

Bring Your Best to the Table

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Sometime in the past you were likely taught about the importance of “bringing your best to the table”—in other words contributing your best ideas and results. Indeed, it is an important key to success. But *what* ideas and results you bring to the table may not be enough. Sometimes it is *how* you present your ideas and results that distinguishes you and determines your success.

This consideration also holds true while writing a scientific paper, when you want to bring your best to another type of table—the table within your manuscript that shows your data. With this type of table, it is also important to understand that how you present your data can affect the success of your paper. In this article, I provide some basic tips on how to create a table that presents your data in a clear and visually appealing manner.

Tables vs Graphs

Data can be presented in either a graph or a table, so how do you choose which is best when writing a scientific paper? Let’s compare the two. Graphs have an immediate visual impact and are good for showing trends or patterns or for highlighting differences between sets of data. Although the data in a graph are quantitative, a graph does not work well when the exactness or precision of the data is important.

Tables, on the other hand, are better when the individual or summarized values are more important than trends. Tables can be used for presenting both quantitative and qualitative data (1). A table can contain words, symbols, numbers, or a combination of all three (2). Tables allow side-by-side comparison of data (3), such as the imprecision of 2 assays at several analyte concentrations. Although there is often a direct relationship between the variables listed in a table (e.g., death or myocardial infarction vs the tertile for a cystatin C concentration), the variables in a table do not need to have a direct relationship. Tables are also good for presenting large amounts of information that would be too cumbersome or confusing to place in the

text (e.g., mass transitions for 20 different drugs being monitored in a toxicology screen).

A good table, although used for a purpose different from that of a good graph, has many of the same attributes (4). A table should draw attention to the data and not to the table itself. In other words, the data within the table should be easy to distinguish and not be lost among poorly arranged words and numbers. Every table should have a clear and concise title. The table should stand alone without the need to refer repeatedly back to the main text. Lastly, the data must deserve to be in a table rather than in the main text.

Table Components

Scientific tables contain 5 major elements (Fig. 1): a title, column headings, stubs (row headings), data fields (the spaces in the columns that contain the data), and footnotes (2). Sometimes a table may contain a spanner, a heading separated by a horizontal line that sits above secondary column headers. A spanner indicates that the column headings below it should be considered as part of a common group. Copy editors and printers will sometimes query an author about one of these table elements, so it is important to understand how each of these elements fits into the presentation of the data.

The title of a table should be sufficiently informative for the reader to understand the experimental data being presented without having to refer to the paper. Consider the following 3 hypothetical titles:

Example 1: *Statin therapy and cancer recurrence.*

Example 2: *Effect of daily oral primvastatin or dorvastatin on the 4-year odds ratio for the recurrence of prostate and breast cancer.*

Example 3: *The effect of daily oral primvastatin or dorvastatin on the 4-year odds ratio (OR) for the recurrence of prostate and breast cancer shows a 3-fold lower ($P = 0.002$) OR for the recurrence of breast cancer for patients receiving primvastatin ($OR = 2.3$) versus dorvastatin ($OR = 6.8$).*

Unless the headers or footnotes in the table include the names of the statin drugs tested, the type of cancer, the time period of the study, and the end point being measured, the title in example 1 may force the reader to look back at the experimental methods section of the paper to understand the context of the data being presented in the table. Example 2 is an informa-

