SPECIAL COMMUNICATION

In Defense of Generalists: Primary Care Observations Have Systematic Advantages

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There is a perception that physician specialists are the experts, and that generalists, often called primary care physicians, are the 'Jack of all trades, master of none.' However, this perception ignores the knowledge that comes from clinical observations, and it is here where the generalist viewpoint has advantages. Generalists observe patients before and after they develop medical concerns. In contrast, the clinical experiences of specialists are often focused on a subset of the population, typically based on certain concerns or age groups. Seeing only a slice of the population may lead to biased clinical perceptions for the effects of behaviors, conditions, or treatments in the general population. In this commentary we demonstrate that limiting clinical observations to patients who have a certain condition or are above a certain age can make exposures which are harmful seem beneficial, and exposures which are beneficial seem harmful. Using hypothetical examples, we illustrate that there are systematic reasons why generalists who see patients over the long-term, both before and after medical concerns, can have a more accurate vantagepoint. (J Am Board Fam Med 2024;37:1133–1139.)

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Introduction

Physicians can be broadly categorized into generalists or specialists. This commentary focuses on physicians who care for an adult patient population, where generalists have labels such as family medicine, general medicine or internal medicine physicians. These generalists, also called primary care physicians, see patients for preventive health care visits as well as a wide array of concerns over the long-term. In contrast, specialists may only evaluate patients with concerns in a particular organ system or in a particular age-group. Many patients want care from physicians who are experts, and there is the perception that physicians who limit their patient panels to those with specific conditions and/or age groups are the experts. In fact, in the Oxford English Dictionary, a synonym for "expert" is "specialist."[1] In contrast, generalists are often viewed as the "Jack of all trades, master of none."

We believe that equating "expert" to specialist is misguided. We agree with others who have documented that by achieving the "4 C's of primary care" promoted by Starfield (Contact, Coordination, Continuity and Comprehensiveness),[2] improved outcomes are often seen, and generalists can rightly claim that they are the experts in taking a broad, comprehensive and holistic approach to patient care.[3] The purpose of this commentary is to use the tenets of the causal inference paradigm to explain an additional under-recognized advantage from the generalist perspective, namely that the experiences of generalists may be less prone to selection bias.

Expertise comes from both external sources and experience. The developers of our modern system of evidence-based medicine (EBM) fought to elevate the role of evidence from research, yet they also emphasized the importance of clinical experience.[4] EBM asks physicians to integrate clinical expertise along with the best evidence and patient values and preferences when providing care.[4]

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Generalists have the advantage of seeing patients over the long-term (ie, the continuity aspect of Starfield's 4C's[2]) both before and after they have medical concerns, and for routine, preventive visits in the interim. In contrast, most specialists see patients for brief, isolated slices of time. Knowing patients over time gives generalists an advantage understanding social needs, family systems, and cultural issues which all contribute to knowing the patient's values and preferences. Generalists and specialists undergo similar training in medical school with respect to evaluating published literature, although specialists may also receive additional training during their longer residency programs. Specialists likely read more about conditions within their specialty and are generally more up-to-date about cutting-edge research and novel treatments that might be useful when standard treatments are ineffective. Specialists have a vital role in caring for those with rare conditions where generalists may lack experience. Specialists may also have technical skills that generalists do not possess. One would generally not want a generalist being the main treating physician for an acute arterial obstruction or many forms of cancer.

There is no shortage of examples taught to medical students worldwide where the generalist misses something important, and the specialist saves the day. Examples of the opposite are hard to find, since by definition patients who improve with the generalist never see the specialist. This commentary focuses on clinical expertise which is greatly affected by clinician experiences. For better or worse, what we see in clinic alters our knowledge and judgments. We argue that when it comes to clinical observations, the specialists who see selected populations can have misleading impressions about the effects of behaviors, conditions or treatments. We use a structural approach to selection bias[5] to demonstrate that seeing selected populations can make harmful exposures seem beneficial, and beneficial exposures seem harmful. Using simplified hypothetical examples for pedagogical purposes, we illustrate that there are systematic reasons why generalists who see patients over the long-term, both before and after medical concerns and conditions, can have a more accurate vantagepoint.

Scenarios

The following hypothetical examples depict situations where a specialist seeing only a selection of the patient population would have biased clinical observations.

