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Optimal price-setting in pay for performance schemes in health care

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ABSTRACT

The increased availability of process measures implies that the quality of health care is in some areas *de facto* verifiable. Optimal price-setting for verifiable dimensions of quality is well-described in the theoretical literature on incentive design. We seek to narrow the large gap that remains between actual price-setting behaviour in pay for performance schemes and the incentive design literature. We present a stylised model for hospital price setting for process measures of quality and show that optimal hospital prices should reflect the marginal benefit of the expected health gains, the weight given to patients' benefit relative to profits, and the opportunity cost of public funds. Based on published estimates, we derive the optimal prices for three measures of quality that have been incentivised in the English National Health Service since April 2010 (treatment in an acute stroke unit, rapid brain imaging, and thrombolysis with alteplase). We then compare the optimal prices with the actual prices offered to hospitals in England under the Best Practice Tariffs scheme for emergency stroke care.

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1. Introduction

Pay for performance (P4P) schemes link provider payments to performance indicators of quality. They receive much attention from both policy makers and scholars. The empirical evidence on the effectiveness of P4P is mixed. However, there is an emerging consensus that the key to effective P4P schemes is in their design elements (Epstein, 2012; Maynard, 2012; Roland, 2012). These design elements include who to pay, what to pay for, the criteria for bonuses or penalties and how much to pay for each unit of increase in quality (Ryan, 2009).

The size of the performance payments (i.e. the price, or the 'power' of the incentive scheme) is obviously critical, but has received surprisingly little attention in the applied literature. It has been treated mainly as an empirical question in ex-post evaluations of implemented schemes rather than as a key parameter that could be set optimally on the basis of economic theory. In an early review of the effects of P4P, Petersen et al. (2006, p. 269) stated that the "[s]ize of the bonus is *probably also important* [our emphasis]" and suggested that "the lack of effect or small effect in some studies *may include the small size of the bonus* [our emphasis]" (see also Cashin et al., 2014).

Normative statements about the size of incentive payments in the literature on design choices have been extremely vague. For example, Conrad and Perry (2009, p. 361) suggested that the optimal incentive size should "follow the Goldilocks

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principle: not too little, but not too much”, while Eijkenaar (2013, p. 124) stated that “[a]ll else equal, the higher the revenue potential for providers, the larger their response and the impact on performance, up to a certain point”.

Empirically, the size of incentive payments is often measured as a percentage of provider income. For example, the largest hospital P4P scheme in the US (the Premier Hospital Quality Incentives Demonstration (HQID) program) set bonuses and penalties as percentages (1–2%) of Medicare revenue (Das and Anderson, 2007). Similarly, the English adaptation, Advancing Quality, set bonuses of 2–4% of revenue for the associated activities (Sutton et al., 2012), and the Commissioning for Quality and Innovation framework determined that 0.5% in the first year rising to 2.5% of provider income be tied to performance on locally selected performance indicators (Kristensen et al., 2013). In their review of the literature, Conrad and Perry (2009) found that incentive sizes in the US varied between 2% and 9% of provider income.

The theoretical literature on incentive design suggests that setting incentive payments relative to revenue is not appropriate. Rather, as we emphasize in this paper, a regulator should focus on the expected health gains of improved performance and the costs of these performance improvements when setting payments for performance. An extensive theoretical regulation literature has investigated how to set optimal prices when health care quality is verifiable (Chalkley and Malcomson, 1998a, 1998b; Ellis and McGuire, 1986; Holmstrom and Milgrom, 1991; Kaarboe and Siciliani, 2011; Laffont and Tirole, 1993). The key insight is that price should be set equal to the marginal benefit of health care (discounted downwards for the opportunity cost of public funds and for altruistic motives of the provider; Ellis and McGuire, 1986; Chalkley and Malcomson, 1998a, 1998b). Given the large increase in availability of indicators of quality, the assumption that many dimensions of quality are verifiable is not unreasonable in many areas of care (Eggleston, 2005; Goddard et al., 2000; Kaarboe and Siciliani, 2011). If quality is verifiable, it is still the case that the optimal price should be basically set equal to the (adjusted) marginal benefit of the verifiable quality (Kaarboe and Siciliani, 2011).

However, the literature on optimal price-setting is purely theoretical, and no attempt has been made to compare the derived optimal price solutions with incentive schemes implemented in practice. This may explain why the optimal price-setting literature appears to have been neglected by the practical P4P literature.

The aim of this paper is to make a first serious attempt at bridging the gap between the theory and the applied literature. We provide a theory model of hospital price setting for P4P schemes, and compare it with the actual implementation of such a scheme. Our example of actual price-setting behaviour is the Best Practice Tariffs (BPTs) hospital scheme for emergency stroke—a national P4P scheme introduced in the English NHS from 2010/11. BPTs are now the main vehicle for supplementing activity-based tariffs with performance related payments in the English NHS. We therefore build a theoretical model whose key assumptions match this scheme closely. The main feature of our model is that hospitals' optimal prices should reflect the marginal benefit of the health gain associated with the incentivised dimensions of care.

For our implementation, we searched the published literature for estimates of the health gains associated with the incentivised dimensions of care (treatment in an acute stroke unit, rapid brain imaging, and thrombolysis with alteplase). Using a monetary social value of a Quality-Adjusted Life Year of £50,000 (previously used by the English Department of Health), we show how the optimal prices depend on the assumed weight given to patients' benefit relative to profits, and the opportunity cost of public funds.

Our application relates to patients affected by stroke. Stroke is the second most common cause of death in the world, causing 10–12% of deaths in the western world (Donnan et al., 2008). The estimated total societal costs of stroke in the UK is £9 billion per year, including approximately £4 billion direct treatment costs, meaning that stroke treatment costs make up 5% of total UK NHS costs (Saka et al., 2009). Timely and appropriate treatment of stroke is thus important both from an individual and a societal perspective.

The framework presented here can be used to improve scholars' and policymakers' thinking about price-setting for quality. Our analysis highlights the importance of setting prices based on expected benefits, not only costs, and the weight which hospitals assign to patients' benefits relative to profits. A key policy implication is that current incentive schemes appear either low-powered or imply a relatively high hospitals' weight given to patients' benefits relative to profits. The interpretation that current schemes are low-powered is consistent with a recent review of existing P4P schemes which suggests that current hospital schemes (that pay up to 5% of the revenues) have achieved very limited or no improvement in incentivising process measures of quality (Cashin et al., 2014, p. 86).

The paper is organised as follows. In Section 2 we describe the BPT incentive scheme for emergency stroke care in English hospitals. In Section 3 we provide a theory model for optimal hospital tariff setting in a context similar to BPTs, i.e. aimed at incentivising processes of health care for emergency stroke treatment. In Section 4 we simulate the theoretical model numerically and compare the result with the actual price set in the BPT incentive scheme. We end the paper with a discussion of our key results and venues for future research.

2. Background

In this section we review the information needed to setup a model that matches the key assumptions of the English BPT scheme including the financial incentives for quality before and after the scheme (Section 2.1), the verifiability of emergency stroke care quality (Section 2.2), and provider performance on the incentivised dimensions of care before the BPT scheme (Section 2.3).

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