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Patterns and predictors of physician adoption of new cardiovascular drugs

Timothy S. Anderson[a], Wei-Hsuan Lo-Ciganic[b], Walid F. Gellad[c], Rouxin Zhang[d], Haiden A. Huskamp[e], Niteesh K. Choudhry[f], Chung-Chou H. Chang[g], Seth Richards-Shubik[h], Hasan Guclu[i], Bobby Jones[j], Julie M. Donohue[d,*]

[a] Division of General Internal Medicine, University of California, San Francisco, USA
[b] Department of Pharmacy, Practice and Science, College of Pharmacy University of Arizona, USA
[c] Division of General Internal Medicine at University of Pittsburgh School of Medicine; Center for Health Equity Research and Promotion, VA Pittsburgh Healthcare System, USA
[d] Department of Health Policy and Management, University of Pittsburgh Graduate School of Public Health, 130 DeSoto Street, Crabtree Hall A613, Pittsburgh, PA 15261, USA
[e] Department of Health Care Policy, Harvard Medical School, USA
[f] Division of Pharmacoepidemiology and Pharmacoeconomics and Center for Healthcare Deliver Sciences, Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, USA
[g] Division of General Internal Medicine at University of Pittsburgh School of Medicine, USA
[h] College of Business and Economics, Lehigh University, USA
[i] Department of Statistics, School of Engineering and Natural Sciences, Istanbul Medeniyet University, Istanbul, Turkey
[j] Department of Psychiatry, University of Pittsburgh Medical Center, USA

ABSTRACT

Background: Little is known about physicians' approaches to adopting new cardiovascular drugs and how adoption varies between drugs of differing novelty.

Methods: Using data on dispensed prescriptions from IMS Health's Xponent™ database, we created a cohort of all primary care physicians (PCPs) and cardiologists in Pennsylvania who regularly prescribed anticoagulants, antihypertensives and statins from 2007 to 2011. We examined prescribing of three new cardiovascular drugs of differing novelty: dabigatran, aliskiren and pitavastatin. Outcomes were rapid adoption of each new drug, defined by early and sustained monthly prescribing detected by group-based trajectory models, by physicians within the first 15 months of marketplace introduction.

Results: 5953 physicians regularly prescribed each drug class. The majority of physicians (63.8%) adopted zero new drugs in the first 15 months, 35.0% rapidly adopted one or two, and 1.2% rapidly adopted all three. Physicians were more likely to rapidly adopt the most novel drug, dabigatran (27.3%), than aliskiren (10.5%) or pitavastatin (8.0%). Physician specialty and sex were the most consistent predictors of adoption. Compared to PCPs, cardiologists were more likely to rapidly adopt dabigatran (Adjusted Odds Ratio 8.90, 95% confidence interval 7.42–10.67; $P < 0.001$) aliskerin (2.05, CI 1.56–2.69; $P < 0.001$) and pitavastatin (3.44, CI 2.60–4.57; $P < 0.001$). Female physicians were less likely to adopt dabigatran (0.71, CI 0.59–0.85; $P < 0.001$) and aliskiren (0.64, CI 0.49–0.83; $P < 0.001$).

Conclusions: Physicians vary in their prescribing of recently-introduced cardiovascular drugs. Though most physicians did not rapidly adopt any new cardiovascular drugs, drug novelty and cardiology training were associated with greater adoption.

Over the past decade the US Food and Drug Administration has approved over 300 new drugs, giving physicians a broad array of new medications of varying therapeutic novelty to treat and prevent disease.[1] Innovative therapies targeting cardiovascular diseases have substantially reduced global morbidity and mortality.[2] Yet diffusion of new cardiovascular drugs has been uneven, characterized both by underuse of evidence-based, cost-effective therapies[3–6] and by overuse of some high-cost medications with minimal therapeutic advantage over existing therapies.[7]

Escalating prices have driven prescription drug spending into the spotlight of health policy debates. Policymakers initially focused on controlling patient demand for new drugs by encouraging the use of

* Corresponding author.
E-mail address: jdonohue@pitt.edu (J.M. Donohue).

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generic drugs through tiered formularies.[8] More recent proposals have targeted industry pricing practices[9,10] and emphasized value-based initiatives designed to help physicians and patients better understand the risks, benefits and costs of new therapies.[11,12]

Whether and how new drug introductions lead to changes in patient care or expenditures ultimately depends on the speed and frequency with which physicians adopt them.[13] To achieve more optimal diffusion, whereby physicians adopt truly innovative medicines and seldom prescribe those with little marginal benefit will likely require targeted interventions. Yet, little is known about how physicians approach prescribing of new drugs. Prior studies show that the speed with which US physicians adopt new drugs is correlated with specialty, practice setting, age, sex, and training.[14–19] However, whether a given physician brings a consistent propensity to adopt all drugs or differentiates adoption based on a drug's novelty is poorly understood because prior studies of physician adoption focus on a single drug or class.

We examined adoption of three newly-introduced drugs that nevertheless varied in the extent to which they represented a therapeutic advance over existing products. We examined adoption in the first 15 months post marketplace introduction: dabigatran, a first-in-class oral anticoagulant; aliskiren, a first-in-class antihypertensive; and pitavastatin, the seventh statin, to answer three questions designed to inform future value-based prescribing interventions. First, does physician adoption vary with drug novelty? Second, do individual physicians take a consistent approach to adopting all drugs? Third, what are the characteristics of physicians who rapidly adopt new drugs across multiple classes?