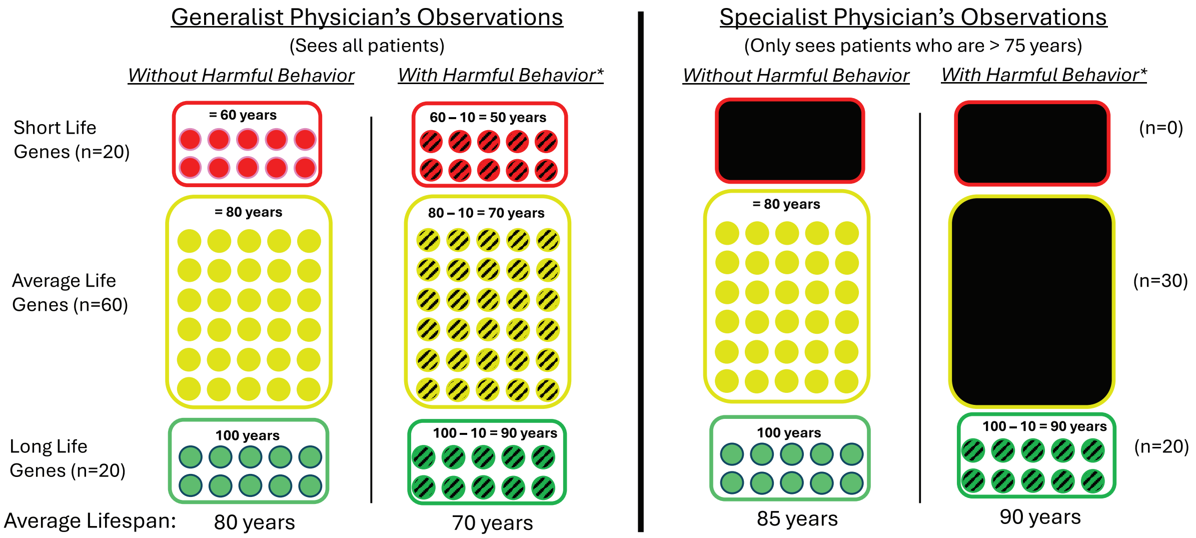
1. Something Harmful May seem Beneficial When Evaluating Only Older Adults

Figure 1 depicts a clinic population of 100 people with intrinsic or acquired variability in lifespan. For simplicity, we will attribute this to genetic variability and imagine that 20 have short-life genes with a life expectancy of 60 years, 60 have average-life genes with a life expectancy of 80 years, and 20 have long-life genes with a life expectancy of 100 years. Assume that physicians are unaware of their patient's genotypes. Now, imagine that half of the population has a specific harmful behavior (eg, smoking) which shortens lifespan by 10 years in everyone. This harmful behavior is independent of the genotypes. Among those with this harmful behavior, those with short-life genes now live to only 50 years, those with average-life genes now live to 70 years, and those with long-life genes now live to 90 years.

The left side of Figure 1 shows the observations of a generalist who sees the entire adult population and the right side shows the observations of a specialist who only sees those over age 75 years. The generalist observes the entire cohort over time and notes that those without the harmful behavior live on average to 80 years, and those with the harmful behavior live on average to 70 years. The generalist's clinical experience would lead them to believe, correctly, that the harmful behavior is harmful. However, as shown on the right side of Figure 1, a geriatric specialist who only sees individuals over 75 years of age would observe that those without the harmful behavior live to 85 years whereas those with the harmful behavior live to 90 years. The specialist's clinical experience would lead them to incorrectly believe that the harmful behavior is not harmful, but instead, beneficial.

The reasoning is as follows: Unbeknownst to the specialist, those with the harmful behavior must have the long-life genes as all others would have died before age 75 years. Thus, the specialist observes that those with the harmful behavior live to age 90 (ie, 100 – 10) years. However, also unknown to the specialist is that the comparison

Figure 1. Observations on the lifespan of a population with genetic variability where a harmful behavior shortens life by 10 years.



Notes: The circles represent a population with genetic variability that is unknown to the physician observers (red = short lifespan, yellow = average lifespan and green = long lifespan). The diagonal lines through the circle represent those with a harmful behavior that is known to the physicians. On the left, the Generalist sees all adult patients and observes that those with the harmful behavior live to an average of 70 years, whereas those without the harmful behavior live to an average of 80 years. On the right, the Specialist only sees those over age 75 years. Consequently, all those with the harmful behavior must have had long lifespan genes. The Specialist may incorrectly conclude that the harmful behavior is beneficial because those with the harmful behavior live to an average of 90 years, whereas those without the harmful behavior live to an average of 85 years.

group of those without the harmful behavior is not genetically similar to those with the harmful behavior, but rather a mix of 75% those with average-life genes (who live to be 80 years) and 25% those with long-life genes (who live to be 100 years). On average the specialist would note that those without the harmful behavior would live to an average age of 85 years. The specialist's observations about the harm of the behavior would fall prey to bias because the specialist is comparing 2 groups who have different risks for the outcome independent of the harmful behavior. This form of selection bias has been labeled "depletion of the susceptibles."[6–8] For pedagogical purposes, we provided an extreme example whereby selecting the elderly found that those with the harmful behavioral lived longer than those without the harmful behavior. Using the same reasoning but with different numbers, the harmful behavior might seem merely less harmful.

