIT Part 5, Chapter 7

### Guidelines for tables, charts, and diagrams

Introduction .....	168
Toolkit guidelines for tables, charts, and diagrams.....	169
A reader-centered approach to using tables, charts, and diagrams ( <i>guideline 10.1</i> ).....	171
Provide clear and informative labeling ( <i>guideline 10.2</i> ) .....	173
Create a clear and uncluttered layout that includes strong visual and written cues ( <i>guideline 10.3</i> ).....	179
Take extra care in explaining numbers and calculations ( <i>guideline 10.4</i> ) .....	184
Verify ease of understanding by getting feedback from readers ( <i>guideline 10.5</i> ).....	187
End notes.....	188

#### List of figures in this chapter:

<i>Figure 5-7-a.</i> Toolkit guidelines for making tables, charts, and diagrams.....	170
<i>Figure 5-7-b.</i> Reducing the cognitive burden of cross-referencing within a chart.....	176
<i>Figure 5-7-c.</i> Making comparison charts easier for people to understand and use..	180
<i>Figure 5-7-d.</i> Income charts are hard to interpret.....	186

---

This document is the seventh of eight chapters in Part 5 of the *Toolkit for Making Written Material Clear and Effective*. The Toolkit has 11 Parts. It was written for the Centers for Medicare & Medicaid Services (CMS) by Jeanne McGee, McGee & Evers Consulting, Inc. The guidelines and other parts of the Toolkit reflect the views of the writer. CMS offers this Toolkit as practical assistance to help you make your written material clear and effective (not as requirements from CMS).

---



## Introduction

### ***About the Toolkit and its guidelines***

To help you develop or revise your written material, the *Toolkit for Making Written Material Clear and Effective* includes detailed guidelines for writing and design. There are 26 guidelines for writing and 46 for graphic design. For the full list, see Toolkit Part 3, *Summary List of the “Toolkit Guidelines for Writing and Design”*.

### ***About this part of the Toolkit***

Part 5 of the Toolkit focuses on the guidelines for graphic design. These guidelines apply to designing various types of written material intended for use in printed formats (see Toolkit Part 1). (For discussion about material that is read on a computer screen, see Toolkit Part 8, *Will your written material be on a website?*)

### ***What is this chapter about?***

This is the seventh of the eight chapters on design in Toolkit Part 5. It explains how to apply the Toolkit Guidelines for designing tables, chart, and diagrams. For background on things to know about the Toolkit Guidelines for Design, see Toolkit Part 5, Chapter 2, *Guidelines for overall design and page layout*.

In this chapter, we use the phrase “tables, charts, and diagrams” very broadly. Reflecting popular usage, we use “chart” as a general term that encompasses a variety of formats, and we often use “chart” to designate any type of table, chart, or diagram. We use the term “rows-and-columns format” to identify a table or chart that is in a “matrix” format with rows and columns. We do not discuss complex graphs that present statistical or survey information. The Toolkit focuses on developing and testing written material for diverse audiences that include people with low literacy skills. Complex graphs are not appropriate for these audiences.

### ***What aspects of design are covered in the other chapters?***

The other chapters in Toolkit Part 5 cover the following topics: tips for learning about design and working with design professionals (Chapter 1); overall design and page layout (Chapter 2); fonts (typefaces), size of print, and contrast (Chapter 3); headings, bulleted lists, and emphasizing blocks of text (Chapter 4); use of color (Chapter 5); use of photographs, illustrations, and clip art (Chapter 6); and forms and questionnaires (Chapter 8).



## Toolkit guidelines for tables, charts, and diagrams

### *How can you use these formats?*

You can use tables, charts, and diagrams in a variety of ways. For example, you can use them to:

- **Help readers understand something visual**, such as the label on prescription medicines or a diagram of body parts. When you design your diagrams, you can include helpful devices such as captions and arrows that point out certain parts of a diagram and help readers understand it. Tables, charts, and diagrams lend visual interest to your written material. They can draw the eye more effectively than blocks of text. You can use them to help emphasize the most important points.
- **Provide a convenient display of information for easy reference.** Tables and charts are often used to summarize information that people use for reference. Examples include schedules for preventive care, charts that tell about health care benefits and coverage, and provider directories that tell people which doctors and other health care providers they can use.
- **Help readers understand a complex idea or comparison.** When you need to share information that is challenging for people to understand, including a carefully-constructed chart or diagram can enhance your written description. Sometimes a table, chart or diagram can replace a lengthy explanation and get your point across more effectively.

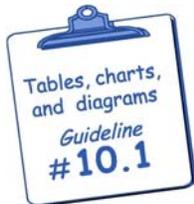
### *Making these formats clear and effective*

Tables, charts, and diagrams can be very helpful to readers, but making them clear and effective requires careful attention. This Toolkit can help. In this chapter, we give suggestions for making your tables, charts, and diagrams easier for people to understand and use. The Toolkit guidelines in this chapter focus on issues that are unique to tables, charts, and diagrams. You can find additional help in other chapters of the Toolkit, since many of the guidelines we cover in other chapters also apply to tables, charts, and diagrams. To give just two examples, whether you are writing text or creating a chart, you want to be selective about how much and which information you include (Guidelines 1.2 and 1.6 in Toolkit Part 4 Chapter 1) and use technical terms only when necessary and explain them if you do (Guideline 3.7 in Toolkit Part 4, Chapter 3). For the full list of guidelines for writing and design, see Toolkit Part 3, *Summary List of the “Toolkit Guidelines for Writing and Design”*.

This chapter discusses the guidelines shown below in Figure 5-7-a.

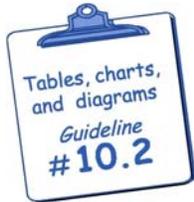
Figure

5-7-a. Toolkit guidelines for tables, charts, and diagrams.



