

Discussion Paper

Strategies to Enhance Numeracy Skills

Andrew Pleasant, Megan Rooney, Catina O’Leary, Laurie Myers, and Rima Rudd

May 5, 2016



NATIONAL ACADEMY OF MEDICINE

Leadership • Innovation • Impact | *for a healthier future*

Strategies to Enhance Numeracy Skills

Andrew Pleasant, Canyon Ranch Institute; Megan Rooney, Health Literacy Missouri; Catina O’Leary, Health Literacy Missouri; Laurie Myers, Merck & Co., Inc.; and Rima Rudd, Harvard University¹

Individuals make decisions about health and well-being every day. Many of those decisions involve using and understanding numbers, and most of the decisions are made quickly, at home or at work, as a person goes about a daily routine. Even with adequate time, many people lack the skills to make good use of numerical information to help them make informed decisions (Peters et al., 2014). Health professionals and health systems also often communicate numerical information poorly, increasing the challenge (IOM, 2014).

Like low health literacy (of which numeracy is a part), poor numeracy skills are widespread and affect more than just those with lower income or less education. Factors such as emotional stress (perhaps from a recent diagnosis), lack of time or confidence, high demands for numeracy skills, or simply a dislike of math can affect understanding, leading to people feel overwhelmed (Peters et al., 2014).

We aim in this paper to provide guiding principles for communicating numbers in a clear, simple way. These principles can be used by health professionals interacting with patients; health systems creating and giving information about diseases, treatments, prevention, cost, and covered services; and health plans explaining the cost of deductibles, co-pays, maximum out-of-pocket costs, tiered coverage for medicines, and quality. Pharmaceutical and medical device companies also have a great opportunity to explain the risks and benefits of medicines and devices. No matter how different these organizations appear, they all should take the opportunity to help foster improved health decision making by presenting data and numbers clearly.

An individual’s ability to understand and use numbers, such as data and risk information, to make health and health care decisions often depends on and can be greatly supported by the way numbers are presented (Zikmund-Fisher, 2013). Even those with higher numeracy skills are helped by clear communication of numbers.

The challenge is to know what numerical information to present (if any) and how to present it so people can find, understand, evaluate, communicate, and use that information to make an informed health decision. This capacity depends on many contextual factors, including the social and cultural setting, the audience, the purpose (to increase knowledge, instruct, facilitate decision making, or persuade), and the nature of the numerical information (is it fractions, percents, ratios, equations, and so forth). We believe that a complete understanding of those different contexts will help professionals choose the best way to communicate numerical information.

STRATEGIES

Several best practices are already well identified that can help make understanding numerical information easier for all people to both understand and communicate (Peters et al., 2014; Trevena et al., 2013; Fischhoff et al., 2011; National Cancer Institute, 2011) . We offer the following strategies to help make numerical information easier to communicate, less confusing, and easier to use.

¹ The authors are participants in the activities of the Roundtable on Health Literacy working group on numeracy.

Marry Words and Numbers to Provide a Complete Understanding

When presenting numeric information (such as quantities, ratios, percentages, and so forth), emphasize numbers rather than words such as “rare,” “low risk,” or “common.” Such words have different meanings to people and can lead to confusion.

However, neither words nor numbers are free from misinterpretation. Instead of replacing numbers with words or words with numbers, use both when feasible to help people better understand your message. This means ensuring that explanatory text accompanies the numbers, interprets their meaning, and gives descriptive information to place the numerical information in context.

Do the Math

Always do the math for your audience. For example, instead of advising people to lose a certain percentage of their body weight, which requires them to measure their weight and then calculate a percentage, advise them to lose a precise number of pounds. By doing the math for these individuals, you give them a specific action goal while not requiring them to perform mathematics.

To teach patients to calculate the percentage, use examples to illustrate the math. For example, a 100-pound person would need to lose 2 pounds to lose 2 percent of his or her weight, but a 200-pound person would need to lose 4 pounds to lose the same percent of his or her weight.

Finally, if a quantity or rate might change over time, do that math for your audience as well. For example, if a rate changes depending on income level, present the rates for several income categories so people can easily see how the rates change. Be specific about what causes changes in risk and express the quantitative rates clearly.

Be Consistent

Use consistent language and presentation styles and formats to help avoid confusion. Present numbers in consistent and expected formats—this further removes the burden of performing calculations and makes it easier to compare numbers. For example, use the same denominators in fractions and ratios when comparing information—that is, compare “10 out of 40” to “20 out of 40,” not to “10 out of 20.”

