NATIONAL INSTITUTE ON AGING

NATIONAL INSTITUTES OF HEALTH
U.S. Department of Health and Human Services

Understanding Risk: What Do Those Headlines Really Mean?

Tips from the National Institute on Aging

*"Risk" is the **chance** that something bad will happen—like catching the flu or being hit by a car when crossing the street. Risk does not mean that something bad will **definitely** happen.*

What does risk mean when it's part of health news? Every day, news stories report medical findings. How risk is described can change how you handle your health. Perhaps a certain medicine carries a 50% increased risk of stroke. That sounds scary. Does it mean that 50%—or half—of everyone taking the drug will have a stroke? No, it doesn't. Let's start by assuming that in every 1,000 people who are not taking the medicine, two people will have a stroke. A 50% increase means 1 more person, or 3 total out of 1,000, will have a stroke while on this drug. Stroke can be a devastating illness, but maybe 3 out of 1,000 doesn't seem as big a risk as 50% sounds. And that risk might be an acceptable one if the medicine could help your health problem.

But how can you know if that increased risk even applies to you? This fact sheet provides background you can use to make sense of research results. Better understanding of risk could help you sort out the news that might be important to you from other reports that might be of interest, but would not be a reason to change how you take care of your health.

Are All Research Studies the Same?

No, there are different types of studies. Some take place in a laboratory, others involve animals, and some look at people. A scientist might start with a question—maybe whether a new drug cures a bacterial infection—and set up an experiment to answer it. In this experiment, the scientist grows the bacteria in the laboratory and then adds the new drug. Usually, there is also a *control*—that is, the same bacteria are grown in the same way but not exposed to the new drug. The scientist then watches the treated bacteria and the untreated bacteria. If the treated bacteria are dying while the untreated ones are still growing, that

could mean the drug is working. Scientists might next test the drug in laboratory animals and later in people.

Which Studies Involve People?

When studying people, scientists often use *observational* studies. In these, scientists keep track of a group of people for several years. It's useful to be able to observe the same people over a long time period. By looking at what those people have in common, as well as how they differ, scientists can discover clues as to who develops a disease and who does not. What they learn can suggest the path for more research.

However, observational studies are limited since they may not be able to prove a cause and effect. Many things can affect an outcome. For example, if an observational study finds that a group of people who chose to eat carrots every day had less heart disease than a group who ate no carrots, that does not mean that eating carrots definitely prevents heart disease. Perhaps the group who ate carrots already had a heart-healthy diet or maybe they exercised regularly. Because the scientists were only observing the carrot-eating behavior, they did not see other factors (both obvious and subtle) that might affect the results.

On the other hand, it is also possible that since the scientists didn't ask about family history, they didn't know that the group who didn't eat carrots had many more cases of heart disease in their family tree than the carrot-eating group—a factor that could have a big influence on the development of heart disease. Further research is often needed to help prove what directly affected health.

What Comes Next?

The results of laboratory experiments and observational studies, when looked at together, might point to the next research step. For example, perhaps a new cholesterol-lowering drug has been tested in the laboratory. And, studies using the drug in animals suggest that it lowers cholesterol levels. Because observational studies have shown that people with high cholesterol levels are more likely to have heart attacks, scientists want to know if heart attacks could be prevented by using the new drug to lower cholesterol levels.

To prove whether or not an intervention, such as this drug, might work in people, scientists use another kind of research study, the *randomized controlled clinical trial.* A clinical trial often involves thousands of people.

First, the research team looks for volunteers, who are assigned to study groups by chance *(randomized)*. For each group that receives a treatment, there is a *control* group that gets a *placebo*. A placebo looks just like the treatment or drug being tested but contains no active medicine. Sometimes people call a placebo a "sugar pill." In addition, the study is *masked.* This means that neither the doctors nor the volunteers know who is getting the test treatment or the placebo. In the case of the cholesterol-lowering drug, for example, study investigators keep track of cholesterol levels and heart attacks in each group over a predetermined period of time. They also watch for side effects of the drug. At the end of the study, the results are analyzed, and everyone learns who was getting the treatment and who the placebo. If there were fewer heart attacks in the group receiving the test drug, it

might mean lowering cholesterol levels with this new drug prevents heart attacks.

How Are the Results Explained?

To describe how well this fictional drug prevented heart attacks, scientists might talk about how it affects someone's *risk* of heart attack. Were people receiving the drug more or less likely to have a heart attack than people who got the placebo?

To explain the findings, scientists report risk, either increased risk or reduced risk, which is sometimes referred to as the "benefit" of the intervention. Risk can be explained in several ways. These include *relative risk* and *absolute risk*.

When the difference in risk between two groups is described as "relative," it is usually shown as a percent—like the 50% increased risk of stroke described at the start of this tip sheet.

When that difference is described as "absolute," it is nothing more than a number found by subtraction—again at the start of this tip sheet, an absolute risk of 1 in 1,000 people. It is important to understand what these numbers mean because how they are presented to you can affect how you "feel" about the finding and whether you decide to change your health-related behavior.

Let's first look at relative and absolute *differences* without thinking about health risk. For example, a soccer team is selling boxes of cookies to raise money for new uniforms. Emily sold 66 boxes, and Sara sold 60 boxes. Emily sold 10% more than Sara—that's the relative difference. Stated another way, Emily sold six more boxes than Sara, the absolute difference. When you hear that Emily sold 10% more than Sara, that might sound like a good margin. But if you understand that meant only six boxes, you might also think that, really, it may not be that much—with just a little more effort, Sara might have tied or beat Emily!