**Take a reader-centered approach to the use of tables, charts and diagrams.**

In deciding whether and how to use these formats, take into account the literacy skills and needs of your intended readers.



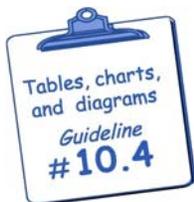
**Make titles, headings, and other labeling specific and complete enough for easy understanding.**

To help readers understand and interpret the meaning of charts and diagrams, use informative text in all labeling. To reduce cognitive burden and the possibility of misinterpretations, avoid using abbreviations, acronyms, footnotes, and cross-references.



**Create a clean, uncluttered layout with strong visual and written cues to guide readers and help them interpret the information correctly.**

Keep the layout tidy and uncluttered, with ample margins and white space. Help readers understand and absorb the information in a chart or diagram by using devices such as taglines, examples, captions, and step-by-step instructions. If you use symbols in a comparison chart, make them as self-explanatory as possible, tell what they mean, and design them with good contrast.



**If there are any numbers or calculations, explain them carefully and give examples.**

Since math is hard for many people, and can be especially hard for people with low literacy skills, take special care with explanations that involve numbers. With calculations, use examples that show each step and explain it clearly. Simplify numeric examples by using rounded whole numbers as much as you can. To help people understand weights and measurements, make comparisons to familiar objects.

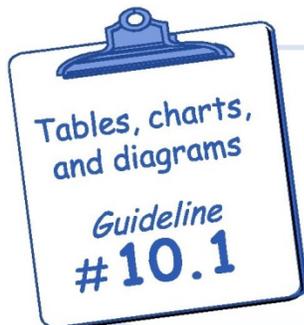


**Pretest your tables, charts, and diagrams to be sure that your intended readers can understand and use them.** Direct feedback from readers is the best way to check on comprehension, cultural appropriateness, and usability of the information you present in a table, chart, diagram, or graph.



Source: Created for this Toolkit. For more about the guidelines and how to use them, see Toolkit Part 3, *Summary List of the “Toolkit Guidelines for Writing and Design”*.

## A reader-centered approach to using tables, charts, and diagrams



Take a reader-centered approach to the use of tables, charts and diagrams.

In deciding whether and how to use these formats, take into account the literacy skills and needs of your intended readers.

### ***Chart formats can be challenging***

This first guideline shown above is a reminder to take your intended readers’ needs and skills into account when you create a table, chart, or diagram. It can be challenging to read and interpret a table, chart, or diagram. These formats are visual displays, and using them effectively requires, among other things, good navigation skills. For example, where should you look first? What path are you supposed to follow through the chart or diagram? What connections must you make to extract information from such formats? If there are numbers involved, the skills related to dealing with numbers and calculations also come into play. These are sometimes called “numeracy skills” (Paulos, 1992).

When you are familiar with tables, charts and diagrams and adept at using them, it’s easy to take for granted the numeracy skills, navigational skills, and other skills they require. For example, think about

what it takes to understand and use a chart with rows and columns (a “grid” or “matrix” format). This type of chart is very common. To use it, you need to comprehend how it is structured and be able to juggle the row dimension and column dimension simultaneously. To extract information from this type of chart, you must (a) interpret the meaning of the row and column headings, (b) select the particular row and column that are of interest, and then (c) locate the cell within the table that is formed by the intersection of that row and column. This process typically requires repeated scanning up and down, back and forth. You might need to make a series of comparisons that may involve looking at two or more cells that appear in different parts of the table.

What we’ve just described is second nature to you, but it may be quite difficult for your intended readers. Making repeated scans, comparisons, and interpretations within a rows-and-columns chart imposes a heavy cognitive demand. This type of chart can be too difficult for people with low literacy skills and people who have limited experience in using this type of chart. In addition, if your material is intended for people with Medicare or other older adults, it is important to know that the cognitive skills people use to interpret a row and columns chart can decline as they grow older (see Toolkit Part 9, *Things to know if your written material is for older adults*).

By testing rows-and-columns charts with readers, you can learn what happens when people lack the skills to use them. When people don’t grasp the need to focus on the intersection of a row and column, they generally focus either on the rows or the columns. For example, they might read across the rows and ignore the column headings, or they might go down each column and ignore the row labels. Either way, the chart won’t make sense to them, and they may get discouraged or frustrated.

### ***Will a chart work well for your intended readers?***

There’s usually more than one way to present information. Tables, charts, and diagrams can be quite effective, but only if they are easy for your readers to understand and use. So before using these formats, take your intended readers’ literacy skills into account. Is there a good match between their skills and the skills that will be required to use the table, chart or diagram?

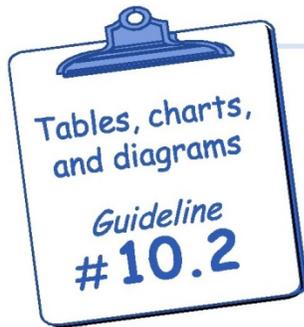
While tables, charts, and diagrams are often difficult for people with low literacy skills, research has shown that people with strong literacy skills can also misinterpret tables and charts. For example, one study investigated how college-educated people with strong quantitative and analytical experience (primarily people with engineering backgrounds) interpreted graphs containing data on energy-related commodities (Blessing, Bradsher-Fredrick, Miller, Miller, & Rutchik, 2003).

The graphs in this study show changes over time, displayed as bar graphs or line graphs or both. Participants were asked to give interpretations and conclusions about each graph. The findings of the study demonstrate that even readers who are well-educated and knowledgeable make numerous mistakes when interpreting graphs, and often can draw correct conclusions only with a great deal of effort.

