**The Hazard of Oxycontin**

Malcolm Wright, Philip Stern & Charles Graham

**Short Abstract:**

Much is known about the devastating effects of Opioid addiction, but little about its genesis. The most widely cited example (Oxycontin) was developed and designed to be used as an alternative to morphine in order to relieve severe cancer pain.

Like all new drugs which require a prescription to be issued, Oxycontin’s rate diffusion was initially determined by innovative physicians.

This research examines the characteristics of physicians who prescribed Oxycontin within the first year of its commercialisation and finds that those who demonstrated specific interest in the therapy area were likely to be early adopters of the new drug. Other variables had no significant impact on their adoption of Oxycontin.

This result is different to other drugs and highlights the potential role and responsibility of innovative physicians in educating network members in macro-level diffusion processes.

*Keywords: OxyContin, Hazard Modelling, Pharmaceutical Prescribing*

**Introduction and Background**

In March 2019 the Tate Galleries took the unusual step of refusing further donations from the Sackler family, owners of Purdue Pharma, in the face of ongoing legal action against the firm over their production and the public’s subsequent misuse of OxyContin (BBC, 2019). Oxycontin was launched in the mid-1990s as a new opioid painkiller, produced in greater strength to be a longer lasting version of the underlying molecule oxoycodone, its primary indication was the relief of pain in cancer patients. By the year 2000 OxyContin was linked to addiction and crime (Pacheco 2002), and the drug together with other new painkillers such as Fentanyl have been criticised for contributing to widespread recreational abuse of opioids, as well as an upsurge in accidental overdoses and deaths.

How did all this start? OxyContin is a prescription pharmaceutical, so it requires that a physician adopt the drug in their prescribing repertoire before it can become accessible to patients. Physicians experience a variety of influences before first prescribing a new drug, and these influences on innovative prescribing behaviour have been much studied from the early seminal work of Coleman, Katz and Menzel (1957) onwards (e.g. see Iyengar, Van den Bulte & Lee, 2015, Stern and Wright 2016).

The influences on prescriptions can be usefully framed in terms of two-step flow (Katz & Lazarsfeld, 1955) in which an initial adopter is influenced by ideas outside the social system, and then spreads influence using their connections within the social system. Similar ideas can be found in Roger’s work on Diffusion of Innovations (Rogers 1962) and the Bass Diffusion model (Bass 1967). In a similar vein, Lublóy (2014) in a systematic review of pharmaceutical innovation diffusion notes the initial influence as being micro-level, to do with physician characteristics, followed by the spread of influence at the macro-level, to do with the flow of ideas within physician networks, and finally at the broader ‘meso-level’ economic and policy environment.

We do not study the meso-level in the present research. Further, quite a lot is already known about macro-level diffusion among physician networks (see Manchanda et al. 2008; Iyengar et al. 2011; Liu and Gupta, 2012; Iyengar et al. 2015). However, much less is known about micro-level effects such as innovator characteristics which show mixed or contradictory findings for both pharmaceuticals (Lublóy, 2014) and consumer products (Bartels and Reinders, 2011). These contradictory findings may reflect differences between products, but also misspecification of the micro-level characteristics linked to initial adoption. Bartels and Reinders (2011) address the problem of mixed findings in the innovation literature by suggesting the construct of innovation be decomposed into three dimensions. These dimensions are innate innovativeness, domain-specific interest in the product category, and the actual innovative behavior. To date, this conceptualization has not been applied in the literature on pharmaceutical innovation.

**Research Aim**

The aim of this study is to investigate the first part of the two-step flow for OxyContin, the initial innovative prescribing behaviour. That is, how did all start? Unlike prior work, the present study incorporates Bartel and Reinders’ (2011) reconceptualization, including measures of innate innovativeness and domain-specific innovativeness, as well physician characteristics and prescribing volume as covariates, and with innovative behaviour treated as the dependent variable. This approach to modelling innovative prescribing behaviour offers new methods to investigate the question: What type of physicians were the first ones to prescribe OxyContin, leading to the current widespread abuse of this drug?

