

William Black, M.D.: Call to order

By Amos Esty

As a radiology resident in the early 1980s, Bill Black began to have some reservations about his chosen specialty. It seemed to him that the field lacked rigor. “There seemed to be a lot of variation . . . in terms of what tests were done and how patients were managed,” he says. “I was looking for some order.”

Black had majored in math as an undergraduate, so he took a logical, quantitative approach to solving problems. To someone with that mindset, the problems within radiology posed an attractive challenge.

At about the time he finished his residency, Black read a journal article showing that screening for lung cancer using chest x-rays did not reduce the risk of dying from lung cancer. In screening, people with no symptoms of a disease are checked for signs of that disease. A common example is mammography. Every year, millions of healthy women who have no symptoms of breast cancer have x-rays taken to look specifically for early signs of breast cancer.

“I and most everyone I knew just sort of assumed that early detection would lead to better outcomes,” Black says. So he was surprised to read that screening for lung cancer didn’t reduce mortality. That paper inspired him to learn more about the use of screening in health care—and eventually to question almost everything he knew about medicine. “If we can’t figure out something this basic, like whether or not it’s good to detect a lung cancer when it’s small versus larger, what are we sure about?” he asks.

The questions Black was posing were becoming increasingly relevant, because the tools available to radiologists were rapidly improving. New technologies, such as computed tomography (CT) scans, allowed doctors to see more detail than ever before. But Black realized that better images did not necessarily mean better outcomes for patients. “We know intuitively that the pictures are pretty,” he says. “They’re showing us more. The big uncertainty is . . . understanding how effective our interventions, our treatments, are.”

After starting his career at the University of Virginia, Black worked for several years at the National Institutes of Health, where he conducted research on health outcomes. In 1991, he was recruited to Dartmouth. Not long after Black arrived, another newcomer, Dr. H. Gilbert Welch, heard Black give a talk on his research. Welch says

Grew up: Chicago suburbs

Education: University of Illinois ’75 (B.S. in mathematics); Medical College of Virginia ’79 (M.D.)

Training: University of Virginia (residency in radiology, fellowship in cross-sectional imaging)

Ambition during college: “To be a pure mathematician”

Early jobs: Mowing lawns, lifeguarding, and working as a vendor at Wrigley Field

Daily routine: Riding his bike to work, when the weather allows

“Screening in general is a close enough call that we shouldn’t use scare tactics or just force people into it, but instead explain . . . the risks and benefits,” says Black.

that he was impressed with Black’s thoughtfulness from the start. “He’s an extremely careful researcher who really raises some fundamental questions,” Welch says. “He expresses some of the most interesting and important ideas in medicine.”

Finding that they shared an interest in understanding the benefits of screening and in studying health outcomes, Black and Welch began a long and productive collaboration. Welch says their work boils down to two basic ideas. First, “the harder you look, the more you find.” And second, “as we look harder, the typical patient is less sick.”

And that, he says, can create a self-perpetuating cycle. “If you look harder, all of a sudden it seems like there’s more people with disease, more reason to be looking for disease,” Welch explains. “At the same time, the typical patient does a lot better, and it really seems like what you’re doing makes sense, when in fact you may be hurting people.”

Last year, Black and Welch collaborated on a paper summarizing their thoughts on overdiagnosis in cancer. Overdiagnosis, they wrote, is “the diagnosis of a ‘cancer’ that would otherwise not go on to cause symptoms or death.” They estimated that about 25% of breast cancers detected with mammograms represent overdiagnosis, as well as about 60% of prostate cancers detected with prostate specific antigen (PSA) tests. Many such patients go on to receive invasive treatments, exposing them to potentially devastating side effects, or even death, all from a “cancer” that would never have caused a problem.

But a confounding factor, Black and Welch noted, is that overdiagnosis can only be conclusively identified if a patient is *not* treated for cancer and eventually dies of a different cause. In other words, no one knows at the time of diagnosis whether a patient is being overdiagnosed. As a result, almost everyone with a positive finding on a screening test gets treated.

Black and Welch are careful to point out, however, that these concepts don’t imply that patients shouldn’t undergo screening tests, only that they should be aware of the potential downsides of screening. Also, they emphasize further, there is a clear distinction between a screening test of a healthy individual and a diagnostic test of an individual showing symptoms of a disease; the latter is always a justifiable choice.

Black’s research on screening has at times put him in the midst of

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controversy. In 1993, he was a member of a committee convened by the National Cancer Institute (NCI) to assess the effectiveness of mammography. The panel reviewed the existing research and found that, for women aged 40 to 49, there was no definitive benefit from routine mammography.

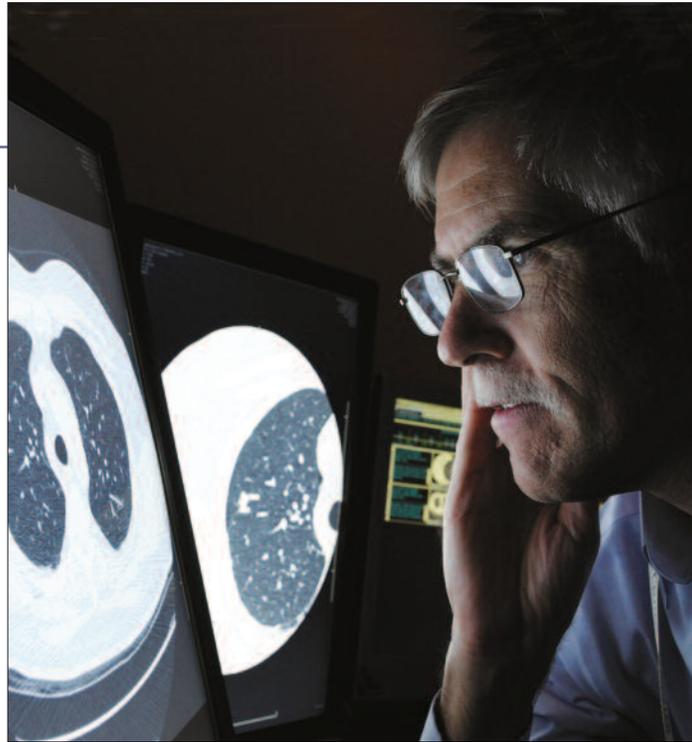
Their report drew attention from the media, the public, even Congress—much of it negative. Critics charged that the conclusions were an attempt to cut health-care spending, though panel members responded that they had not even included the cost of mammography in their analysis. “I just . . . called it as I saw it,” Black remembers. “But I had a very unpopular view.”

