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From the campus of Harvard Medical School, this is *ThinkResearch*, a podcast devoted to the stories behind clinical research. I'm Oby.

And I'm Brendan. And we are your hosts. *ThinkResearch* is brought to you by Harvard Catalyst, Harvard University's clinical and translational science center.

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Social networks exist everywhere-- online, in real life at work, at school. But we don't often consider how our networks of health care can be predetermined for us. Unknowingly, this trend has huge impacts on our health care spending without a direct link to outcomes. As health care systems become more complicated and networks become larger, Dr. Michael Barnett is looking to find a solution that will also result in better outcomes and improve efficiency.

Dr. Michael Barnett is an assistant professor of health policy and management at the Harvard TH Chan School of Public Health and a primary care physician at Brigham Women's Hospital. So Dr. Barnett, thank you for joining us. Welcome to the show.

Thank you.

You're a primary care physician, as well as a researcher. One of your first published papers looked at patient-sharing networks and the cost of care in US hospitals. Could you tell us what patient-sharing networks are?

Patient-sharing networks are really a different way of looking at the health care system and the data that health services researchers, which is my discipline, typically look at health care data. So a lot of the work that we've done to learn about the health care system comes from health insurance claims from large insurers. Like for instance, Medicare has data going back decades on tens of millions of enrollees in the program.

Now, one way to look at it is to think of those data as just a record of different services that patients have gotten and how much they were paid and which doctors did them. Another way to look at it is that actually you can link together doctors by the patients that they have both seen in a particular time period.

OK, so like a primary care physician and a specialist, for example.

Right. So a primary care physician sees a patient three times in a four-month period. And then during that same period, they see their cardiologist twice. And so you could say, we don't know exactly whether or not that primary care doctor and the cardiologist actually talked with one another and know anything about the other person. But they do share this patient. We do know that.

And with just that little insight, you actually add this enormous dimension of complexity in these data that reflects this very complex web of how the health care system's interconnected. The reason I'm interested in patient-sharing networks and why I think there's a little growing cottage industry in health services research looking at them is that often our experience as physicians and patients is getting lost in this web of the health care system and seeing lots of doctors.

And who's talking to whom? And what does it mean to have a team that actually knows each other versus doesn't? To us it seems like one of the only ways to capture that complexity in a way that does it justice is to actually take the network perspective and actually rise above just the way of looking at health care as just a list of doctors who are seeing a patient at a given time.

And could you tell us a little bit more about what you looked at in this study and what the goal of the study was?

The motivation for the study was-- we did this actually several years ago back when, in the health services world, all the rage was trying to understand variation in spending. So this was back when the Dartmouth Atlas of Health Care was talked about really quite a bit.

And so this was the groundbreaking research done by Elliott Fisher, Jack Wennberg, and many other colleagues-- John Skinner-- at Dartmouth, where they did a pretty descriptive analysis where they just looked at how much an average patient in Medicare costs across different regions of the country. And they looked at it in many different ways, looking at either total spending or end-of-life spending or how many primary care or cardiology visits people had.

And what they found was basically, without fail, there was enormous variation in the amount of care and the amount of spending that an average patient got in regions across the country with almost no demonstrable difference in their level of illness or the quality of care or their outcomes. And so many people were scratching their heads trying to what actually drove this difference in care. Why was this happening?

The reason we wanted to look at patient-sharing networks is that we thought, well, maybe one potential explanation for all this variation is actually the extent to which a network of doctors in an area is very diffuse or concentrated. So I'll give an example. As a primary care physician, I could refer, let's say, half of my patients to other specialists. That's a very high referral rate. So if I see 200 patients, then 100 of them are seeing specialists.

Now, those 100 patients-- they could see 200 specialists together. Each of them could see two specialists, each of whom are separate. Or they could all see the same 20 specialists. And each of them is basically spreading their care within a small group of people.

And the difference between those two arrangements of the health care network are not trivial. And they're also-- it's basically impossible to measure without having at least a little bit of a network framework. And so we thought that maybe comparing the difference between the spread of patients across a few versus many doctors through referral patterns actually might be one of the underlying mechanisms that generated increased spending.

Because the concept would go that patients who see many, many more doctors across an entire region-- their physicians communicate less. They're more likely to get duplicative care. They're more likely to get care from people who have different approaches to managing certain illnesses. And just more stuff is going to happen.