Given the difficulties that graphs pose to highly skilled readers, it is particularly important that charts and diagrams used with less skilled readers be carefully designed and tested. The discussion of Guidelines 10.2 through 10.5 that follows will help you make your charts or other displays as clear and effective as possible. It includes examples of ways you can adapt charts to make them more suitable for people with low literacy skills. The final guideline in this chapter emphasizes the need to test charts and other displays with readers to be sure they are working well.



## Provide clear and informative labeling



*Make titles, headings, and other labeling specific and complete enough for easy understanding.*

*To help readers understand and interpret the meaning of charts and diagrams, use informative text in all labeling. To reduce cognitive burden and the possibility of misinterpretations, avoid using abbreviations, acronyms, footnotes, and cross-references.*

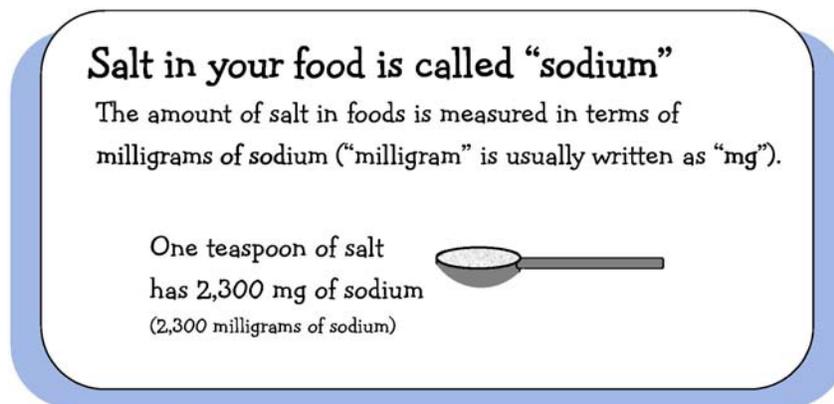
When you use tables, charts, diagrams, and similar visuals, take extra care to make the text in your titles, headings, and other labels as unambiguous and informative as you can. Here are some tips:

- 1. Be specific and informative.** Keeping text extremely brief will take up less space in your chart or diagram, but it won't be helpful to your readers if it's ambiguous or misleading. Below is an example of two possible headings for a comparison chart column (these are from charts shown later in this chapter in Figure 5-7-c). Compare the brief but ambiguous one-word heading, “appointments” on the left with the slightly longer but much more informative one on the right:



2. **Avoid using abbreviations, acronyms, and footnotes.** Unless they are already familiar to your intended readers, abbreviations and acronyms make material more difficult to read and understand.

- Footnotes are unfamiliar to many less-skilled readers, and they add burden for any reader. They are also easy to overlook. If there is something important that the reader should know, *incorporate it into the main text* rather than using a footnote.
- Sometimes it may be important to teach the meaning of an acronym or abbreviation, because that is the form of the word that readers will encounter. If this is the case, explain it carefully. Here’s an example that explains the abbreviation “mg.”



Source: This example and others about sodium that appear elsewhere in this chapter have been adapted from visual displays the Toolkit writer created for a project.

3. **Make sure that text and numbers are readable and understandable at a glance.** Don’t make readers pause or struggle to see small print in a diagram or figure out what type of number you are showing them. Keep the text for labels and numbers large enough that it is easy to read. If

numbers are percentages, put a percent sign after each number, and if they are dollar amounts, put a dollar sign in front of each number.

- 4. Make your explanations cohesive and give examples.** Since it can be hard for readers with low literacy skills to absorb and apply new concepts, be as explicit as possible in explaining the connections among concepts and what they mean. Give examples and use devices such as captions and step-by-step instructions and explanations. Here is an example of an explanation that uses captions:

**Reading about sodium (salt) on a food label**

One way to find out the amount of sodium in foods is to read the nutrition labels on food you buy. Here are things to look for on the label:

**Serving size** → (the amount of sodium is based on eating this much of the food)

**Number of milligrams of sodium** → in each serving size of the food

Nutrition Facts	
Serving Size 1 cup (8g)	
Servings Per Container 12	
Amount Per Serving	
Calories 90	Calories from Fat 10
% Daily Value	
Total Fat 1g	2%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
<b>Sodium 190 mg</b>	<b>8%</b>
Total Carbohydrate 22g	7%
Dietary Fiber 3g	12%
Sugars 9g	
Protein 3g	

- 5. Considering explaining something in more than one way.** For example, suppose that you need to tell people how to get to your location. Some people like to use maps, and others may prefer written instructions for driving. Why not include both a map and written directions? Readers can choose the one they prefer or use both. Here are some tips for giving directions:

- When you do the written directions, consider the most common routes people are likely to take, and be very clear about the starting point. Since many people have trouble with geographic directions, it's helpful to include references to north, south, east, and west as well as references to making left and right turns.
- Make the map large enough for easy reading and label it carefully. For tips on formatting your map to make it easier for people to understand and use, compare the examples on page 81 of *Before & After Page Design* (McWade, 2003).

- Reduce cognitive burden by avoiding cross-references.** Figure 5-7-b below discusses how cross referencing within a rows-and-columns or “grid” format makes the chart harder to understand and use and suggests other approaches you can use.

**Figure 5-7-b.** Reducing the cognitive burden of cross-referencing within a chart.

NOTE: This Figure is based on text and tables from *The Health Literacy Style Manual* (MAXIMUS, 2005: 74-76).

Forms and applications typically use charts and tables to collect information. They don’t take up much space, and they are often neat and efficient. The problem is that they are very difficult to read and complete, because they’re often crowded, the print is small, and they require readers to cross-reference.

