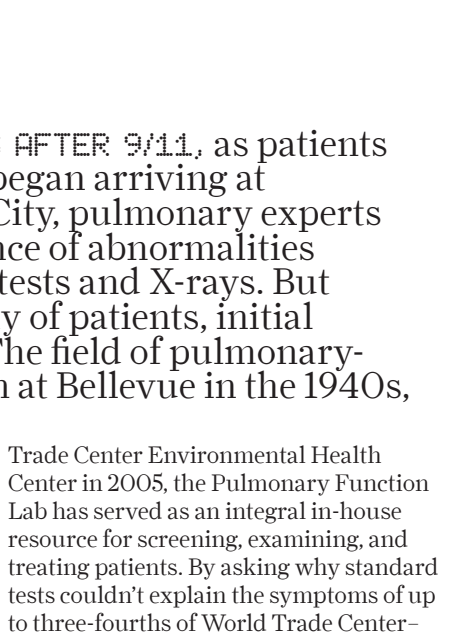
DOCTOR:
ROBERTA GOLDRING

Innovative Tests Uncover Breathing Problems

Something wasn't adding up.

BY:
BRYN NELSON

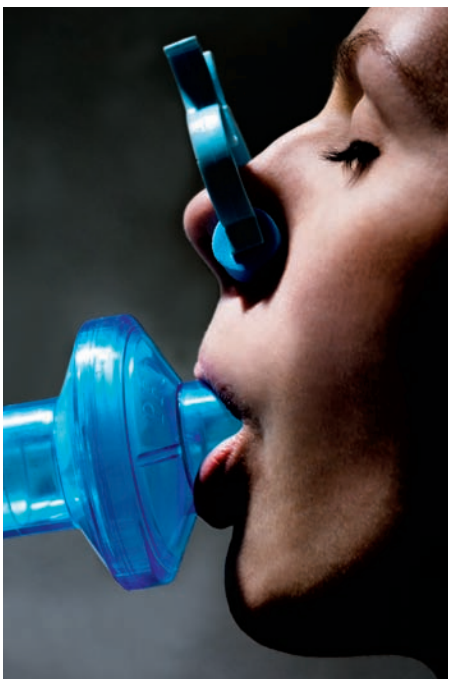


Roberta Goldring, M.D. (foreground), who directs the Pulmonary Function Lab at Bellevue, tests a patient.

IN THE MONTHS AFTER 9/11, as patients with respiratory symptoms began arriving at hospitals around New York City, pulmonary experts were expecting to find evidence of abnormalities through standard breathing tests and X-rays. But for an overwhelming majority of patients, initial tests showed nothing at all. The field of pulmonary-function evaluation was born at Bellevue in the 1940s, a legacy of Nobel Prize winners Drs. Andre Cournand and Dickinson Richards, Jr. More than 60 years later, this current incarnation of their famed Cardiopulmonary Laboratory trains a steady influx of medical fellows and residents, performs specialized tests available nowhere else in the city, and evaluates about 2,000 patients every year.

"When a patient is referred, we translate the request into a question," says Roberta Goldring, M.D., director of the lab, a protégé of Drs. Cournand and Richards. "That question may or may not be what the initial doctor had intended to ask." The lab, as Dr. Goldring and her colleagues see it, should be less concerned with recognizing patterns than with asking about lung physiology and how disease can affect the organ's intricately branching airways.