OK. So the idea is that if people see a wide-- like that 200 specialists scenario-- that because they're not talking to each other, the specialist isn't as aware of what has already been done. And it causes more spending, more care that maybe is not necessary.

Yeah. So that's one mechanism. Another one is-- so comparing 200 versus 20, let's say in the group of patients that are seeing 200 specialists there are, let's say, 30 cardiologists that are taking care of those people, whereas in the other there are two. And so the 30 cardiologists are all going to have their own way of doing something.

And that's going to span a spectrum because physicians are human. And we don't expect there to be zero variation between doctors. Everyone is different. But the more doctors you have involved in a patient's care, the more stuff happens. Whereas the patient seeing two cardiologists are almost by definition going to get a relatively narrower spectrum of care decisions made about certain things because there's only two doctors who are largely responsible for that.

And so part of this is just mechanical. It's not necessarily that people are duplicating the same test over and over or purely that they're not talking with one another. But if a group of patients is just seeing a huge span of specialists, just more different things will happen to them.

One interesting facet of this is that I think the average American consumer probably prefers the system where patients see many more specialists because nobody wants to be in a system where they feel like they're constrained to only see one of three or four people if they want a specialist. They want to know they have the entire menu open to them. And they can see anyone. But the trade-off there is that then you have a system where a single PCP might have patients seeing 20, 30 different cardiologists.

And from your study, what kind of conclusions were you able to draw about the effect of these networks and whether or not they're spread out or not? How does that affect-- I mean, you're looking at costs. But were you also looking at quality of care?

In the first study we looked at, it was really largely spending and utilization-- so basically how often people got hospitalized or the amount of care they used in the end of life. And in subsequent studies, my colleagues have looked at more quality-focused outcomes, like readmissions, emergency room visits.

What we found was that metric of how many physicians do my patients see as a primary care doctor, which in the network lingo is called "degree"-- we found that, first of all, that varied enormously across regions and across hospitals by five-, six, seven-fold depending on where you were. And that was just the median.

So in some areas of the country, the average panel of 100 patients saw 100 different physicians in a year. And in another part of the country, it could be 600 or 700 physicians. So first, there was enormous variation.

But also, that variation was strongly associated with overall spending in almost any metric that we looked at in Medicare. And it's very hard in these study designs to have something that's causal, where we can actually move past just a pure association, though what I can say is that the association between this metric and variation in spending was stronger than most other things that we looked at or that were available to observe about these areas.

And what are some of those other things? Because you're talking about the entire country, which has many variations in density and time that people have to travel to get to doctors.

So you can look at the physician supply in an area, how many physicians are there, how many hospitals are there, population density, just anything you can observe about an area, like median income and things like that. You can also measure other aspects of how health care is delivered.

It is a complex question that I can't exactly answer, which is, how many of those things are on the causal pathway between this concept of degree and spending versus just simply confounders? That's pretty complex because it's not like a simple one-to-one relationship. But I think for us, it was pretty-- we were surprised by the magnitude of the association and just how strong it was relative to other predictors.

The other metric that we looked at, which is a decent amount more sophisticated, is when you have a network of physicians, you can look at more than just the number of other doctors a patient sees. You can also look at the position of physicians relative to one another in that network.

So for instance, you could have a network where the way things work is there is an outer ring of PCPs that are just all referring to this clump of specialists in a hospital in the center, a hospital in some metro area. And that could turn out to be a network where specialists end up being very central, where basically the path connecting any two PCPs almost always goes through specialists. And we call those "specialist-centered networks."

Then you could have actually the opposite scenario, where basically there's a lot more sharing between primary care physicians in one way or another. And they're referring more to kind of like an outer ring of specialists. And that would be more of a primary care-centered network. So the idea is really, where is the-- are patients more likely to bounce back and forth between specialists or back and forth among primary care doctors in one way or another?

And what we found was that there is a strong positive correlation between increased use of care and spending in the specialist-centered networks and the opposite for primary care-centered networks. And there's no mechanical reason why that actually would necessarily need to be the case. It is probably related to-- they're not exactly the same-- as looking at primary care versus specialist supply in an area.

So there are certain regions of the country where there are proportionately more specialists than primary care physicians. And you see similar relationships when you look at those metrics as well. But to us, that was an interesting demonstration that it seems that's a fairly high-order measure of-- how physicians were connected had a strong relationship with some outcomes that we think were very important.

And what would those outcomes be?