**Examples of cross-referencing:**

The figure illustrates cross-referencing in a form. On the left is a form titled "Household Information" with a grid of fields. A circle highlights a section of the grid where fields for "Marital Status", "Student Status", "Grade", and "Race" are filled with asterisks (\*, \*\*, \*\*\*, \*\*\*\*) to indicate they refer to a legend. On the right is a circular legend with four columns: "Marital Status", "Student Status", "Race", and "Hispanic (Yes or No)". Each column contains a code (e.g., MA, NM, DI, SE, WI for marital status) and a corresponding field label. At the bottom, a horizontal legend lists the codes and their meanings:
 

- \* Marital Status Codes: MA - Married, NM - Never Married, DI - Divorced, SE - Separated, WI - Widowed
- \*\* Student Status Codes: PT - Part-time/Half-time, FT - Full-time, NA - Not Applicable
- \*\*\* Grade Codes: Elementary and High School - (1 through 12), College - 13, NA - Not Applicable
- \*\*\*\* Race Codes: W - White, AI - American Indian/Alaskan Native, A - Asian, B - Black, P - Native Hawaiian/Pacific Island

To *cross-reference* means to refer to another part of the document that is related to the first. Cross-referencing forces readers to move their eyes from the line they’re reading to another line, or another part of the same page, or another page in the document, and then to return to the first line. They must break

from the familiar left to right pattern of reading and read up and down as well. Readers may lose their places or forget what they were reading about.

Here are some examples of cross-referencing that you often see in charts and tables:

- **Column heads.** Applicants have to read them, then drop their eyes to the fill-in line, then read the column head again (or the next column head), and continue in that manner.
- **Coding.** Assigning codes for categories forces applicants to read all codes and categories to identify the one that fits them. Then they have to remember the code and write it somewhere else on the form.
- **Asterisks.** Asterisks require readers to drop their eyes to the bottom of the chart or page in order to read what the asterisk refers to, and then somehow find their places again. Using asterisks also assumes that all readers know what an asterisk signifies – and most poor readers do *not* know what an asterisk signifies.

In the example shown below, the application doesn’t avoid cross-referencing, but it mitigates the problem somewhat by using checkboxes within the fields to help applicants answer questions. Note that there are no asterisks.

logo

**State Department of Health and Human Services**

**State Partners for Health Medicaid Application**

**1**

**Tell us about yourself.**

Name (first, middle initial, last):		<input type="checkbox"/> Female	Date of birth:		
Address where you get mail (include your apartment number):		City:	State:	Zip Code:	County:
Home address (if not the same as your mail address):		City:	State:	Zip Code:	Home phone number:
Marital Status:	What language do you use most?	Do you want Medicaid for yourself?		You only have to give us your Social Security Number and citizenship information if you want Medicaid for yourself.	
<input type="checkbox"/> Single <input type="checkbox"/> Married <input type="checkbox"/> Divorced	<input type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> Chinese <input type="checkbox"/> Russian <input type="checkbox"/> Sign Language <input type="checkbox"/> Vietnamese <input type="checkbox"/> Other: _____	<input type="checkbox"/> Yes <input type="checkbox"/> No		Social Security Number:	Are you a U.S. citizen? Yes <input type="checkbox"/> No <input type="checkbox"/>

**2**

**Tell us about people in your family who live in your home.**

Name (first, middle initial, last):	Sex:	Date of birth:	How is this person related to you?	Marital Status:	Race:	Does this person want Medicaid?	If this person wants Medicaid, you must give the Social Security Number and citizenship information.	
	<input type="checkbox"/> Female		<input type="checkbox"/> Child <input type="checkbox"/> Spouse	<input type="checkbox"/> Single <input type="checkbox"/> Married <input type="checkbox"/> Divorced	<input type="checkbox"/> Black <input type="checkbox"/> White <input type="checkbox"/> Asian	<input type="checkbox"/> Yes <input type="checkbox"/> No	Social Security Number:	Is this person a U.S. citizen? Yes <input type="checkbox"/> No <input type="checkbox"/>
	<input type="checkbox"/> Female		<input type="checkbox"/> Child <input type="checkbox"/> Spouse	<input type="checkbox"/> Single <input type="checkbox"/> Married <input type="checkbox"/> Divorced	<input type="checkbox"/> Black <input type="checkbox"/> White <input type="checkbox"/> Asian	<input type="checkbox"/> Yes <input type="checkbox"/> No	Social Security Number:	Is this person a U.S. citizen? Yes <input type="checkbox"/> No <input type="checkbox"/>
	<input type="checkbox"/> Female		<input type="checkbox"/> Child <input type="checkbox"/> Spouse <input type="checkbox"/> Other: _____	<input type="checkbox"/> Single <input type="checkbox"/> Married <input type="checkbox"/> Divorced	<input type="checkbox"/> Black <input type="checkbox"/> White <input type="checkbox"/> Asian	<input type="checkbox"/> Yes <input type="checkbox"/> No	Social Security Number:	Is this person a U.S. citizen? Yes <input type="checkbox"/> No <input type="checkbox"/>
	<input type="checkbox"/> Female		<input type="checkbox"/> Child <input type="checkbox"/> Spouse	<input type="checkbox"/> Single <input type="checkbox"/> Married <input type="checkbox"/> Divorced	<input type="checkbox"/> Black <input type="checkbox"/> White <input type="checkbox"/> Asian	<input type="checkbox"/> Yes <input type="checkbox"/> No	Social Security Number:	Is this person a U.S. citizen? Yes <input type="checkbox"/> No <input type="checkbox"/>
	<input type="checkbox"/> Female		<input type="checkbox"/> Child <input type="checkbox"/> Spouse	<input type="checkbox"/> Single <input type="checkbox"/> Married <input type="checkbox"/> Divorced	<input type="checkbox"/> Black <input type="checkbox"/> White <input type="checkbox"/> Asian	<input type="checkbox"/> Yes <input type="checkbox"/> No	Social Security Number:	Is this person a U.S. citizen? Yes <input type="checkbox"/> No <input type="checkbox"/>

Is anyone in your home pregnant?    Yes    No   If yes, who is pregnant? \_\_\_\_\_   When is the baby due? \_\_\_\_\_

Is anyone in your home disabled?    Yes    No   If yes, who is disabled? \_\_\_\_\_

## Person boxes

One alternative to using charts and tables is to collect all of the information for each individual applicant before moving on to the next applicant. That way, applicants can concentrate on one person at a time, while reading and writing from left to right.