Consistency is also important when providing information such as dosage instructions. What pharmacists write on the prescription label often vary, given the same prescription, and these variations can cause patient confusion (Wolf et al., 2009).

When possible, align your use of numbers with expected normative meaning—for example, have higher numbers reflect “better” and lower numbers reflect a “worse” situation.

Present Only the Most Necessary Information, But Enough to Be Fully Understood

Providing too much information can be overwhelming, especially to those with lower numeracy and health literacy skills. Do not overwhelm people with numbers, but do give them all of what they need to make a truly informed decision. For example, to help people compare

treatment options (for example, surgery versus chemotherapy versus palliative care, or chemotherapy alone versus chemotherapy plus radiation treatment), present only the most important information related to the goal of this task—understanding and then choosing the best treatment option. This means eliminating background information that is not directly relevant to the choice.

To help people make fully informed decisions, you also need to explain what information you have left out, why you left that information out, and where they can find it if they are interested. Provide supporting information to help them easily find credible, accurate, and understandable additional information.

Be Visual—Use Images and Shapes to Reflect the Meaning of the Numbers

Researchers suggest giving people information in different ways, such as in verbal along with written or graphical form, to meet their preferred learning style and to ensure understandability. Providing information in graphical form using charts, pictographs, and diagrams is particularly helpful.

Combine numbers, words, and visuals to explain risk statements. Risk statements that solely rely on numbers may be difficult. People better understand probabilities when they are presented with words and visuals that reinforce the meaning of the numbers rather than when numbers are presented alone. Certain types of graphics in risk communication, such as icon arrays, bar charts, and risk scales can also be helpful.

To help people manage their medicines, provide medication schedules, simple charts, or even computer-aided tools to help people integrate multiple treatments and simplify daily routines. Be sure your visuals explain rather than confuse. For example, when using graphs and charts to compare numerical information, be sure they are all presented in the same way, in the same scale, and with the same labels and value ranges.

Different types of visuals are better for communicating different concepts:

- Line graphs are usually better to explain trends over time than pie charts or bar graphs.
- Pie charts often show magnitude through an easy comparison of a part to the whole.
- Bar charts can show magnitude and change over time or across groups.
- Maps allow geographic comparison.
- Pictographs or icon arrays can represent quantity while reflecting percentage of the whole.

Finally, be very aware of your use of color and labels in visual presentations of numeric information. People may assign meaning to a color (for example, red is often linked with danger). Some people also have difficulty visually interpreting colors; contrast can often be useful to help differentiate. Be sure your labels are understandable while being brief but also relevant and informative.

Be Aware of How You Present or Describe a Risk

To make informed decisions, people need to understand the risks and benefits of

behaviors, treatments, and preventive actions. When communicating about numbers that discuss risk, you are communicating about behaviors and their likely outcomes. That information will be interpreted in many ways that include but go beyond a person's numeracy skills.

Be careful using percentages to explain changes in risk. For example, a change in risk from "1 in 100" to "2 in 100" is a 100 percent change, but using only that percent change is misleading and may not lead to informed decision making. Furthermore, always explain what the percentage is of, be it about people or objects or risk.

Be extremely careful when comparing risk because even when the numbers are equivalent, the actual risk and the outcomes of that risk may not be equivalent. For example, when reporting change in two risk levels of 20 percent, if the baseline for one risk was 1 percent, that is an increase to 1.2 percent, but if the baseline for the second risk was 20 percent, that would be an increase to 25 percent. Furthermore, be very conscious of whether you are describing a risk or the level of dread or fear of that risk. Be very aware that people will interpret a risk based on many factors beyond the numbers—for example, how much they understand the risk, how much they dread or fear the risk, and how many people and which people may be affected by the risk.

Whether communicating relative or absolute risk, always be specific about who or what that risk is based on. Try to provide both absolute risk and relative risk. Absolute risk tells the likelihood of something happening at all—it is the risk itself. The higher the absolute risk, the more likely it is that something will happen. Relative risk tells how much more or less likely something is compared to something else. This compares two risks—it tells you nothing about the actual risk. Research shows that when only relative risk is presented, people may view risks as larger or treatments as worse. Providing absolute-risk information does the math for the reader, making the choices more concrete and requiring less cognitive effort and room for error.