So that was spending per patient and the use of care, like hospital days and ICU days and things like that.

So generally, when the network is more specialist-centered, there's more spending, more hospital care utilization?

Yeah, more use of stuff, lots of stuff, expensive stuff.

So when you have a specialist-centered network, does that necessarily indicate that there are fewer primary care doctors in an area?

Not necessarily. I will admit it's been a little while since I've looked at this. So I don't know that we disentangled it fully. But there's no require-- just because primary care doctors or specialists are central in one network or another doesn't mean by definition that one should be more central than another.

Now, if you have way more specialists than primary care doctors, it's probably a lot less likely that you get a primary care-centered network just if you took random arrangements of networks. So I'm not going to say there's no relationship. But there isn't necessarily a relationship that we would assume would be there by default.

And so this conclusion-- you said this was a little while ago now. But what are some takeaways that you can make from this? Why is this important?

Even though this was a while ago, a lot of other people have been continuing to pursue this work, including the group I worked with when I did that study, which has produced more analyses like this. And what we've consistently found is that the more dispersed physicians' connections are-- so basically, the more physicians their patients are seeing-- and also the looser a physician team is that's taking care of a group of patients.

There's many different ways you can look at this. But the big picture is basically, the more fragmented and dispersed either a network is in a whole region or caring for a single patient or group of patients, the more expensive that care is, the more likely they are to be hospitalized. And their quality is no better or, if anything, looks somewhat worse. It almost never looks better.

And this has been replicated now by a few different groups in lots of different data sets, also by a few economists who have used better causal approaches than we had thought of at the time. So the takeaway here for me-- and I think we really haven't fully realized this yet-- is that there is enormous-- we're still spending a lot of energy in this country trying to redesign our care delivery system.

And a lot of it is looking at, how do individual practices work? Or how do individual hospitals work, which is not an easy problem. We haven't fixed it. But how do you make primary care offices work together better as a team so that the physician and the nurse and the medical assistant and a social worker can actually use each other's skills efficiently and take care of a broader population and all those things? So interteamwork.

And we've barely scratched the surface of a larger problem, which is, how do you actually get virtual teams of physicians working in different offices in a larger area-- not even that big of an area-- to actually communicate effectively and share patients in a way that actually makes sense as opposed to just being basically a random process of which patient happens to see which doctor at a given time?

And all the research that we've done indicates that actually, even though that process has basically no organizing principle for how individual patients go through the system, it's likely it could have a big impact in the care people receive. I think the policy impact there is really-- I think we need to consider that and actually start to think about it in designing delivery systems and in delivery systems actually examining how their patients receive care.

But one problem is we're kind of-- I think we're a little bit ahead of our time, which is that we have such-- our health care system is preoccupied with much more basic issues than just, how do you just make basic processes work well in health care, that it's very hard to get to the higher-order issue of, how do you get this population of patients to see the right group of specialists who communicate with each other and the primary care doctors? But our research implies that that's also probably pretty important and needs to be addressed at some point.

So as a primary care physician that sees patients, how do you take these research findings and implement them in your practice?

So the way I think about it is-- and it is tough because I'm just a single person in the system. But one way is I try to make sure that if I refer a patient to another specialist that there is-- I have a discrete goal. And I communicate that as best as I can to the patient and to the specialist.

And the idea there is that if we have a clear goal articulated for why the patient's seeing that person, they're not just getting captured in the orbit of another physician who's going to see them twice a year. And it's not exactly clear what they're working for or what they're accomplishing. They're just kind of seeing them because they did see them in the past. And that happens a lot, actually.

The other thing is there's lots of talk about-- there's a lot of increasing focus on deprescribing for patients. So how do we figure out when we can take people off of medications that they may not need anymore or may no longer be working as well as they used to?

And so I think in the same way we can kind of deprescribe physicians, which is a lot of patients are seeing tons of physicians. And they're not necessarily getting benefit from seeing that person any more. If somebody's blood pressure is very well controlled, and they were seeing a cardiologist because their blood pressure is very hard to manage, and if their regimen is fine, they don't have to see the cardiologist every six months just to check in and make sure their blood pressure still OK.

The primary care doctor can refer them back or touch base with the cardiologist when things get worse. But otherwise, they just don't have to see that person. And it's basically reducing those unnecessary touches.