Today, the issue of whether women in their forties should get mammograms remains a point of contention. Guidelines published in 2009 by the U.S. Preventive Services Task Force caused widespread controversy by concluding—as the NCI panel had 16 years earlier—that for women in their forties, mammograms did not offer a clear benefit and that the decision to undergo mammography should be made by each woman, individually, in consultation with her physician.

For the past decade, one of Black’s primary research interests has been helping to lead a major national trial of lung cancer screening using CT scans, the National Lung Screening Trial (NLST). The trial enrolled almost 55,000 participants from 2002 to 2004 at 33 medical centers across the country. About half the participants underwent annual CT scans for three years, while the other half underwent annual chest x-rays for three years. The study followed participants through the end of 2009 and compared the number of deaths from lung cancer in each group to see if CT screening decreased the risk of death from lung cancer.

Participants in the CT group were 20% less likely to die from lung cancer during the study than were participants in the x-ray group, a finding that Black says is truly significant. “Even though that doesn’t seem huge in relative terms, . . . lung cancer is by far and away the leading killer among all cancers,” he says. “So if you put that in the context of how big lung cancer is, that’s a fairly impressive finding.”

Black says the rigor with which the trial was conducted is almost as important as the reduction in mortality. All of the participants were at much higher risk of lung cancer than the general population. Their ages ranged from 55 to 74, and all had a long history of smoking. That’s



JON GILBERT FOX

Black, a leader of the National Lung Screening Trial, helped ensure the rigor of the study’s finding—that using CT to screen smokers for lung cancer saves lives.

one important difference between screening for lung cancer compared to screening for other cancers, he says. “With lung cancer, it’s pretty easy to find the people at risk.”

Another notable element of the lung trial is that few invasive procedures such as biopsies were performed, even on participants who had a positive CT scan. Many of the positives in both groups turned out to be false positives, so a high rate of invasive follow-up procedures might indicate that some people were treated unnecessarily. But only about 3% of the participants with a positive CT scan underwent an invasive procedure, and very few

complications resulted from those that were performed. Black says these results show it is possible to do large-scale screening without causing a lot of unnecessary interventions and side effects.

Finally, Black points out that patients in the CT group had a lower rate of death from any cause—not just a lower rate of death from lung cancer. That’s important, he explains, because investigators sometimes misclassify the cause of death in screening trials, leading to an apparent reduction in death from the disease being studied but no reduction in death overall. “Death is pretty certain, but the cause is anything but,” he says. “So you really have to be careful about how you determine the cause of death.”

“I think it’s a great study,” says Welch, who was not involved in the NLST. “Any time people really go to the effort to actually try to capture the full effects of screening, everybody’s got to applaud it.”

Given Black’s history of skepticism toward screening, his enthusiasm for the NLST results may seem surprising. But he doesn’t dispute that screening and other uses of imaging technology can be beneficial—only that it’s important to carefully evaluate their effectiveness.

“I still believe that screening in general is a close enough call that we shouldn’t use scare tactics or just force people into it, but instead explain to them as best we can what the risks and benefits are,” Black says. As Welch puts it, “We just need to tell people the truth.”

Black is now working with colleagues to develop ways to communicate to patients the risks and benefits of lung cancer screening. He worries that if the screening technique used in the trial was extended nationwide, it might lead to problems. “You wouldn’t want to exag-

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much is certain. What I particularly loved about her article was her ability to so succinctly identify the key element of our program and to work it into a beautiful narrative—about scientific haves and have-nots and how we at DMS are addressing a statewide concern.

The story reinforced for me the central meaning of the program; this is why I accepted the job and why I enjoy the work we do. I was fascinated, even awed, to see it captured in print. Thank you—a million thanks, really. I'll be keeping this article with me for many years to come!

CHARLES WISE
Thetford, Vt.

Wise is the project manager at DMS for NH-INBRE—the New Hampshire IDEa (Institutional Development Award) Network of Biomedical Research Excellence. The program, funded by a \$15-million federal grant, aims to improve scientific research and education at eight undergraduate institutions in the state. ■

Faculty Focus: Black

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gerate benefits or exaggerate risks," he says. "You wouldn't want overly aggressive follow-up of findings."

So one lesson the former math major took from the NLST is that, as with everything else in radiology, it's essential to take a rigorous approach. "There should be a logic," he says. "There should be a method for reporting our observations, for interpreting our observations, and for making decisions." ■

Alumni Album: Auerbach

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that of his father and Dow, he, too, plays a lot of different positions—from caring for hospitalized patients to teaching residents to conducting research on patient outcomes to spreading the word about his specialty.

So Auerbach might be working in a different environment than those early mentors, but, like them, he has become a pillar of his own community. ■

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