**Model and Data**

We hold panel data for n = 235 UK physicians for two years – one year prior to the launch of OxyContin, and the one year following including notation on the specific week in which the physician first prescribed OxyContin, if they did so in the first 52 weeks following the drug launch. The time-dependent nature of our data makes is suitable for hazard modelling rather than less statistically powerful models such as logistic regression. We therefore apply Cox proportional hazard regression to our panel data on physician prescribing behaviour. The key variables used, and their operationalisation are:

*Innovative behaviour* – prescribing OxyContin in the first 52 weeks following launch.

*Innate innovativeness* – number of innovative prescribing behaviours across six different therapeutic categories in the year prior to OxyContin’s launch.

*Domain specific interest* – concentration of prior prescribing on nervous system drugs

*Prescribing volume* – total volume of prior prescribing

*Physician characteristics* – practice size, practice location, physician age, physician gender.

**Results**

Table 1 shows, the results. Exp (B) shows how the odds of innovation change with changes to the independent variable. This is managerially meaningful, but does not assist comparisons between variables as it is not scale free. The Wald statistic, conversely, controls for the range of the independent variable and thus can be used for inter-variable comparisons.

Table 1 Hazard of Innovative Behaviour

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Innate Innovativeness | Domain Specific Interest | Prescribing Volume | Practice Location | Practice Size | Age | Gender |
| Exp (B) | n.s. | 2.251 \* | n.s. | n.s. | n.s. | n.s. | n.s. |
| Wald | 0.122 | 4.521 | 1.113 | 0.125 | 1.966 | .611 | 0.076 |

However, both statistics show that the major, and indeed only significant effect, is Domain Specific Interest. That is, it is the ‘experts’ who first adopted this particular drug. Or more precisely; the more a physician concentrated their prescribing in nervous system drugs, the greater the odds that they would engage in innovative prescribing behaviour for OxyContin. This might seem an intuitive result but in fact from the study of 24 other new drug launches we seldom see this pattern.

Thus, OxyContin made its first inroads amongst those who already prescribed a lot of painkillers, and these physicians in turn influenced others. If lax prescribing has been the cause of OxyContin abuse, this might be partially addressed by better education of the expert physicians, including their responsibility to be careful in passing on their knowledge to later adopters of such dangerous new drugs.

**References**

Bass, F. M. (1969). A new product growth for model consumer durables. *Management Science*, *15*(5), 215-227.

BBC (2019) Tate art galleries shun Sackler money over opoid crises, *BBC News*, downloaded from [https://www.bbc.com/news/business-47661685 I July 2019](https://www.bbc.com/news/business-47661685%20I%20July%202019).

Coleman, J., E. Katz, H. Menzel. 1957. The diffusion of an innovation among physicians. *Sociometry*, 253–270.

Iyengar, R., C. Van den Bulte, T. Valente. 2011. Opinion leadership and social contagion in new product diffusion. *Marketing Science*, 30(2), 195–212.

Iyengar, R., C. Van den Bulte, J.Y. Lee. 2015. Social contagion in new product trial and repeat. *Marketing Science*, 34(3), 408–429.

Lublóy, Á. (2014). Factors affecting the uptake of new medicines: a systematic literature review. *BMC health services research*, *14*(1), 469.

Katz, E., & Lazarsfeld, P. F. (1955). *Personal influence: the part played by people in the flow of mass communications.* Free Press of Glencoe.

Bartels, J., M. J. Reinders. 2011. Consumer Innovativeness and its correlates. A propositional inventory for future research. *Journal of Business Research*, 64(6), 601-609.

Liu, Q., S. Gupta. 2012. A micro-level diffusion model for new drug adoption. *Journal of Product Innovation Management*, 29(3), 372–384.

Manchanda, P., Y. Xie, N. Youn. 2008. The role of targeted communication and contagion in product adoption. *Marketing Science*, 27(6), 961–976.

Pachecho, R.m (2002), The use and Misue of OxyContin, *Harvard Library*, downloaded from <http://nrs.harvard.edu/urn-3:HUL.InstRepos:8846740> 1 July 2019.

Rogers, E. 1962. *Diffusion of Innovations*. Free Press of Glencoe.

Stern, P., M. Wright, M. 2016. The adoption of new prescription drugs is strongly associated with prior category prescribing rate. *International Journal of Research in Marketing* 33 (1), 220-224.