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Is blood thicker than water? Peer effects in stent utilization among Floridian cardiologists

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ABSTRACT

Variations in physician practice are pervasive and costly, and may be harmful. The objective of much policy in the West is to increase the interconnectedness of physicians, furthering the transfer of information and thus reducing variation.

This study tests whether physicians are influenced by the practice of peers, or if propensity, mere context or sorting of like-minded physicians better explain similarities and differences in practice. We study US cardiologists who place coronary stents into patients with blocked arteries around the heart. Organized in locally competing physician groups and also as solo practitioners, they see patients in offices, but insert the stents at a shared production facility – the cath lab.

We examine their use of the popular drug-eluting coronary stents between their launch and rapid adoption in early 2003, and through the period of late 2006 in which private and public reports of serious late side-effects eventually led to reductions in use. Our analyses use administrative claims data on nearly 1000 cardiologists and their patients in Florida, USA, merged with Florida physician licensure data. Collectively these physicians used these stents nearly a quarter of a million times in the 4 year period reviewed. Pooled and panel linear regressions for device utilization by a physicians are estimated using measures of peer utilization, physician characteristics and controls for unobservable physician characteristics, common shocks and selection effects.

We find strong evidence for intra-group but against inter-group practice spillovers. Even when sharing the same lab, competing cardiologists did not appear to correlate practices. Our results are consistent with a view that policies aimed at increasing the interconnectedness of physicians must first consider the organizational barriers and competitive forces that can stymie knowledge transfer even among physicians working closely together.

Introduction

> "*Some interventional cardiologists are beginning to talk among themselves about a problem some of them think they have seen with drug coated stents*"(*Fogoros, 2005*:1).

Variations in physician practice are well-known in the US (Wennberg & Cooper, 1999), and policies that aim to enhance connections between and improve information flow among healthcare providers may be effective (O'Connor et al., 1996; Valente & Davis, 1999; Majumdar, Chang, & Armstrong, 2002, 2004; Nicholson & Epstein, 2003; Jippes et al., 2010; Meltzer et al., 2010). The premise of such policies is illustrated in the classic Coleman, Katz, and Menzel (1966) study which showed physician peer effects played an important part in the adoption of tetracyclines. Much research finds the potential influence of other physicians and key opinion leaders remains strong (Bikhchandani, Chandra, Goldman, & Welch, 2002; Berwick, 2003; Borbas, Morris, McLaughlin, Asinger, & Gobel, 2000; Burke, Fournier, & Prasad, 2007; Chandra & Staiger, 2007; Escarce, 1997; Grilli & Lomas, 1994; Greenhalgh, Robert, MacFarlane, Bate, & Kyriakidou, 2004; Meltzer, 2009; Soumerai et al, 1998).

Yet the transfer of best practices within healthcare settings has not been simple in the USA and in affluent Western countries more broadly (Doumit, Gattellari, Grimshaw, & O'Brien, 2007; Fattore, Frosini, Salvatore, & Tozzi, 2009; de Jong, Groenewegen, Spreeuwenberg, Schellevis, & Westert, 2010Keating, Ayanian,

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Cleary, & Marsden, 2007; Kuo, Gifford, & Stein, 1998), and practice patterns appear relatively immutable to the influence of peers (Kravitz et al., 2003; Nicholson & Epstein, 2003; Tucker et al., 2007). Observed variations in the utilization of medical service remain widespread in the USA (Fisher et al., 2003), while unobserved differences in which patients are treated likely mask further variation in community health (Huesch, 2010a). On the other hand, some US interventions based on 'top down' policies to reduce practice variations have been very effective (Oshiro, Henry, Wilson, Branch, & Varner, 2009), and more successful than interventions relying on education or peer-influences (Clark et al., 2010).

In this study we contribute to this literature by exploring possible peer effects and variation in the utilization of a new medical device by nearly 1000 specialist physicians in Florida over the period 2003 to 2006. Collectively these physicians used drug-coated coronary stent device [DES] to relieve blockages in the arteries around the heart nearly a quarter of a million times. This period was characterized by rapid adoption and subsequent decreases in use as reports of late side-effects of the device emerged. We relate the use of DES by one physician to the use by his or her partners and competitors, and to observed and unobserved characteristics of the physicians.

We account for differing opportunities for physicians to interact with each other and conjecture that within a practice group there will be correlation in use, while the impact of physicians outside the practice group will be substantially less. We elaborate our predictions to reflect the opportunities for physical contact at a shared practice office, and at a cath lab where competing groups also perform stents. We conjecture that practice partners who share the same office but practice at different labs will still be influential, but competitors practicing at the same lab will not be influential.