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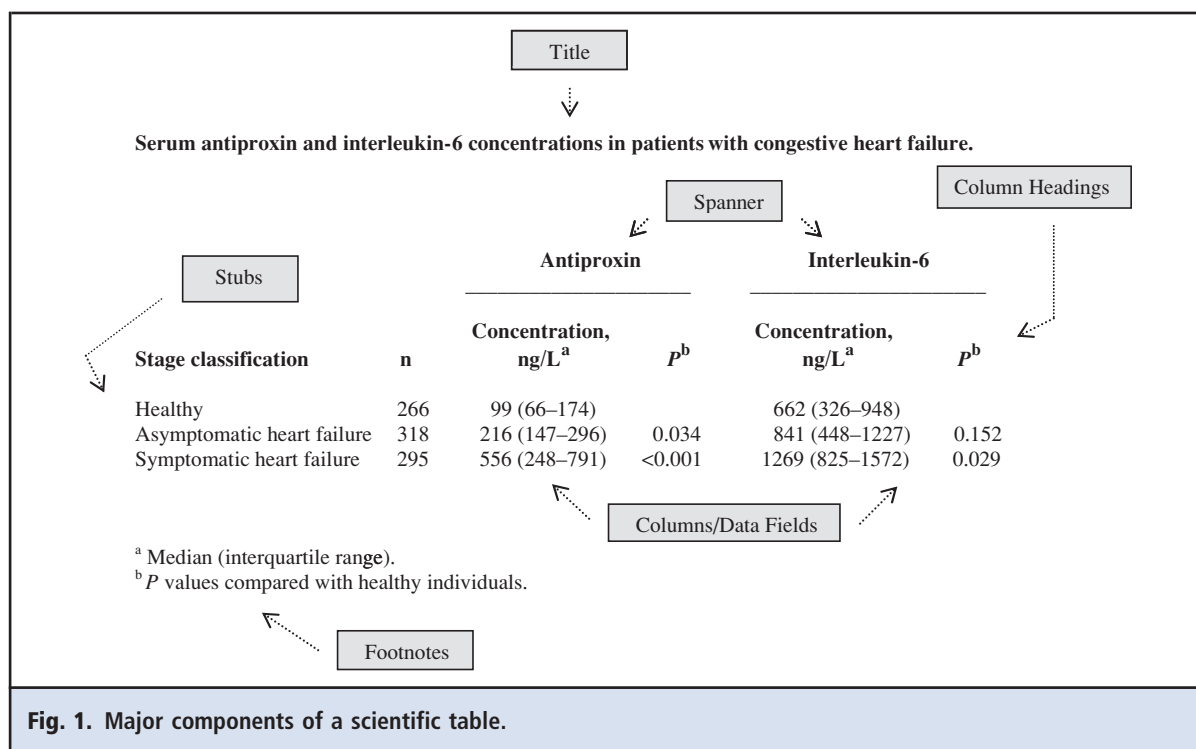


Fig. 1. Major components of a scientific table.

tive title that tells the reader much more about the study design (a 4-year follow-up study), the measured end point (odds ratio for recurrence), the specific diseases being studied (prostate and breast cancer), and the therapeutic agents being tested. The title in example 3 contains the same useful information as in example 2 but makes the mistake of providing the data and results as well. Titles should not include experimental details, data, or results. The data belong in the data fields of the table. Results and experimental details belong in the text.

The far left column containing the stubs lists one or more variables, usually the independent variable(s). All of the remaining columns to the right of the stubs must link back to the rows. This first column may not require a column header if the meaning of the stubs is evident (Table 1). If the variables have units (e.g., time, concentration, percent), these units should be added in parentheses or after a comma. If the variables all have the same units, the common unit can be designated after the main header above the stubs, if one is present.

When listing units of measure, be sure to use the journal's required format. Many journals, including *Clinical Chemistry*, request that SI units be used throughout a scientific paper. In the text, conventional units may be added in parentheses after SI units, but a different format should be used in a table. In a table, one should use the primary units in the body of the table and provide conversion factors to the secondary

Table 1. Options for displaying annual per capita healthcare expenditures.

A. Annual per capita healthcare expenditures.	
	Expenditure, \$
Israel	1971
Madagascar	36
Sweden	2828
Yemen	82
Zimbabwe	149
B. Annual per capita healthcare expenditures.	
	Expenditure, \$
Israel	1971
Madagascar	36
Sweden	2828
Yemen	82
Zimbabwe	149
C. Annual per capita healthcare expenditures.	
	Expenditure, \$
Sweden	2828
Israel	1971
Zimbabwe	149
Yemen	82
Madagascar	36

Table 2. Long-term outcomes according to cystatin C tertile.^{a,b}

	Cystatin C tertile			Log-rank <i>P</i>
	First tertile: <0.86 mg/L (n = 378)	Second tertile: 0.86–1.01 mg/L (n = 365)	Third tertile: >1.01 mg/L (n = 385)	
Death within 4 years	3.4% (12)	6.2% (21)	13.5% (48)	<0.001
Spontaneous MI within 3 years	5.5% (19)	7.5% (22)	9.8% (36)	0.03
Procedure-related MI within 3 years	8.0% (30)	11.8% (43)	7.9% (30)	0.10
MI (spontaneous or procedure-related) within 3 years	12.6% (46)	18.1% (61)	16.3% (61)	0.17

^a Data are presented as percentages from Kaplan–Meier curves at long-term follow-up; the number of events is in parentheses.
^b Table from Clin Chem 2009;55:1118–25. Used with permission.

(i.e., conventional) units in footnotes, which are discussed below.

