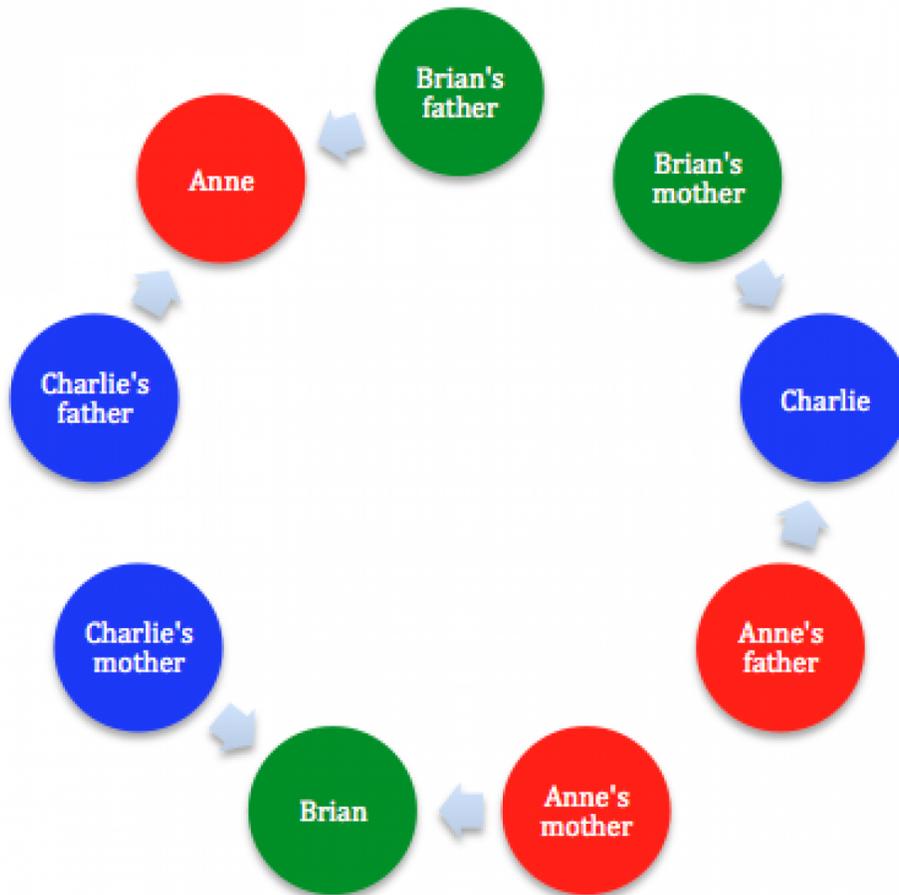


Lung exchanges

Breathe deeply for the three of us



Free exchange

Sep 28th 2014 | by A.T. | BOSTON

IN 1993 Vaughn Starnes, a Californian surgeon, performed an operation on a 13-year-old patient with cystic fibrosis, a disease that affects breathing. He removed one lung lobe from each of the parents then transplanted them into the child's lungs. All three survived their operations and the child's condition improved dramatically. It's a happy tale. How can economics get it to happen more frequently?

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Healthy people have five lung lobes: two in the left lung and three in the right. But four lobes are enough to live a normal life and even to run a marathon. Most patients suffering from cystic fibrosis have two failing lung lobes that need to be replaced. They have two options: either wait for a transplant from a dead person, or hope that two living donors donate one lobe each. But finding compatible living donors is

hard. Even parents' lungs often do not match the blood- and tissue-types of their children.

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Let's say Anne and Brian both need a pair of lung lobes, but neither of them is compatible with their respective parents. But what if they are both compatible with *each other's* parents? Anne's parents give their lung lobes to Brian, Brian's to Anne, and they both live to run the marathon.

But what if Anne and Brian are only compatible with *one* of the other's parents, but there is another patient, Charlie? As long as they are mutually compatible, Anne could receive lobes from Brian's and Charlie's fathers, Brian could get transplants from Anne's and Charlie's mothers, and Charlie could breathe through the lungs of Anne's dad and Brian's mum (see figure). That is a three-way lung exchange (see chart).

On September 28th Haluk Ergin, Tayfun Sönmez and Utku Ünver [presented](http://www.tayfunsonmez.net/wp-content/uploads/2014/09/lung-exchange-6.pdf) (http://www.tayfunsonmez.net/wp-content/uploads/2014/09/lung-exchange-6.pdf) a novel matching algorithm that finds all possible patient-donor combinations that could mutually benefit from an exchange of lung lobes. They work in a field of economics called “market design”, which studies how markets

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The authors simulate their algorithm using the living lung-donor population in America. The number of lung transplants in America could double, thereby proportionally helping more patients than do kidney exchanges. (These results are conservative: implementing the scheme would boost publicity for lung exchanges, which could induce further living donations.)

The National Organ Transplant Act, passed in 1984, forbids exchanging organs “for valuable consideration”—that is, for money. But in 2007 Congress amended (<https://www.govtrack.us/congress/bills/110/hr710#summary/libraryofcongress>) the Act to allow “paired organ exchanges”, such as kidney exchange, since it does not involve cash. This amendment will probably apply to lung exchanges as well, reckons Alexandra Glazier, vice-president of the New England Organ Bank. The first trial is likely to happen in Japan, where 40% of lung transplants are already from living donors. The earlier hospitals adopt nationwide lung exchanges, the more willing donors there will be.

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