From my perspective, it just collectively reduces the burden on my patients and myself of the amount of medical interactions my patients have that may not be working towards them being healthier and happier, which is what we all care about. And we don't care about just people seeing doctors. And the more they see doctors, the more stuff is going to happen, like we just talked about.

So one of the other thorny issues that you've looked at is reducing opioid use disorder. And you have some interesting work that looked at the mixed results and negative unintended consequences of some of these policies. Could you give us some examples of recent policies aimed at reducing opioid use disorder that have had mixed or negative results?

So this is a more recent research interest of mine the same way I was really interested in understanding why health care spending and use varied so much across the country. As a resident, I also saw basically how chronic opioid use and opioid dependence was just this incredible challenge in the primary care system.

And we had been actually taught quite explicitly that chronic opioid use was the compassionate way to treat pain for patients. And it was immediately clear as soon as I had my own primary care panel and started seeing more patients in the hospital that it seems to cause many more problems and be much more complicated for patients the problems and these symptoms it presumably solved. That's what got me interested in this question.

And so for the past three years or so, I've been looking a lot at opioid prescribing and now moving more into understanding opioid use disorder itself. And so the project you're mentioning was a thought piece I did along with a study to ask a broad question of, what are we doing with policy to try to restrict opioid prescribing?

And the reason that's pretty topical now is because, of course, the opiate epidemic is constantly in the news. And it seems like the dominant policy response that has really been the main thrust for state legislatures and the federal government has really been talking about, how do we get doctors to prescribe fewer opioids?

And there's a lot to talk about in terms of whether or not that's actually the right way to reduce opioid use disorder. And I think it probably isn't. But it's been the major focus. And even if we take that as the main goal of these policies, it turns out that we don't have a great track record at knowing exactly which policies make that change effective.

So it turns out that opioid prescribing has fallen enormously since its peak in around 2011, 2012, which is when I graduated from medical school-- right at its peak. It's fallen about 40% since then. But it's not clear at all which policy has actually been associated with that change specifically.

What we did is we looked at a number of different policies that have been tried over the past five years or so and just did a selected survey of high-quality research in the area. And what we found was, pretty consistently, there were very few policies that seemed to consistently be associated with decreased prescribing without any other unintended consequences.

So just to give an example, a very commonly cited policy is called "prescription drug monitoring programs." And these are basically state-level databases that track controlled substance prescribing. And so the idea is that physicians can look up patients before they prescribe an opioid or a new opioid and see whether or not that patient might be misleading them about where they've gotten opioids in the past, whether or not they're doctor shopping, and things like that.

So it looks like these programs called PDMPs for short-- it looks like they might work. But they definitely only work when you mandate their use by physicians. And that wasn't really known until relatively recently. And there had really been no evaluation process in place by any of these states to actually look and see whether these things worked.

And that was really a trend that I'd seen across many of these programs, which is that a lot of these policies are put into place with very strong philosophical beliefs. And people felt like this was the right thing to do but basically had almost no follow-up in terms of asking the question of whether or not this policy achieved the ends that they were planning for it to. Basically, people just turned their attention elsewhere once the law was passed and just kind of moved on to the next topic.

The issue with PDMPs is that when you mandate physicians to check them, it takes actually a fair amount of physician time. And it's actually become really frustrating for a lot of doctors because they have very restrictive security requirements. And you have to change your password all the time. If you forget your password, it adds big-- you have to go into a different window when you're in the clinic room. It's very awkward and frustrating.

Right. And you have a short visit anyway. So it just compounds that.

And it's very awkward if we have to spend four or five minutes of our precious 15, 20 minutes together basically just trying to negotiate logging into a system and entering their information and figuring out, particularly if it's a patient who we have a very low level of concern for. We've known them for a while. But we just have to do this still.

I don't know that anyone has really asked the question of whether or not those mandates and benefits from those mandates has actually merited that extra physician cost. It's something that I think is discussed but just has not really been part of the policy debate.

So then there are other policies out there-- for instance, things like dosage limits, pill limits. There are other policies like criminalizing doctor shopping or giving pharmacists authority to require authorization for certain types of opiate prescriptions. And a lot of the research has found basically no effect of any of these.

There are also more and more programs to basically notify doctors about their opioid prescribing habits, which is what we looked at in this particular study that you mentioned, which is that in part of this comprehensive opioid legislation in Massachusetts called Chapter 55 that was passed a few years ago, the state mandated that the Department of Public Health send doctors a letter that told them, how many opioids do you prescribe? And how does it compare to the rest of your peers and your specialty in the state?