The remaining columns, which usually represent the dependent variables, should each have a concise heading. Because the units in each data field of a column are typically the same, it is acceptable to state the units just once in the column header, either in parentheses or after a comma, rather than to repeat the units after each value. If you have missing data or no applicable entry for a data field, do not leave the space blank, because the reason for the missing entry may not be clear to the reader. If there are no data for that field, you can insert an em dash (—) or an ellipsis (. . .) to designate that no data are available. The abbreviation NA can also be used, but it must be defined in a footnote, because NA can be interpreted as “not applicable,” “not available,” or “not analyzed” (2).

Each footnote should be placed on a separate line at the bottom of the table. Most journals recommend that superscripted letters rather than numbers be used to designate footnotes, because a superscripted number can be confused with an exponent. Some journals prefer the use of symbols to numbers for designating footnotes, so it is wise to read the selected journal’s submission requirements. Letters (or numbers, or symbols) designating footnotes should be ordered alphabetically (or numerically), starting with the title of the table and then working left to right and down, just as in reading text. The symbol designating a footnote that applies to the entire table should be placed after the title. Symbols for footnotes that apply to an entire row or column should be placed after the row or column heading (Fig. 1), and those that apply to a single data field should be added after the entry for that field (2).

Table Alignment

As an author, you can help your tables make a positive visual impression and make them easy to read if you

follow some general rules for formatting and alignment:

- The stubs should all be left justified.
- In the columns/data fields, words should be left justified, and whole numbers should be right justified.
- Data fields containing decimal points, plus/minus symbols, slashes, hyphens, or parentheses should be aligned on these elements.
- When the text in a stub wraps to a second line, the corresponding data field should align with the top line of the stub.

Some examples show how these alignment rules help improve the clarity of a table. Table 1 shows the annual per capita healthcare expenditures for a set of countries. Note how the names of the countries in the stubs and the numbers in the column are easier to read when they are justified appropriately (Table 1A), compared with the centered spacing often seen in drafts of papers (Table 1B). Because the meaning of the stubs is evident, it is not necessary to add a heading for the stubs. Also note that the unit of measure (\$) for the data is placed after the column heading because the same unit applies to all of the data fields.

Long-term outcomes according to cystatin C tertile are shown in Table 2. Because the meanings of the stubs are evident, no heading is necessary. Entries in the stub column are left justified. The numbers (percentages) in the data fields contain a decimal point; therefore, the numbers in each column, including the *P* values in the last column, are aligned with the decimal point. Note that to fit within the width of the stub column, the text in the fourth row has wrapped to a new line, but the corresponding data fields in this row have remained aligned with the top line of the stub.

Table 3 also illustrates many of the concepts described earlier for creating an effective table. The title is sufficiently informative that a reader can understand

Table 3. Phenytoin concentrations measured by immunoassay for matrices supplemented with 10 mg/L phenytoin.

	Mean (SD), mg/L	Mean \pm SD, mg/L	Deviation from target, %
Pig serum	11.4 (2.1)	11.4 \pm 2.1	14
Sheep serum	10.7 (1.4)	10.7 \pm 1.4	7
Artificial serum	10.3 (0.8)	10.3 \pm 0.8	3
Saline	10.1 (0.6)	10.1 \pm 0.6	1
Human serum	9.9 (0.6)	9.9 \pm 0.6	-1
Cow serum	9.6 (1.4)	9.6 \pm 1.4	-4
Horse serum	8.9 (0.7)	8.9 \pm 0.7	-11

the experiment performed and the data produced. The stubs are left justified, and their meanings are sufficiently clear from the title that a header is not needed. The units are placed in the headers for the columns because the units apply to all of the data in the column. Two different styles for presenting the mean and SD are shown in columns 2 and 3. In column 2, which follows *Clinical Chemistry* style, the data are aligned on the decimal point. Some journals allow the style shown in column 3, in which the data are aligned on the common element (\pm). In the last column, the numbers are right justified regardless of whether the numbers are positive or negative. It might help to pretend that a decimal place exists after each whole number and that you are aligning the numbers with this decimal point.

Tables of Lists and 2-Column Tables

Sometimes a table can be a simple list of information, such as the exclusion criteria for a clinical trial, instrument settings, or sequences of primers used in a PCR assay. Although the items in such lists may not have any inherent rank or order, how you decide to order them may affect what the reader infers (3). Table 4 illustrates 2 ways to list the top 10 states for air quality. Table 4A starts with Idaho and ends with Tennessee. As a reader, I would infer that the point of the table is to show that Idaho is the top state for air quality and that Tennessee is 10th among the 50 states, but if the states were ranked alphabetically (Table 4B), I would infer that the point is simply to list the top 10 states, with no implication regarding which state was best in air quality.