Below is an example that shows the first two entries on a page of “person boxes.” Applicants can read and answer from left to right, rather than up and down – one person at a time. They don’t have to look up or remember any codes, such as codes for race or ethnicity, because the form has simple check boxes within the fields.

**2. Household.** Tell us about the people who live with you. Write about everyone in the home. Include unborn children and anyone who is part of your household but is not living in the home at this time. (Use another sheet of paper or copy this page if you need more space to write.)

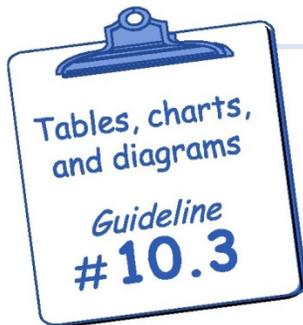
PERSON 1				
Legal name (first, middle, last):	Date of birth:	Age:	Sex: <input type="checkbox"/> male <input type="checkbox"/> female	Social Security Number:
How is this person related to you? <input type="checkbox"/> child <input type="checkbox"/> spouse <input type="checkbox"/> other:	Marital status: <input type="checkbox"/> single <input type="checkbox"/> married <input type="checkbox"/> separated <input type="checkbox"/> divorced <input type="checkbox"/> widowed		Is the person a U.S. citizen? <input type="checkbox"/> yes <input type="checkbox"/> no	
Is the person a student? <input type="checkbox"/> yes (grades 1-12) <input type="checkbox"/> yes (college) <input type="checkbox"/> no	Race: <input type="checkbox"/> white <input type="checkbox"/> Amer. Indian/Alaskan Native <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> black <input type="checkbox"/> Native Hawaiian/Pacific Island		Does this person want health coverage? <input type="checkbox"/> yes <input type="checkbox"/> no	

PERSON 2				
Legal name (first, middle, last):	Date of birth:	Age:	Sex: <input type="checkbox"/> male <input type="checkbox"/> female	Social Security Number:
How is this person related to you? <input type="checkbox"/> child <input type="checkbox"/> spouse <input type="checkbox"/> other:	Marital status: <input type="checkbox"/> single <input type="checkbox"/> married <input type="checkbox"/> separated <input type="checkbox"/> divorced <input type="checkbox"/> widowed		Is the person a U.S. citizen? <input type="checkbox"/> yes <input type="checkbox"/> no	
Is the person a student? <input type="checkbox"/> yes (grades 1-12) <input type="checkbox"/> yes (college) <input type="checkbox"/> no	Race: <input type="checkbox"/> white <input type="checkbox"/> Amer. Indian/Alaskan Native <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> black <input type="checkbox"/> Native Hawaiian/Pacific Island		Does this person want health coverage? <input type="checkbox"/> yes <input type="checkbox"/> no	

Source: This Figure is based on text and tables in *The Health Literacy Style Manual* (MAXIMUS, 2005:78-79). The text has been adapted with permission to serve as an example in this Toolkit. For more information, see references at the end of this chapter.

## Create a clear and uncluttered layout that includes strong visual and written cues



Create a clean, uncluttered layout with strong visual and written cues to guide readers and help them interpret the information correctly.

Keep the layout tidy and uncluttered, with ample margins and white space. Help readers understand and absorb the information in a chart or diagram by using devices such as taglines, examples, captions, and step-by-step instructions. If you use symbols in a comparison chart, make them as self-explanatory as possible, tell what they mean, and design them with good contrast.

To illustrate the impact of formatting, Figure 5-7-c below uses comparison charts as an example. This figure shows three versions of a chart that summarizes results from a fictional survey of patients that asked about their experiences with their family doctor. The information is the same in each chart, but the formatting differs. By comparing Charts A, B, and C, you will see the difference between a cluttered and clean layout. You will also see ways of using formatting features to guide readers and help them interpret the information correctly.

Figure

5-7-c. Making comparison charts easier for people to understand and use.

Charts A and B below illustrate ways of formatting comparison charts that pose barriers for readers. These barriers make the charts less appealing at first glance as well as making them harder to understand and use.



**Centering the names weakens alignment and reduces appeal**

Strong alignments are crucial for a clean and tidy layout, and they make text easier to read. Usually text within a column should be left-justified. Here, in the column of names, either left-justification or right-justification would work well and be better than centering.

**Centering the star symbols weakens visual cues for comparing them**

Centering the stars makes them hard to compare. The stars should be left-justified, for ease of comparison. When they are left-justified, three stars extend much farther than two stars, which in turn extend farther than one star (see Chart B below).

	Appointments	Listening	Explanations	Time
Dr. P. Brown	☆☆☆	☆☆	☆☆☆	☆☆
Dr. R. Connelly	☆☆	☆☆	☆☆	☆☆
Dr. B. Layco	☆	☆☆	☆	☆
Dr. N. Linn	☆☆☆	☆☆	☆☆	☆☆
Dr. E. Melton	☆☆☆	☆☆☆	☆☆	☆☆☆
Dr. C. Perry	☆☆	☆☆☆	☆☆☆	☆☆
Dr. V. Rema	☆☆	☆☆	☆☆	☆☆
Dr. F. Springer	☆	☆☆	☆☆	☆

**Meaning of the headings is unclear**

These one-word headings are so brief and generic that it's hard to know what they mean.

**Overall layout is busy, cluttered, cramped, and hard to read**

The layout is cluttered with unnecessary lines. Margins are tight and there is little white space.