And I got the first wave of these letters. And what I noticed was that the letters seemed completely uninformative because they didn't adjust for the number of patients that a physician saw. So actually, it was largely a measure of just, how much did you work? How big was your patient panel?

And the data was also presented in a particularly poorly compelling way. It just wasn't very easy to read. It was hard to actually get the password to open the file and all that. So we wanted to look at basically whether or not these letters seemed to change the prescribing habits of anyone or high prescribers. And we used some electronic health record data from doctors across the state to look at it compared to neighboring states. And we found no effect.

And our takeaway there was really just pointing out that the Massachusetts Department of Public Health, which was administering this, has a finite number of resources. And they were mandated to do this by the state. And it seemed like a good idea. But it seemed like the primary goal of everyone was just to get this thing done and just like--

Just to get something done to say we did something.

Exactly. It's not that this was a bad idea. It's just that it was a promising idea that probably needed to be done well for it to be successful and needed to actually be monitored to see if you actually achieved any goal you wanted. And if not, then you could either scrap it or redesign it or just decide what to do next. But none of that was really the case.

And from my perspective, if we're going to be designing policy in this incredibly sensitive area that's also really quite controlling for how physicians prescribe, we need to actually have a clear goal and do some kind of monitoring of what happens. And we have the data. It's not asking for something impossible. It just needs to be built into the culture of how we design these policies.

I think the Department of Public Health was not very happy with-- was not super happy with us publishing this. But I still feel that we have to point out when we're just spinning our wheels on a policy. I just don't see why it helps anyone. Even if it feels like the right thing to do, why waste our time on things that physicians will ignore or find unhelpful?

Is there any work that you're doing now or that you have coming up that you're excited about, that you're looking forward to?

Well, I'm doing something in the space of both of these projects, actually. So for the patient-sharing network stuff, one thing that my coauthors and I have recognized is that the research that inspired us to start this patient-sharing network studies-- a lot of that data is actually now 15 to 20 years old.

When we started working on it, it was slightly newer research that was still poorly understood. And now the research that informed what we did is quite out of date. So what we are starting to look at is, how has the dynamics of how physicians have shared patients with other physicians and the way that patients see primary care and specialist physicians across the US-- how has that changed in the past 20 years?

I think with health reform and new payment models, I think there is the concept that we are incentivizing health systems to improve coordination of care, whatever that means. And hopefully what that means is that patients aren't just seeing more and more physicians without any clear reason. And so that's something that we are looking into.

And then another set of projects we are doing around opioid use disorder. One is I'm starting to look more into the availability of treatment for opiate use disorder, which is, as a single-policy issue, probably one of the biggest gaps we have in this country. And so we've been doing secret shopper surveys, where we're calling either buprenorphine prescribers, buprenorphine being probably the most readily available and effective treatment for opiate use disorder that's currently available--

Sort of like a methadone?

Yeah, exactly. So it's similar in many ways to methadone. But it doesn't have nearly as many restrictions to its distribution.

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So that's one thing that we're doing, as well as I'm planning on doing some similar calls to detox and residential treatment facilities as well to understand, what are the barriers that patients might encounter in seeking treatment? And then another thing that I'm doing is moving from looking at prescribing itself to looking at the population of patients on chronic opioid therapy, of which there are still millions in the US, who are kind of caught between a rock and a hard place with these new restrictive prescribing policies.

Because it's not easy to just get off of opioid therapy. But a lot of these policies are really not designed with these patients in mind. So there's an increasingly loud uproar about the hostility of the health care system towards patients who are on chronic opiate therapy. And what happens to them?

And so we're trying to do a lot of basic epidemiology. And we're trying to see how this population has changed over time, understanding-- for those who are discontinued from their therapy, is that actually done within guidelines, which is basically not stopping people cold turkey but actually tapering them over time? And are there any negative effects for people who are stopped off of that therapy? Well,

Thank you, Dr. Barnett. It's been a great conversation.

Thank you. It's a pleasure.

Next time on *ThinkResearch*.

So there are organisms in the environment that are present at the time when an open wound presents itself. They also move in. And they colonize the wound. But they don't create an infection. What we'd like to do-- and which surprisingly has not been done-- is we'd like to characterize the organisms that move in but don't cause infections.

Dr. Victor Neil discusses the skin microbiome and how we should be rethinking wound healing.

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