With a 2-column table (Table 1), you have the choice of ordering either the stubs or the data fields. Lang refers to this choice as helping the reader see specific information (organizing the table from the outside in) vs helping the reader see patterns (organizing the table from the inside out) (5). In Table 1A, the

Table 4. Two ways to list the top 10 states for air quality.

A. States with the 10 highest air quality indices.	
Idaho	
North Dakota	
Montana	
Alaska	
Minnesota	
Hawaii	
New Mexico	
Wisconsin	
South Dakota	
Tennessee	
B. States with the 10 highest air quality indices.	
Alaska	
Hawaii	
Idaho	
Minnesota	
Montana	
New Mexico	
North Dakota	
South Dakota	
Tennessee	
Wisconsin	

country names are listed alphabetically, and the reader is not drawn to any pattern in the data. Rather, the reader must look for the country of interest and then find the corresponding dollar expenditure for that country. This ordering helps the reader find specific information. The layout in Table 1C helps the reader see a pattern. The dollar values in the data field are ranked from highest to lowest, and the reader is drawn to the pattern of the data rather than to the country names. Again, how you organize the table can affect what the reader sees and infers.

The Best Tip of All: Keep Your Tables Small

One trap that authors often fall into is to assume that all acquired data should be placed in a table. In an attempt to be comprehensive in providing information, you may create a table that is so large and complex that the important data—and the message—get lost among column after column (or row after row) of information. The data that belong in a table are the data that are essential for conveying the results you want the reader to see.

So what is the right size for a table? A useful rule provided by Huth (6) is that the maximal width should

be 60 characters and spaces in a row for a table running across half a page and 120 characters and spaces for a table running the full width of a page. For a 2-column journal such as *Clinical Chemistry*, a table width of 110 characters and spaces would fit onto a portrait-formatted page. Otherwise, a journal might consider publishing the table in landscape format (sideways), but this formatting is awkward for the reader and just does not look as nice on the page (Tables 5 and 6).

Fortunately, there are several ways to condense the size of a table. One is to reorient the table so that the variables are reversed in the table (6, 7), as shown in Table 7. This table contains the same data as Table 5 but uses half the width. It also fits a portrait layout on the journal page. If the ratio of the number of column headings to row headings is greater than 2:1, you should evaluate whether reorienting the table would allow a better presentation of the data (6).

Another option is to evaluate whether all of the columns or rows are necessary in a table and whether any nonessential data can be removed. In Table 6, for example, are all of the data and text in the first 3 columns necessary? Will the first author and reference number suffice to identify the studies? Is there a strong reason (e.g., the differences in the number of patients are critical to your discussion) to include the number and sex of the patients if the same information can be found in the reference? Isn't the initial value for a variable, such as the leukocyte count, typically considered 100%? Condensing column 1 and removing columns 2 and 3 yield a table (Table 8) that is narrower and looks cleaner on the printed page. Other columns of data that could be removed and explained in a footnote include those that contain a single data point, a column in which all of the values are the same, or a column in which only 1 or 2 of multiple values differ from the others (e.g., 9 positives and only 1 negative). If a column contains a series of *P* values with only 1 or 2 being statistically significant, this column could be replaced with superscripted letters or symbols after the values, with the significant differences and explanations presented in footnotes.

The use of abbreviations instead of longer names also can reduce the width of a table substantially. Journals allow more leeway in the use of abbreviations in tables because the definitions can be provided in footnotes. As an example of this approach, one could try to abbreviate the types of acute myelogenous leukemia in Table 5 (e.g., UL, undifferentiated leukemia; MML, myelomonocytic leukemia; EL, erythroleukemia). Try this, and see how much this table could be condensed by doing so.

If you have data that could be removed from a large table but are of consequence for the reader to best understand your message, consider placing the most

Table 5. Age-related 5-year survival for forms of acute myelogenous leukemia.

Age, years	Undifferentiated leukemia, %	Myeloblastic leukemia, %	Promyelocytic leukemia, %	Myelomonocytic leukemia, %	Monocytic leukemia, %	Erythroleukemia, %	Microkaryoblastic leukemia, %	Megakaryoblastic leukemia, %
<21	91	80	85	81	82	73	62	52
21-40	89	83	79	77	68	61	57	41
41-60	74	62	68	59	40	37	31	24
>60	51	48	39	34	28	21	16	9

Table 6. Previous studies of leukocyte reduction during kelvac therapy in patients with chronic myelogenous leukemia.