☆☆☆	☆☆	☆
Above average	Average	Below average

**Placement of the legend reduces its impact**

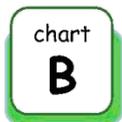
Putting it here at the bottom makes it more likely that some readers will ignore or overlook it.

**Color banding hinders rather than helps**

The color banding is supposed to make it easier to track across the rows, but it adds clutter and draws too much attention. The color banding interferes with pattern recognition when you try to interpret the star symbols.

Figure 5-7-c, continued.

This next example, Chart B, reduces some of the barriers shown above in Chart A, but there is still plenty of room for improvement in formatting.



**Better place for the legend**

Putting it here at the top left makes it more prominent and fits with a reader's natural point of entry into a chart.

**Left-justification of the star symbols makes them easier to compare**

When stars are lined up on the left side, they extend to different lengths. These variations in length help readers compare stars and identify patterns in the chart.

	Appointments	Listening	Explanations	Time
Dr. P. Brown	★★★	★★	★★★	★★
Dr. R. Connelly	★★	★★	★★	★★
Dr. B. Layco	★	★★	★	★
Dr. N. Linn	★★★	★★	★★	★★
Dr. E. Melton	★★★	★★★★	★★	★★★★
Dr. C. Perry	★★	★★★★	★★★★	★★
Dr. V. Rema	★★	★★	★★	★★
Dr. F. Springer	★	★★	★★	★

**Layout is better overall, but still needs improvement**

Removing the color banding helps, and so does the change in the star symbols. Making the lines gray instead of black helps, too. The layout has more white space and is less cramped. But there is still clutter from the unnecessary lines, and the labels for the columns are too brief and generic.

**Names are easier to read**

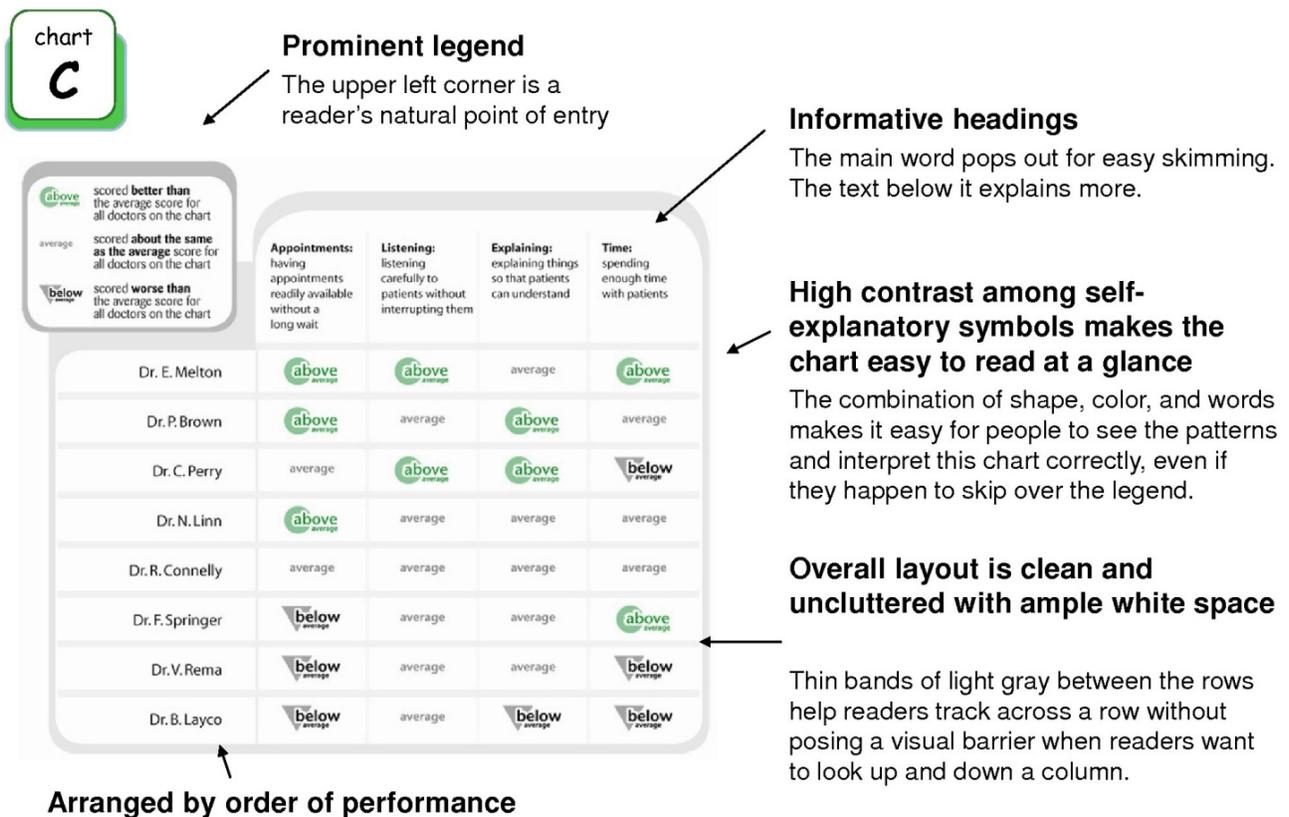
Left-justifying this list of names strengthens the alignment and creates a tidier look. This adds appeal and makes the names easier to read.

**Coloring the stars draws attention**

Making the stars solid and adding color draws attention to what's important in this chart. The color is dark enough to provide good contrast.

Figure 5-7-c, continued.

The formatting in Chart C below has addressed the barriers illustrated above in Charts A and B.