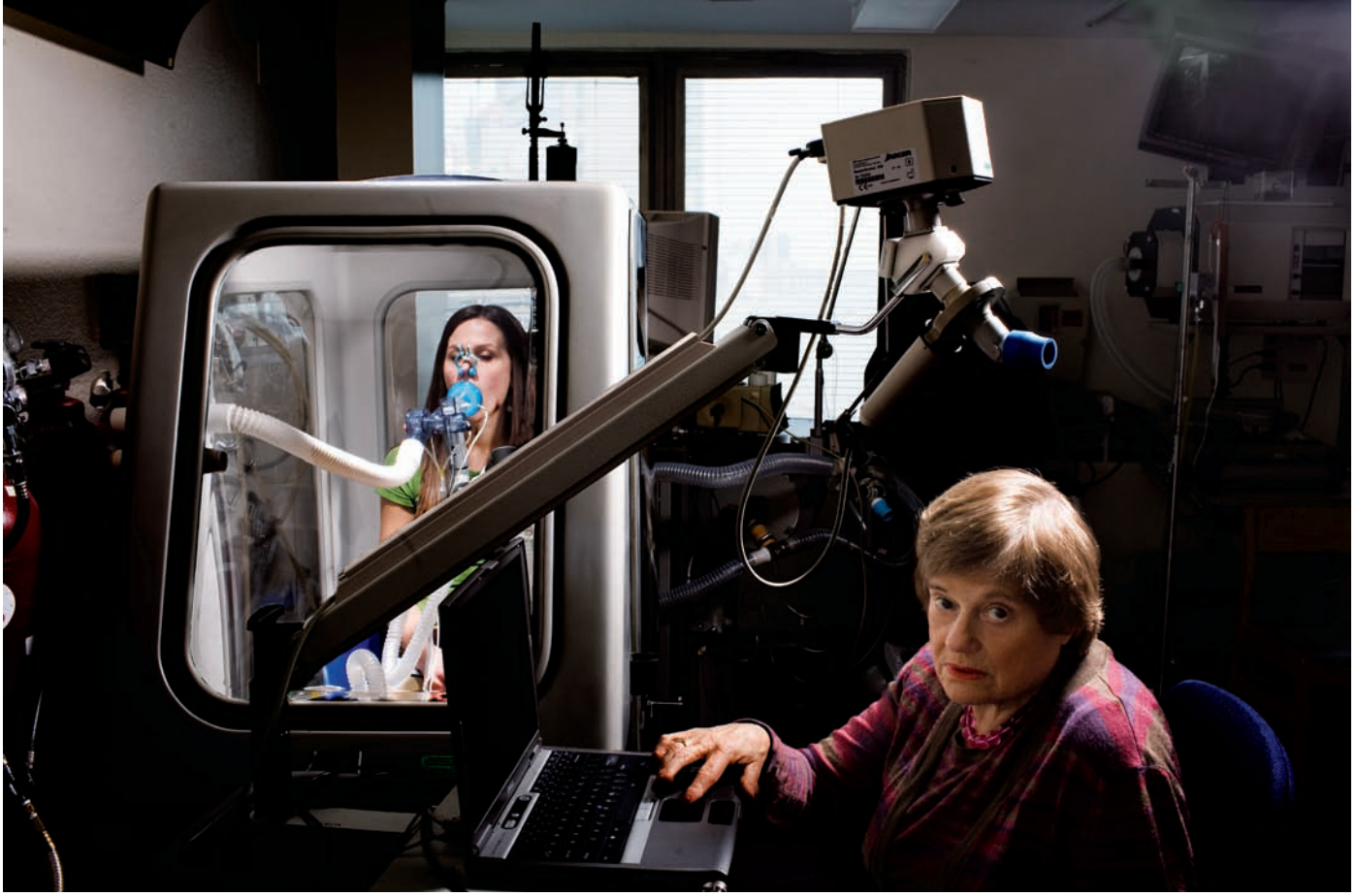
Since the opening of Bellevue's World Trade Center Environmental Health Center in 2005, the Pulmonary Function Lab has served as an integral in-house resource for screening, examining, and treating patients. By asking why standard tests couldn't explain the symptoms of up to three-fourths of World Trade Center–affected patients, the lab's experts may redefine how screens for a far greater array of respiratory diseases are conducted.