Study	No. of patients	Leukocyte count, % ^a						
		Day 0	Day 7	Day 14	Day 21	Day 28	Day 56	Day 84
Wilkins and Potter, Ref ^b 11	M11;F11	100	97	—	84	—	—	70
Pillsbury et al., Ref 12	M10;F18	100	100	81	—	76	—	64
Annesley et al., Ref 18	M27;F20	100	89	76	—	63	—	62
Kronenberg and Stenmeyerson, Ref 20	M9;F7	100	103	95	—	88	69	—
Flowers and Peterson, Ref 25	M20;F23	100	101	96	93	89	86	98
Floyd et al., Ref 26	M27;F23	100	95	—	—	91	—	79
Robinson et al., Ref 27	M19;F20	100	—	100	—	96	—	94
Nowicki and Phillips, Ref 32	M15;F16	100	—	92	—	82	74	—

^a Percentage of initial value at start of treatment.
^b Ref, reference; M, male; F, female.

important data showing the results in a printed table and placing the secondary data in a supplemental or online table. In the current era of electronic publishing, most journals make use of these supplemental electronic files as a way to optimize the use of an article's allotted page space, yet such files still allow authors to provide secondary details and data in an easily accessed format.

Sometimes the best option is to split a large table into 2 separate tables. Authors tend to avoid this in an attempt to count 1 large, complex table as a single table to stay within the journal's limit on tables and figures. This trick more often backfires than helps, however. It takes a peer reviewer more time to try to understand a large table, it takes more time and money for an editor or copy editor to reformat the table, and it takes more time for the reader to understand. None of this added

effort creates a good impression. My advice is to make the effort up front to split the table.

Learning Exercise

Look at Table 9. This table can be improved in several ways to make it more clear and informative. Compare your suggested changes with those provided at the end of this article.

Final Thoughts

When you write a paper, you know that any typographical and grammatical errors will be corrected during the

Table 7. Age-related 5-year survival for forms of acute myelogenous leukemia (AML).

AML type	Age			
	<21 Years	21–40 Years	41–60 Years	>60 Years
Undifferentiated, %	91	89	74	51
Myeloblastic, %	80	83	62	48
Promyelocytic, %	85	79	68	39
Myelomonocytic, %	51	48	39	34
Monocytic, %	82	68	40	28
Erythroleukemia, %	73	61	37	21
Microkaryoblastic, %	62	57	31	16
Megakaryoblastic, %	52	41	24	9

Table 8. Previous studies of leukocyte reduction during kelvac therapy in patients with chronic myelogenous leukemia.

Study (reference)	Leukocyte count, % ^a					
	Day 7	Day 14	Day 21	Day 28	Day 56	Day 84
Wilkins (11)	97	—	84	—	—	70
Pillsbury (12)	100	81	—	76	—	64
Annesley (18)	89	76	—	63	—	62
Kronenberg (20)	103	95	—	88	69	—
Flowers (25)	101	96	93	89	86	98
Floyd (26)	95	—	—	91	—	79
Robinson (27)	—	100	—	96	—	94
Nowicki (32)	—	92	—	82	74	—

^a Percentage of initial value at start of treatment.

Table 9. Effect of tacrolimus or sirolimus on everolimus measurement.

Specimen	Measured concentration	Bias, %	<i>P</i> ^a
Blood + 10.0 μg/L everolimus	9.9 μg/L	-1	
Blood + 10.0 μg/L everolimus + 10.0 μg/L tacrolimus	10.5 μg/L	5	0.052
Blood + 10.0 μg/L everolimus + 10.0 μg/L sirolimus	14.3 μg/L	43	<0.001

^a *P* value compared with everolimus alone. *P* < 0.05 considered significant.

final editing process. Nonetheless, you always perform a spelling and grammar check, because you know that confusing or poorly composed sentences do not make a good impression during the review process. The same holds true for tables. Although the editors and printer will make sure that your table is formatted properly before publication, the time to make the best impression is during the review process. A table that not only is easy to read but also emphasizes the point you are trying to make will get you started on a solid footing.

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Answers to Learning Exercise

1. The title would be more informative if it included the analytical technique or assay used.
2. An em dash may be added to the last column.
3. Because the unit of measure is the same for each concentration measured, it could be presented once after the corresponding column heading.
4. The numbers, including the *P* values, should be aligned on the decimal point.
5. The information in the stubs for the second and third rows wraps to a second line. The data in the column entries should be aligned with the top line of the corresponding stub.
6. Because only 1 *P* value is statistically significant, one could remove the last column and provide the same information in a footnote.