	Emily	Sara
Number of boxes sold	66	60
Relative difference	10% more than Sara	
Absolute difference	6 boxes more than Sara	

Relative Risk and Your Health

The results of the cholesterol drug trial might be described in terms of *relative risk*. This compares the chance that a person who takes the new medicine will have a heart attack to the chance that someone not taking the medicine will have one. It tells us how much larger or smaller the risk of heart attack is while using the test drug. Maybe the study showed the **chance** of heart attacks in the group receiving the placebo is 50% greater than the **chance** of heart attacks in people taking the test medicine. That does not mean half of all those not taking the test drug had heart attacks. Instead, this is what it means: Let's say the group receiving the test medicine had a 2% risk of heart attack. Then the untreated group would have a 3% risk of heart attack—50% larger than the 2% risk in the treated group.

Absolute Risk and Your Health

Absolute risk tells you the number of health problems that happened or might have been prevented because of a treatment. In our imaginary study of a new cholesterol drug, maybe there were 2 heart attacks in 100 people taking the drug and 3 heart attacks in a similar group taking the placebo. That is, for every 100 people not using it, there would probably be 1 more heart attack (3 minus 2). That's the absolute risk. Some people find absolute risk easier to use for their own healthcare decisions than a relative risk percentage.

Putting Risk to Work

How can you use risk information when making healthcare decisions? To illustrate, let's look at Julia, who recently learned that she has lost bone mass and might develop osteoporosis. Exercising and getting more calcium and vitamin D are slowing her bone loss. But her doctor also suggested she use a drug to help prevent osteoporosis. Several drugs are available. Julia asked her doctor how well each one would protect her from breaking a bone. For each medicine, the doctor gave her a risk percentage (relative risk) and also told her how many more people who don't take each drug break a bone than those who do take the drug (absolute risk). They also talked about the possible side effects of each drug.

Julia found it helpful to think about risk in a slightly different way—looking not only at the risk of breaking a bone, but also the chances of **not** breaking a bone. For example, if people who take osteoporosis drug A have a 30% risk of breaking a bone, that also means they have a 70% risk of **not** breaking a bone. People taking osteoporosis drug B have a 60% risk of breaking a bone or a 40% chance of **not** breaking a bone. Both prevent fractures, but drug A appears to be more effective.

Another approach to making a difficult decision about treatment or lifestyle changes is to try stepping back a little. It can be useful to look at the risks and benefits, and think about how you would decide for someone else. Perhaps you can more objectively weigh benefits versus risks when you are not thinking about yourself.

Ask Yourself

The next time you learn about a new medical finding, here are some questions to ask:

1. ***Was this a study in the laboratory, in animals, or in people?*** Results of research in people are more likely to apply to you.

2. ***Does the study include enough people like you?*** Were the people in the study a similar age, sex, education level, income group, and ethnic background as you? Did they have the same health concerns and lifestyle?

3. ***Was it a randomized controlled clinical trial involving thousands of people?*** These trials give scientists the most useful information about whether a treatment or a lifestyle change is effective. But they are the most costly to do, and scientists hope to find more efficient, less expensive ways to study this in the future.

4. ***Where was the research done?*** Scientists at a medical school or large hospital, for example, often lead complex experiments or have more experience with the topic. Many large clinical trials involve several institutions or clinics, but the results may be reported by one coordinating group.

5. ***Are the reported results in line with previous studies?*** Sometimes a study will report something very different from what scientists expected to find. In medical research, the road to understanding is never straight. Research findings may differ, but the trend of research should be in the same direction. Any result needs to be repeated elsewhere several times before it might be considered truly valid.

6. ***What does it mean when the results of a study are described as statistically significant?*** Statistically significant means the finding is not likely to be due to chance. It does not always mean, however, that the finding is important for your health decisions.

7. ***Are the results presented in an easy-to-understand way?*** Absolute risk, relative risk, or some other easy-to-understand number should be used.

8. ***If a new treatment was tested, were there side effects?*** Sometimes the side effects are almost as serious as the disease. Or, the drug might worsen a different health problem.

9. ***Who paid for the research? Do they stand to gain financially from positive or negative results?*** Sometimes the Federal government or a nonprofit foundation helps fund research costs. They looked at the plans for the project and decided it was worthy of support, but they will not make money as a result. If a drug is being tested, the study might be partly or fully paid for by the company that is developing the drug.

10. ***Where did you see or hear the results? Is the newspaper, magazine, website, or radio or television station a reliable source of medical news?*** Some media outlets have special science reporters on staff. They are trained to interpret medical findings. These news reports can alert you about the latest research results, but you should talk to your doctor to help you judge how accurate the reports are.

Interested in a Clinical Trial?

To learn more about clinical trials, the National Institute on Aging has two publications—*Clinical Trials and Older People—Tips from the National Institute on Aging* and *Participating in Alzheimer's Disease Clinical Trials and Studies*. Both are available at *www.nia.nih.gov/health*, or you can get a print copy by calling 1-800-222-2225. If you would like to volunteer for a clinical trial, you will find many listed at *www.clinicaltrials.gov*.

The Bottom Line

Ask your doctor to help you understand the results and what they could mean for your health. The results of one study need to be considered along with similar research by other scientists at different locations over a period of time before they are accepted as general medical practice. Progress in medical research takes many years, and understanding what new discoveries mean to you will help you improve, as well as protect, your health.

For more information about health and aging, contact:

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