Spirometry, the most common pulmonary function test, measures maximum airflow and volume as patients inhale or exhale. The test, however, covers only the lungs' largest airways, about 25 percent of the total bulk. Although spirometry can detect asthma or chronic obstructive pulmonary disease-related anomalies, it is far less useful in pointing out problems within the peripheral airways that comprise the majority of the lungs. Lab physician Beno Oppenheimer, M.D., an instructor in medicine who also directs the surgical intensive care unit at the Manhattan VA Medical Center, says diseases of these smaller airways have troubled pulmonary physiologists for years, not least because of the difficulty in identifying them. The peripheral lung network is often dubbed the "silent zone" because of its inaccessibility to most medical exams.

But not all. In the late '90s, the NYU/Bellevue Occupational & Environmental Medicine Clinic sought the lab's advice for a group of asthmatics and chronically ill patients exposed to respiratory irritants in the workplace. Despite their symptoms, the patients had passed the spirometry test, and the best alternative at the time was an invasive three-hour examination in which doctors threaded a catheter down the esophagus to check for obstructions in the small airways. The results were dramatic, revealing an obstruction in every case. Treating the patients with asthma inhalers reversed most of the abnormalities.

From that experience, clinicians at the lab suspected that esophageal catheters would likewise uncover lung obstructions



in those exposed to dust and debris following the World Trade Center disaster. But using the invasive test on thousands of people simply wasn't practical — it would also have been painful. Fortuitously, lab physician Kenneth Berger, M.D., assistant professor of medicine and physiology and neuroscience, heard about a new alternative known as forced oscillometry, which measures airflow resistance in the small peripheral airways of the lung and can be performed on resting patients. Unlike the esophageal catheter, oscillometry is noninvasive, quick, and particularly child-friendly due to its simple requirement that patients breathe normally into a mouthpiece linked by tubing to a computer.

Coincidentally, the technique was first described in the 1950s by a former Bellevue physician, but the prototype machine was limited to research use and never marketed commercially. A half-century later, however, other researchers were discovering its potential for revealing abnormalities in the lungs of iron workers, smokers, and patients exposed to airborne toxins. The lab quickly bought a new version of the oscillometer, a decision that yielded a breakthrough study published last October in the journal *Chest*.

In their paper, collaborators from the lab and the WTC Environmental Health Center re-examined 174 symptomatic patients with normal spirometry test results. Remarkably, the new oscillometry method pointed toward an obstructed airflow in the smaller airways in the lungs for two-thirds of the patients, a finding that correlated strongly with results obtained independently by the esophageal catheter. Again, most patients responded well when treated with asthma inhalers.

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But as with other World Trade Center–related health studies that lack direct before-and-after comparisons, the new analysis cannot conclusively rule out other factors — city air pollution, for instance — as the real culprits for these respiratory ailments. To address that uncertainty, the Bellevue lab and health center are teaming up again, this time in collaboration with the New York City Department of Health and Mental Hygiene.

Early in January, the researchers began bringing their portable spirometry and oscillometry machines to community rooms and centers around the city, rapidly testing residents exposed to airborne particles after 9/11 and New Yorkers living in unaffected neighborhoods. If the data show clear differences between the two groups, the new measurement could strengthen the suspected link between the disaster and the upswing in health problems among downtown workers and residents. "And it has the potential, because of its applicability to smoking, to asthma, to any other occupational and environmental disease, to totally change the way we do screening for respiratory diseases," Dr. Berger says.

What of the symptomatic patients who nonetheless tested "normal" on every test? "We're still left with a little bit of a dilemma, clinically," he says. Another collaboration investigating new functional MRI (fMRI) techniques, however, may yet reveal the source of their unexplained symptoms. The laboratory's history is, after all, one of preparing for the chance opportunities that have come along over the years. Defining the physiology of individual patients, Dr. Oppenheimer says, has not only opened up broad new avenues of research and collaboration but also paved the way toward reworking treatments and reclassifying diseases. "We're going to end up redefining the patterns that were described in the 1940s," Dr. Goldring adds. A fitting enterprise for the lab that started it all. ●