The above example is overly simplistic, depicting only 2 causes of the outcome (genes and a single behavior) that are completely independent of each other. Real-life is obviously more complicated. Still, there are real-life examples that are consistent with the selection bias we described. For example, the Danish Birth Cohort Studies of 1895 to 1915 found "no survival association with the 'usual suspects' in the oldest-old."[9] The authors wrote, "Despite the large sample size and virtually complete follow-up, the well known mortality predictors in middle-aged and young old, for example, smoking, obesity, education and a number of chronic diseases were not found to be associated with mortality in the oldest-old." In another example, researchers using data from NHANES III in the US noted, "the risk of death associated with smoking is significantly lower at older ages, where smoking no longer increases mortality for individuals who survive to age 80 and beyond."[10] To be clear, we believe that smoking is harmful in all age groups, just like the harmful behavior in our simplified example. It is the choosing of people who must live beyond a certain age that creates the misleading impression. Outcomes tend to have more than 1 cause and evaluating only those above a certain age can be fraught with selection bias. We have previously outlined ways to mitigate this in research.[11]

2. Something Beneficial May Seem Harmful When Evaluating Only Older Adults

Perhaps less intuitive, the same principles shown in scenario 1 can make exposures which are beneficial (eg, gardening) seem harmful to a specialist. Consider the same cohort as above with lifespan variability which, for simplicity, we will attribute to genotypes. Similar to scenario 1, those with a short-life genes live to 60 years, those with an average-life genes live to 80 years and those with a long-life genes live to 100 years. But now imagine that half of the population has a beneficial behavior which increases lifespan by 10 years in everyone. Among those with the beneficial behavior, those with short-life genes now live to 70 years, those with average life genes now live to 90 years and those with long-life genes now live to 110 years. Using the same distributions of genotypes as scenario 1, those without the beneficial behavior would live to be an average of 80 years and those with the beneficial behavior would live to be an average of 90 years. Consequently, the generalist seeing the entire population would observe that those with the beneficial behavior live 10 years longer on average.

If there were a geriatric specialist who only saw those 85 years of age or older, then that specialist would have a biased viewpoint of this beneficial behavior. The specialist would be unaware that those without the beneficial behavior must have had the long-life genes. The specialist would merely see that those without the beneficial behavior live to 100 years of age. In contrast, those with the beneficial behavior would be a mix of 75% those with average-life genes (who live to 90 years) and 25% those with long-life genes (who live to 110 years) to reach an average age of 95 years. In this example, the specialist would observe that those with the beneficial behavior die 5 years earlier than those without the beneficial behavior. Beneficial actions can also be depleted when a specialist sees a selected group.

3. Something Harmful May Seem Beneficial When Evaluating Only Those with a Health Condition

The clinical experience of specialists who see only those with a specific condition may also suffer from selection bias. Figure 2 depicts an imaginary cohort where some contract a condition. The condition has 2 causes which we have labeled X and Z. Assume that 10% of the population gets the condition through X, and 30% of the population gets the condition through Z. If X is a cause, then the person dies at 60 years, and if Z is the only cause, then the person dies at 70 years. If they have neither X nor Z, then they do not have the condition and they live to be 80 years.

The left side of Figure 2 shows the generalist's experience which is with the entire population. The generalist recognizes that both X and Z shorten lifespans: Those with neither X nor Z live to an average of 80 years. Those with X live to only 60 years, and those with Z (mix of those with and without X) live to 69 years. Those without X (mix of those with and without Z) live an average of 77 years, and those without Z (mix of those with and without X) live an average of 78 years.

In contrast, the specialist's experience is only with people who have the condition, which means they have either X or Z, or both X and Z. The specialist would perceive X to be harmful because their deaths occur at age 60 years; however, they may perceive Z to be beneficial because those with Z live longer than those with X. This is referred to as collider stratification bias because the 2 variables, X and Z both cause (ie, collide on) the condition, and there's stratification as the specialist is seeing only those with the condition.[12]

While this theoretical example may seem esoteric, in fact collider stratification bias is an explanation for many absurd findings in the medical literature. These findings are often labeled as paradoxical but can be explained through the logic of collider stratification bias. In the hypothetical example above, the physicians knew who had X and who had Z. However, in real-life physicians and researchers are often unaware of all the causes of conditions. When observing only those with a medical condition, a known cause of the condition can seem beneficial if it is less dangerous than other causes. Studying only a select group of patients has led to reports of health benefits from smoking and obesity such as the following: greater survival in babies born to mothers who smoke when studying only small birth weight babies,[13] greater survival in smokers when studying only those with certain types of lung cancer,[14] improved blood pressure readings in smokers when studying only those with hypertension,[15] lower rates of pediatric diabetes in those with obesity when studying only those who had a test for diabetes,[16] and hundreds of articles claiming an advantage of obesity when studying only those with conditions caused by obesity such as heart failure.[17]

Figure 2. Observations on the lifespan of a population where a condition* has 2 causes, X or Z.