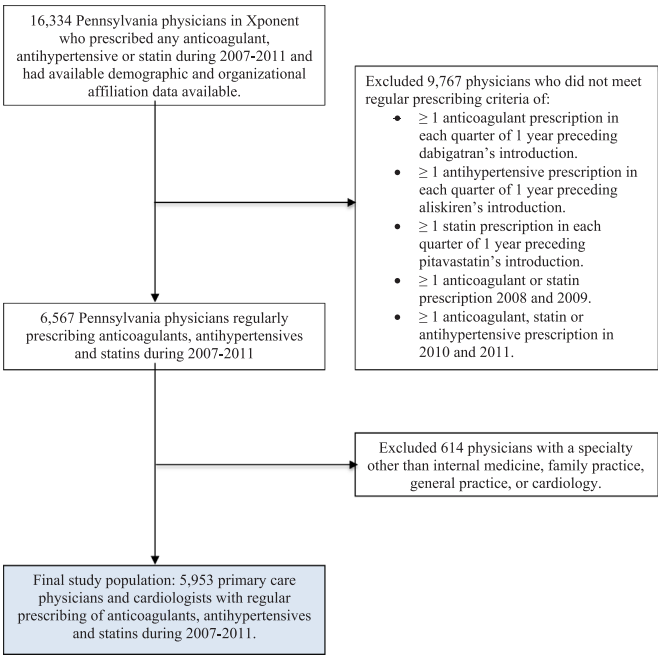

Fig. 1. Prescriber study population flow chart.

1. Methods

1.1. Data sources

We obtained monthly physician-level data on prescriptions dispensed for anticoagulants, antihypertensives and statins from IMS Health's Xponent™ database, which captures over 70% of all US prescriptions filled in retail pharmacies and uses a patented proprietary projection methodology to represent 100% of prescriptions filled in these outlets. Xponent™ includes data on the number of filled prescriptions for the drug classes of interest regardless of payer for patients of all ages. Prescribing data was linked to data on physician characteristics from the American Medical Association (AMA) Masterfile, which includes demographics, specialty and medical education for all US physicians. Physicians' organizational affiliations were determined using IMS Health's Healthcare Organizational Services (HCOS) Database, which captures over 29,000 practices, clinics, hospitals and integrated health systems.

1.2. Study population

We examined monthly prescribing data for all physicians practicing in Pennsylvania who regularly prescribed anticoagulants, antihypertensives and statins. We then limited the sample to physicians with a record in the AMA Masterfile and HCOS databases (Fig. 1). As physician specialty was a major variable of interest and primary care physicians (PCPs) and cardiologists made up over 90% of prescribers of these medications, we limited our sample to those two specialty groups. To measure adoption among actively practicing physicians we required ≥1 prescription fill in each drug class in each quarter of the year before new drug introduction and each year after new drug introduction.

1.3. Study drugs

Our analytic approach examines the influence of drug novelty on adoption of three drugs in three classes of cardiovascular drugs. As such, we are unable to distinguish between novelty and class effects on physician adoption behavior. The ideal experiment to clarify the influence of novelty on physician adoption would examine the introduction of multiple drugs of the varying novelty within the same class, at the same time. However, this experiment is not feasible, as drugs of differing novelty within the same class are rarely introduced in the same timeframe. Comparing adoption across extended time periods risks confounding due to external time-sensitive policies and changes in the study-base of physicians. We focused on cardiovascular drugs as they are widely prescribed by both primary care physicians and cardiologists, and in each drug class there are multiple therapeutic options with largely similar efficacy across patient populations. We examined the prescribing of three recently approved cardiovascular drugs of differing novelty for which alternatives existed prior to the study drug introduction.

Drug novelty was determined using previously accepted definitions which incorporate novel drug mechanism, therapeutic advantage, safety and convenience.[20,21] The most novel study drug, dabigatran was the first new oral anticoagulant approved for treatment of atrial fibrillation. Dabigatran represents the first addition to the anticoagulant market since warfarin and an important advance given similar efficacy in stroke prevention, modest reductions in major bleeding compared to warfarin and no requirement for regular blood monitoring.[22] A second, moderately novel drug, was aliskiren, the first direct renin inhibitor approved for treatment of hypertension. Direct renin inhibitors are the third class of antihypertensives to target the renin-angiotensin system, and studies demonstrate efficacy and tolerability profiles similar to other classes[23,24] but they have not been endorsed as first-line treatments.[25] At the time of aliskiren introduction, there were 40 alternative antihypertensive medication formulations. We considered pitavastatin, the seventh statin to be introduced in the US, to be the least novel of the study drugs as it has the same mechanism of action as existing drugs and clinical trials show it has similar efficacy compared to existing statins.[26]

We examined study drugs that were introduced in a relatively narrow timeframe (2007–2010). Given data availability, we imposed the same follow up period for all drugs. Prescribing of each drug was studied from month of FDA approval to 15 months following introduction: March 2007 to May 2008 for aliskiren, June 2010 to August 2011 for pitavastatin, and October 2010 to December 2011 for dabigatran.