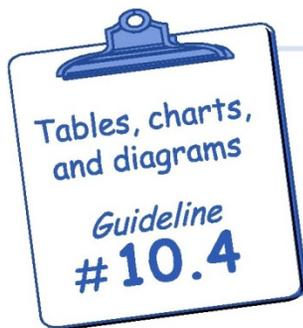
Source: This series of charts and commentary was created for use in this Toolkit. Information in the charts is fictional. Chart C, which illustrates some features of “good” formatting, has been adapted from charts designed by the Toolkit writer for use in a CAHPS study of the impact of formatting on readers’ use of comparison charts (Carman & McGee, 2006).

### ***Contrast as a tool for guiding readers***

“Contrast” refers to the degree of difference, such as differences in light and dark, differences in shape or size, etc. As shown in the charts in Figure 5-7-c above, you can use contrast to help guide your readers:

- **To help draw readers’ attention to what’s important, try *increasing the contrast*.** For example, in Chart C above, the key word in the headings is formatted with strong contrast to make it pop out. When you are developing your own charts, strong contrast might mean choosing a font with a heavier look, or making the type size a little larger. You may need to experiment with variations in font size, style, and weight to get the desired effect (for help with this, see Toolkit Part 5, Chapter 3, *Guidelines for fonts, size of print, and contrast*).
- **To help subdue possible distractions, try *reducing the contrast*.** Suppose, for example, that you have a large chart and you need to add some horizontal lines between the rows to help readers track accurately across the page. To make these lines effective but not distracting, try reducing the contrast until the line is as subtle as possible, while still serving the function of separating the rows. Experiment to see what works. For an example, compare the black lines in Chart A above with the subdued light gray narrow bands in Chart C.
- **Fine-tune the contrast to help readers make comparisons.** For example, if you are using symbols in a comparison chart, choosing symbols that contrast well with each other helps readers compare them and pick out patterns in the chart. Chart C shows how this can work.

## Take extra care in explaining numbers and calculations



If there are any numbers or calculations, explain them carefully and give examples.

Since math is hard for many people, and can be especially hard for people with low literacy skills, take special care with explanations that involve numbers. With calculations, use examples that show each step and explain it clearly. Simplify numeric examples by using rounded whole numbers as much as you can. To help people understand weights and measurements, make comparisons to familiar objects.

Being able to understand and manipulate numbers (“numeracy” or “numerical literacy”) is an important part of literacy skills. In 2003, the National Assessment of Adult Literacy gave literacy tasks to a large sample of U.S. adults. This study assessed health literacy by examining people’s ability to use written information to do a broad range of health-related tasks. Results showed that many people find numerical information difficult to understand and use (National Center for Education Statistics [NCES], 2006; see also the discussion of literacy skills in Toolkit Part 1).

If your written material includes any numbers or calculations, it’s vital to explain them very clearly and carefully. Here are some tips:

- 1. Give examples and base them on whole rounded numbers if you can.** Many people have difficulty when numbers are expressed as decimals and fractions. Whenever possible, round to whole numbers.
- 2. If there are calculations, break them down into a series of steps and explain each step.** If you show addition, subtraction, multiplication, or division, present the calculations in the usual way, rather than describing them in words or using an unconventional visual presentation. Here is an example:

**Nutrition Facts**  
Serving Size 1 cup (30g)  
Servings Per Container 12

Amount Per Serving  
Calories 90      Calories from Fat 10

	% Daily Value
Total Fat 1g	2%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
<b>Sodium 190 mg</b>	<b>8%</b>
Total Carbohydrate 22g	7%
Dietary Fiber 3g	12%
Sugars 9g	
Protein 3g	

Since there are 190 milligrams of sodium in each cup, a person who eats **two cups** of this soup will be getting **380 milligrams of sodium**.

190 milligrams of sodium in a one-cup serving  
**x 2 servings**  
= 380 milligrams of sodium in two cups of soup

In this example, notice how it begins with text that provides context and prepares the reader for the calculation that follows. Pertinent parts of the label are circled to remind readers where the numbers come from. The calculation itself ( $190 \times 2 = 380$ ) uses the standard formatting that is presented in schools when people learn how to do multiplication. To reinforce understanding, the calculation itself is expanded with explanatory text.

- 3. To help people interpret numbers and quantities, make comparisons to familiar objects.** For example, a four-ounce serving of meat is often compared to the size of a deck of cards. Earlier in this chapter, we showed an example that told how many milligrams of sodium are in a measuring teaspoon of table salt.
- 4. If a table of numbers is likely to be too challenging for some readers, consider converting it to a different format.** To get the main points across you may have to delete some of the details. Figure out what readers truly need to know and then adapt the amount of information and the way you present it so that you help them understand the main message without misleading or confusing them. Figure 5-7-d below gives an example.

**Figure**

5-7-d. Income charts are hard to interpret.

NOTE: This Figure is from *The Health Literacy Style Manual* (MAXIMUS, 2005:78-79).

Income charts are particularly hard to understand and follow. The main problem is that they contain lots of numbers, and readers with limited literacy skills often have limited numerical literacy skills too. In other words, they have difficulty reading and understanding numbers. In addition, income charts are often outdated as soon as they’re published!

It’s hard (or maybe impossible) to make income charts easy to follow and useful. It’s better to summarize the information for each income category generally and present it in narrative format.

Usually the goal of displaying an income chart is to encourage applicants to apply – not to ask them to self-screen. If that’s the case, it’s better to give them some general information; let them apply, and then let them know if their income is higher (or lower) than the program allows.