Notes: The circles represent a population where there are patients without a condition (green circles) and patients with a condition (striped circles) that may be caused by either X (red) or Z (yellow) The variable X causes people to die at age 60 and the variable Z causes people to die at age 70. On the left, the Generalist observes the whole patient population and notices that patients without the condition live to be 80 years of age, patients with X die at age 60 and patients without X (mix of those with and without Z) die at age 77, and patients with Z die at age 69 (mix of those with and without X) and patients without Z die (mix of those with and without X) at age 78 (some have X). On the right, the Specialist observes only patients with the condition. The specialist observes that patients with X die at age 60 years and patients with Z die at age 69 years (some have Z and X). The specialist would therefore incorrectly conclude that Z is beneficial.

4. Bias from Evaluating Only Those Who Fail Standard Treatments

When specialists see only those who fail to improve with treatments given by primary care physicians, they may not fully appreciate the benefits of the prior treatments. Many treatments result in some who respond well and others who do not. Imagine a common musculoskeletal condition whereby standard, noninvasive, care causes symptoms to improve in 80% of patients. The patients who do not improve (ie, the remaining 20%) seek care at a specialty clinic. What if the physicians at the specialty clinic randomize their patients to test the standard noninvasive measures against a novel injection? Imagine that the specialist noted that in those assigned the injection, 50% improved, 40% stayed the same and 10% had side effects. The comparison group would be those assigned to the standard care group. Since those patients have already not responded to standard noninvasive measures, it is likely that they would not respond again.

Consider a patient with the condition who has not sought care previously. The generalist's observations would lead to a recommendation for the standard noninvasive treatment, informing patients that there's an 80% chance of benefit. The specialist's observations are only with patients who had shown themselves to be unaided by the standard noninvasive treatment. Consequently, the specialist might recommend the injection as the most effective initial treatment. Of note, based on the example above, it is unknown how well the novel injection works compared with standard care in those who have not failed standard care. The injection may be expensive. It is certainly invasive, and we know that it causes side effects in 10% of people whereas the noninvasive treatment is unlikely to have side effects.

5. Loss to Follow-up: Another Reason Why Generalists May Have Less Biased Observations

Observations from generalists are likely less prone to bias from "loss to follow-up."[18–20] When a physician asks a patient to return if no improvement occurs, the physician may assume that any patient who does not return has improved. In fact, the patient may have chosen to not return for other reasons. Research studies confirm that losses to follow-up are often doing worse than those who return.[18,19] The generalist may have a more accurate assessment of their treatments as they are more likely to see their patients after treatment. For example, the patient who has not improved with treatment, whether prescribed by a generalist or a specialist, may return to their generalist to request a referral, return for assistance with other conditions, or return for preventive health care visits. At any of these visits, the generalist may learn of the previous treatment's failure or success.

Limitations

The examples given above were theoretical scenarios and one could conceive other scenarios which show the clinical experience of the specialist to be superior. We have assumed that generalists see an unselected population, but patient panels of generalists can also be limited by geography, socioeconomic factors or other variables. For the patient with a chronic condition who requires frequent visits to a specialist over a lifetime, then the specialist's observations would be more like the generalist's in the scenarios. Certainly, in many real-life situations the specialist is unquestionably the more informed expert, such as with conditions which are rare and/or require highly technical skills. Specialists are likely to acquire a higher level of knowledge on particular topics through extra study of the medical literature. This commentary focused on the knowledge that comes from clinical experience. Some may argue that the clinical experience of the specialist becomes more advanced in a specific area because they see more people with a particular condition. However, when there's a systematic error such as selection bias due to seeing a restricted sample of patients, seeing more patients within the same restricted sample does not correct the bias and may, in fact, increase the misperception about the effectiveness of certain actions.

Conclusion

This commentary has tried to counter the perception that the physician specialist is the expert, and the physician generalist is the "master of none." This perception ignores the knowledge that comes from clinical observations, and it is here where the generalist viewpoint has advantages. Many generalists follow patients reflective of the general population, and see these patients both before and after they develop medical concerns. In contrast, the clinical experiences of most specialists are focused on a subset of the population based on certain conditions or age groups. Seeing only a slice of the population may lead to biased clinical perceptions for the effects of behaviors, conditions, or treatments in the general population such that those which are harmful can seem beneficial and those which are beneficial can seem harmful. In summary, for many common conditions, when it comes to the knowledge gained from clinical observations, being a generalist has systematic advantages.

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