As much as possible, use both positive and negative frames to describe a risk. For example, "1 out of 10 women who take this medicine have side effects. This means that 9 out of 10 women do not." Some research suggests that when communicating risk, negative framing ("You have a 1 in 10 chance of dying") can result in a desired behavior change more often. On the other hand, when promoting healthy preventive behaviors, positive framing ("Seat belts lower your chance of getting hurt in an accident") may be more effective.

Check In Early and Often

Always take the time to test your communication with the intended audience. Involve your audience early and often in message development—they are the experts in their own life and communication skills. During the communication, use methods such as teach-back to ensure that your message is being understood as intended. Clearly explain your message and check in for comprehension as you do so. For example, when comparing two risks, the teach-back could take the form of a question such as, "I want to make sure I explained this well, so tell me, which risk did I say was higher of the two risks we've been talking about? Why is that risk higher?"

CONCLUSION

Numeracy helps people in all walks of life—be they mathematical experts or third-grade students—to solve problems. One thing we can all agree on is that being alive inherently means you will encounter problems to be solved. These may be entirely numerical or about a risk you

do not understand or a social or cultural situation you find perplexing. We close by proposing that numeracy skills—both the skill to navigate numbers as well as the skill to successfully communicate numerical information—will be useful across the wide range of problems life presents. By making numbers and their implications more understandable to more people, we can improve decision making, efficiency, and outcomes such as health and quality of life.

Andrew Pleasant, Ph.D., is the senior director for health literacy and research at Canyon Ranch Institute. Megan Rooney, M.S.W., M.Ed., is the director of program development at Health Literacy Missouri. Catina O’Leary, Ph.D., L.M.S.W., is the president and chief executive officer of Health Literacy Missouri. Laurie Myers, M.B.A., is the global health literacy director at Merck & Co., Inc. Rima Rudd, Sc.D., M.S.P.H., is a senior lecturer on health literacy, education, and policy at the Harvard School of Public Health, Harvard University.

REFERENCES

- Fischhoff, B., N. Brewer, and J. Downs, eds. 2011. *Communicating risks and benefits: An evidence-based user's guide*. Washington, DC: Food and Drug Administration. <http://www.fda.gov/downloads/AboutFDA/ReportsManualsForms/Reports/UCM268069.pdf> (accessed March 31, 2016).
- IOM (Institute of Medicine). 2014. *Health literacy and numeracy: Workshop summary*. Washington, DC: The National Academies Press.
- National Cancer Institute. 2011. *Making data talk: A workbook*. <http://www.cancer.gov/cancertopics/cancerlibrary/MDT-Workbook.pdf> (accessed March 31, 2016).
- Peters, E., L. Meilleur, and M. K. Tompkins, eds. 2014. Numeracy and the Affordable Care Act: Opportunities and challenges. In *Health literacy and numeracy: Workshop summary*. Washington, DC: National Academies Press.
- Trevena, L. J., B. J. Zikmund-Fisher, A. Edwards, W. Gaissmaier, M. Galesic, P. K. Han, J. King, M. L. Lawson, S. K. Linder, I. Lipkus, E. Ozanne, E. Peters, D. Timmermans, and S. Woloshin. 2013. Presenting quantitative information about decision outcomes: A risk communication primer for patient decision aid developers. *BMC Medical Informatics and Decision Making* 13(Suppl 2):S7. <http://doi.org/10.1186/1472-6947-13-S2-S7>.
- Wolf, M. S., P. Shekelle, N. K. Choudhry, J. Agnew-Blais, R. M. Parker, and W. H. Shrank. 2009. Variability in pharmacy interpretations of physician prescriptions. *Medical Care* 47(3):370–373.
- Zikmund-Fisher, B. J. 2013. The right tool is what they need, not what we have: A taxonomy of appropriate levels of precision in patient risk communication. *Medical Care Research and Review* 70(Suppl 1):37S–49S.

Suggested Citation

Pleasant, A., M. Rooney, C. O’Leary, L. Myers, and R. Rudd. 2016. *Strategies to enhance numeracy skills*. Discussion Paper, National Academy of Medicine, Washington, DC. <http://nam.edu/wp-content/uploads/2016/05/Strategies-to-Enhance-Numeracy-Skills.pdf>.

Disclaimer: The views expressed in this Perspective are those of the authors and not necessarily of the authors’ organizations or of the National Academy of Medicine (NAM). The Perspective is intended to help inform and stimulate discussion. It has not been subjected to the review procedures of, nor is it a report of, the NAM or the National Academies of Sciences, Engineering, and Medicine. Copyright by the National Academy of Sciences. All rights reserved.