We attempt to control for alternative explanations of correlations in physician behavior that have nothing to do with observation, imitation or information transfer. These include random individual propensities which may explain some practice variations (Armstrong, 2003; McGuire, Anstrom, & Peterson, 2003; Nicholson & Epstein, 2003; Omoigui et al, 1998; Skinner & Staiger, 2005). Homophily, or the non-random sorting of like-minded individuals into groups (Aral, Muchnika, & Sundararajan, 2009; Manski, 1993) may also simulate peer effects.

Finally, aggregate contextual effects which impact all physicians can produce the illusion of knowledge transfer (Cohen-Cole & Fletcher, 2008; Iyengar, Van den Bulte, & Valente, 2011a; Lyons, 2011). For example, when the Coleman et al. (1966) study was re-analyzed, incorporating aggregate pharmaceutical advertising spend and pages, peer effects became insignificant (Van den Bulte & Lilien, 2001).

Background

Information gained by one physician and shared with others may reduce other physicians' cost of, or uncertainty about adoption of innovations (Escarce, 1997). Many of the features of the healthcare sector ought to predispose to similar success. Social norms support and encourage altruistic information transmission and best practice transfer, and few legal anti-competitive obstacles block individual physicians sharing commercially sensitive information across organizational boundaries. Medico-legal pressure to conform to a community standard may drive harmonization in individual practices (Burke, Fournier, & Prasad, 2004). Many services are also performed in a shared social and physical setting with opportunities for close direct or indirect interactions (e.g. via sales representatives).

However, the lack of widespread success suggests that other features of the healthcare sector may stymie successful knowledge transfer. For examples, incentives to provide such information may be missing (Phelps, 1992), barriers may hinder its flow, and issues of trust might inhibit acceptance. Such attributes of the *conduits* between physicians, the *contents* of the information to be shared, and the *conditions* that might motivate or inhibit such sharing are all important.

Contents

In our setting, the contents of the information to be transferred include awareness of the new DES stent product. Stents are used by physicians performing percutaneous transluminal coronary angioplasties [PTCA] to treat blockages of the coronary arteries before, during or immediately after a heart attack. To prevent the artery closing again after catheterization and balloon inflation, a small scaffold known as a bare metal stent [BMS] is used. Drug-eluting stents [DES] were a technological revolution which essentially eliminated the early re-blockage associated with BMS. DES were heralded by many physicians as a 'new era' and approved by the US Food and Drug Administration [FDA] in April 2003, by which time the government payor had already announced higher hospital reimbursements for DES, and created new billing codes to simplify adoption.

This public information was widely available to physicians through media, marketing, journal and peer specialty society guidelines (see Table 1). Other information regarding problems associated with its use (e.g. the stent was too large for some vessels, or the introducer too stiff) and information about late side-effects was available privately.

Based on the widespread availability and positive view of DES' effectiveness compared to BMS, the US reached an 80% DES/PTCA implantation rate by the first quarter of 2004. Stricter 'on label' use ought to have led to far fewer patients receiving DES. Instead 'off label' use was prevalent: legal use by cardiologists of DES in ways neither formally approved by the FDA nor proven in the original clinical trials. These adoption dynamics are shown for Florida in Fig. 1.

In 2004, the medical journal *The Lancet* noted four cases of late adverse effects of DES in Europe. Late stent thrombosis [LST] was a sudden and unexpected blockage of the stented vessel a year after implantation often leading to death, often after 'off-label' patient use. Over the next 9 months several journal articles and one conference presentation mentioned this rare but lethal late DES side effect. By August 2005 the FDA had warned that DES patients needed longer anti-clotting therapy and cardiologists had started to privately comment on the DES problem (Fogoros, 2005).

The use of DES fell steadily from the beginning of 2006 as existing practice guidelines set by U.S. specialty peer groups were amended. In March 2006 at the American College of Cardiology conference in Atlanta, results from a large Swiss study showed unequivocal LST evidence. By the end of 2006, the FDA regulator had warned about 'off-label' use, and the need for dual action anti-platelet therapy to prevent LST. In hindsight, as Steven Nissen of the Cleveland Clinic commented: "[cardiologists had] traded a short-term benefit on a relatively benign disorder, namely restenosis, for a long term mortality disadvantage." (Nissen, in Schuchman, 2006, 1951.)

In our setting, some of the information on adverse side effects was private (Fogoros, 2005), and not always verifiable through personal experience. One interventional cardiologist noted "there is a little background noise of thrombosis. If you treat [only] 200–300 patients a year, you don't notice it." (Anonymous, cited in Trends – in – Medicine, 2005, p1).