[MUSIC PLAYING]

ROBERT KELLY: So pectus excavatum is a condition of the front of the chest in which there's a depression because the sternum is abnormally close to the spine. It's a problem which is present at birth in, perhaps, a third of patients, but develops in most around the time of the adolescent-growth spurt. And in many of those patients, it becomes much more severe around the time of the adolescent-growth spurt.

It's very clear, in pectus excavatum, that a large fraction of patients, in our series of somewhere around 4,000 practice patients, we find about 2/3 have symptoms. The symptoms are commonly shortness of breath with exertion, easy fatigability, or pain in the chest.

So children who develop pectus excavatum when they're toddlers or younger can be treated with the vacuum bell, a suction cup that's placed on the front of the chest. And we want to do that when the chest is very flexible and pliable, which means that it's a good time to start around the beginning of school age.

Commonly, though, the depression really isn't noticeable until the patient gets to the pubertal growth spurt-- so perhaps around the age of 12, 11, somewhere in there. And symptomatic patients then can present for evaluation to the Nuss Center.

We use an objective evaluation with three-dimensional imaging; external optical scanning, using white light to characterize the shape of the chest; CT scanning or MRI scanning to give a cross-section of the internal organs; pulmonary-function testing to see the effect on the lungs; and echocardiogram and EKG, which are done to check the effect on the heart. The evaluation of chest-wall patients was developed here at CHKD. And with that evaluation, we don't operate on about half the patients who turn up for evaluation, even though the majority of our patients come from outside our so-called "normal service area."

So you know that if you send your patient here, they are going to get treatment only if they need treatment. And we try to evaluate very objectively who it is needs what type of intervention.

"Pectus carinatum" is the medical name for the condition where the sternum or breastbone protrudes abnormally far from the spine. Pectus carinatum is less common than pectus excavatum in the United States. And patients seldom develop pectus carinatum before the time of the growth spurt that happens at puberty-- so around age 12 or so.

Patients with pectus carinatum complain of problems with exercise and endurance less frequently than patients with pectus excavatum, but it certainly affects carinatum patients as well. Similarly, chest pain can occur at the site of the protrusion in pectus carinatum.

In patients with pectus carinatum, we treat patients with a staged management. So the first stage of management is to treat the patient with an external brace. About 3/4 of patients treated with a brace have effective treatment. And in those in who embrace treatment isn't effective, we offer surgical treatments, of course.

Generally speaking, brace treatment is undertaken around the age of, say, 13 or 14. I think 14 years is the average age our patients begin treatment with the brace. It generally requires a year to two years of treatment with the brace.

After the brace has flattened the chest, there's a recurrence of pectus carinatum in about 5% of patients. So even though we don't require the patient to wear the brace to skeletal maturity, 95% of the time, the chest stays in the corrected position after it's straightened out.

So we're happy to see patients with carinatum whenever they're noticed to have the problem, and that typically is around age 13 or 14. If it is noticed in a toddler or a younger child, we can see the patient, but children that young-- very difficult to treat with a brace. It's hard for somebody that small to wear the brace for many hours a day.

Our experience with excavatum carinatum has been reported several times. The first report of the first 10 years came out in 1998. In 2008, we reported the next 10 years. And over that 20-year interval, we had treated 1,215 patients.

We just had accepted for publication in the top surgical journal, which is *Annals of Surgery,* report of the last 10 years of experience with pectus excavatum, which was 1,034 patients. This hospital certainly has the largest experience with this problem in the United States, and we continue to look at all aspects of the chest-wall problem.

So we have looked at lung function, the radiographic evaluation of patients, the psychological implications of the problem and you've shown that the body-image concerns that so many patients have-- many of the boys won't take their shirt off to go swimming or to do shirts and skins basketball or whatever. But after operation, they can't wait to get their shirt off, and frequently sit up in the hospital ward with no shirt on in bed after they've had their repair.