Here’s an income chart that’s hard to follow:”

<b>ARKIDS First Income Eligibility</b>						
Family Size	ARKids A				ARKids B	
	Under Age 6		Age 6 and Over		Annually	Monthly
	Annually	Monthly	Annually	Monthly		
2	\$16,120	\$1,343	\$12,120	\$1,010	\$24,240	\$2,020
3	\$20,296	\$1,691	\$15,260	\$1,272	\$30,520	\$2,543
4	\$24,472	\$2,039	\$18,400	\$1,533	\$36,800	\$3,067
5	\$28,648	\$2,387	\$21,540	\$1,795	\$43,080	\$3,590
6	\$32,824	\$2,735	\$24,680	\$2,057	\$49,360	\$4,113
7	\$37,001	\$3,083	\$27,820	\$2,318	\$55,640	\$4,637
8	\$41,177	\$3,431	\$30,960	\$2,580	\$61,920	\$5,160
Add for each additional member	\$4,176	\$348	\$3,140	\$262	\$6,280	\$523

The above income limits will increase slightly on April 1, 2004.

Here is a revision that gives general information in narrative form:

If you have 2 people in your family and you make less than \$2,020 each month, you may be able to get ARKids A or ARKids B.

If you have 3 people in your family and you make less than \$2,543 each month, you may be able to get ARKids A or ARKids B.

If you have 4 people in your family and you make less than \$3,067 each month, you may be able to get ARKids A or ARKids B.

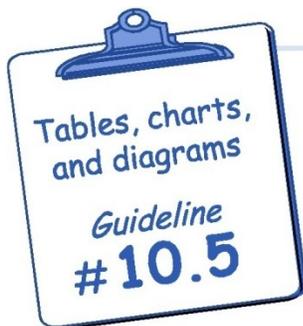
If you have 5 people in your family and you make less than \$3,590 each month, you may be able to get ARKids A or ARKids B.”



Source: This Figure is based on text and an accompanying table in *The Health Literacy Style Manual* (MAXIMUS, 2005:78-79). The text has been adapted slightly, with permission, to serve as an example in this Toolkit. For more information, see references at the end of this chapter.



## Verify ease of understanding by getting feedback from readers



Pretest your tables, charts, and diagrams to be sure that your intended readers can understand and use them.

Direct feedback from readers is the best way to check on comprehension, cultural appropriateness, and usability of the information you present in a table, chart, diagram, or graph.

Getting reader feedback is the best way to create useful and understandable charts and diagrams. Use the feedback you get from members of your intended audience to fix problems and fine tune the formatting. Add explanations and labeling that will help guide readers to identify main points and make a correct interpretation, and remove or change things that might confuse them.

You may be tempted to skip this important step of getting reader feedback, but getting feedback about tables, charts and diagrams is especially important. Because you are familiar and comfortable with using tables, charts, and diagrams, it can be hard to keep in mind that many of your readers are not. Many readers may find this way of presenting information to be intimidating and difficult, especially those with low literacy skills. When you use a table, chart, or diagram in your written material, it is crucial to verify that your readers are able to interpret them correctly and find them easy to use.

The most effective way to check on how well a table, chart, or diagram is working is to show it to readers and get their reactions. How you ask for their feedback is important. Don’t ask directly for an opinion about whether the chart is easy to understand. Instead, to get the most meaningful feedback, ask your readers to tell in their own words what the chart is about. Give them some tasks to do that will help demonstrate whether they are able to understand and apply the information it presents (this is called “usability testing”). For help on how to test your charts and diagrams, see Toolkit Part 6, *How to collect and use feedback from readers*.



## End notes

Thanks to Penny Lane, Mark Evers, and Julie Carson for their contributions to this chapter.

### ***References cited in this chapter***

- Blessing, Colleen, Howard Bradsher-Fredrick, Herb Miller, Renee Miller, and Robert Rutchik  
2003 *Cognitive testing of statistical graphs: Methodology and results*. Presented at the 2003 Federal Committee on Statistical Methodology Conference. Energy Information Administration, Department of Energy, 1000 Independence Ave., S.W., Washington, D.C., 20085. Download report at <http://www.fesm.gov/03papers/BlessingBradsher.pdf>.

Carman, Kristin and Jeanne McGee

- 2006 *Improving quality information in the consumer-driven era: showing the differences is crucial to informed choice*. Handout to accompany a presentation given by Kristin Carman at the 10<sup>th</sup> CAHPS User Group Meeting, Baltimore, Maryland, March 2006. For the latest version of this manuscript, please contact Kristin Carman at the American Institutes for Research, (KCarman@air.org or 202-403-5090) or the Toolkit writer, Jeanne McGee (jmcgee@pacifier.com or 360-574-4744).

MAXIMUS

- 2005 *The health literacy style manual*. Published by MAXIMUS (11419 Sunset Hills Road, Reston, VA 20190, 1-800-MAXIMUS, maximus.com). *The health literacy style manual* is a publication of Covering Kids & Families™ a national program supported by the Robert Wood Johnson Foundation with direction provided by the Southern Institute on Children and Families (140 Stoneridge Drive, Suite 140, Columbia, SC 29210, (803) 779-2607, <http://www.thesoutherninstitute.org>). The manual can be downloaded at <http://www.coveringkidsandfamilies.org/resources/docs/stylemanual.pdf>. To request a printed copy, send an e-mail to [jimpalumbo@maximus.com](mailto:jimpalumbo@maximus.com).

NCES (National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education)

- 2006 *The health literacy of America’s adults: Results from the 2003 national assessment of adult literacy*. Report NCES 2006-483, prepared by Mark Kutner, Elizabeth Greenberg, Ying Jin, and Christine Paulsen at the American Institutes for Research. Download report from <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2006483> (accessed September 9, 2006).

McWade, John

- 2003 *Before & after page design*. Berkeley, CA: Peachpit Press.

Paulos, John Allen

- 1992 *Beyond numeracy: Ruminations of a numbers man*. First Vintage Books edition. New York: Vintage Books.

To view, save, or print all or parts of this Toolkit from your personal computer, visit <http://www.cms.gov> and select Outreach & Education.

CMS Product No. 11476  
September 2010

