Statistical Modeling, Causal Inference, and Social Science

"Luckily, medicine is a practice that ignores the requirements of science in favor of patient care."

Posted by Andrew on 19 February 2017, 9:33 am

Javier Benitez writes:

> This is a paragraph from Kathryn Montgomery's book, How Doctors Think:
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> > If medicine were practiced as if it were a science, even a probabilistic science, my daughter's breast cancer might never have been diagnosed in time. At 28, she was quite literally off the charts, far too young, an unlikely patient who might have eluded the attention of anyone reasoning "scientifically" from general principles to her improbable case. Luckily, medicine is a practice that ignores the requirements of science in favor of patient care.
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> I [Benitez] am not sure I agree with her assessment. I have been doing some reading on history and philosophy of science, there's not much on philosophy of medicine, and this is a tough question to answer, at least for me.

I would think that science, done right, should help, not hinder, the cause of cancer decision making. (Incidentally, the relevant science here would *necessarily* be probabilistic, so I wouldn't speak of "even" a probabilistic science as if it were worth considering any deterministic science of cancer diagnosis.)

So how to think about the above quote? I have a few directions, in no particular order:

1. Good science should help, but bad science could hurt. It's possible that there's enough bad published work in the field of cancer diagnosis that a savvy doctor is better off

ignoring a lot of it, performing his or her own meta-analysis, as it were, partially pooling the noisy and biased findings toward some more reasonable theory-based model.

2. I haven't read the book where this quote comes from, but the natural question is, How *did* the doctor diagnose the cancer in that case? Presumably the information used by the doctor could be folded into a scientific diagnostic procedure.

3. There's also the much-discussed cost-benefit angle. Early diagnosis can save lives but it can also has costs in dollars and health when there is misdiagnosis.

To the extend that I have a synthesis of all these ideas, it's through the familiar idea of anomalies. Science (that is, probability theory plus data plus models of data plus empirical review and feedback) is *supposed* to be the optimal way to make decisions under uncertainty. So if doctors have a better way of doing it, this suggests that the science they're using is incomplete, and they should be able to do better.

The idea here is to think of the "science" of cancer diagnosis not as a static body of facts or even as a method of inquiry, but as a continuously-developing network of conjectures and models and data.

To put it another way, it can make sense to "ignore the requirements of science." And when you make that decision, you should explain why you're doing it—what information you have that moves you away from what would be the "science-based" decision.

Benitez adds some more background:

> As I'm sure you already know, what and how science is practiced means different things to different people. Although pretty significant this is just **one** quote from her book:) I may be wrong but I think she is a literary scholar interested in epistemology of medicine. Here's a few links to give you more context on the book:
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> 1. This book argues that medicine is not itself a science but rather an interpretive practice that relies on clinical reasoning.
> 2. She makes it clear that medicine is not a science, but a science-using practice with a collection of well-honed skills involving a special familiarity with death.
> 3. Here Montgomery shows, with example after example, just why we should see medicine, not so much as a science but rather as situational reasoning serving a practical end; an endeavour based upon, but distinct from, medical science…
> 4. She suggests that "science is a tool, rather than the soul of medicine" and that medicine "is neither a science nor an art. It is a distinctive, practical endeavor whose particular way of knowing . . . qualifies it to be that impossible thing, a science of individuals".
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> You probably already know we memorize lots of facts, get very little training in statistics and philosophy, so asking a doctor if the practice of medicine is a science is a challenging question. I also think it's a very important question and addressing it would benefit the field.

This all raises interesting questions. I agree that it would be a mistake to call medicine a science. As is often the case, I like the Wikipedia definition ("Science is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe"). Medicine *uses* a lot of science, and there is a science of medicine (the systematic study of what is done in medicine and what are the outcomes of medical decisions), but the practice of medicine proceeds case by case.

It's similar with the practice of education, or for that matter the practice of scientific research, or the practice of nursing, or the practice of truck driving, or any job: it uses science, and it can be the subject of scientific inquiry, but it is not itself a science.