

GP payment schemes review

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Glossary

CCG	-	Clinical Commissioning Group
CHS	-	Community Health Services
DES	-	Directly Enhanced Services
GMS	-	General Medical Services
GP	-	General Practitioner
LES	-	Locally Enhanced Services
LTCs	-	Long-term Conditions
PbR	-	Payment by results
PCTs	-	Primary Care Trusts
PHCT(s)	-	Primary Health Care Team (s)
PMS	-	Primary Medical Services
QOF	-	Quality and Outcomes Framework

Executive Summary

We conducted a review of the literature on primary care physician (Eg family doctor, general practitioner or other generalist working in a community setting) payment, methods and their impacts on physician behaviour. A comprehensive search of databases identified a large number of studies, of which thirty six were included in the final review. Although we were interested in looking at a wide range of outcomes, the majority of the evidence related to activity volume, referrals, supplier-induced demand, patient pre selection and prevention. Our review therefore focused on the evidence around the effects of the three main remuneration methods (fee-for-service (FFS), capitation and salary) on these outcomes. We also considered mixed systems of the main methods. The studies included in the review spanned qualitative, quantitative, mixed method research and RCTs.

The evidence reviewed confirmed the theoretical prediction that more variable payment schemes, such as FFS that links payment to output, are associated with higher volume of services than more fixed payment schemes such as capitation or salary. Physicians paid under FFS were found to have a higher number of patient visits, work more hours and spend less time with other aspects of care such as indirect care or teaching and administration duties compared to alternative less variable schemes. With regard to supplier induced demand there is evidence that physicians induced demand by increasing the intensity of care in order to protect their incomes although this was not observed in all studies. The effect of reimbursement methods on supplier induced demand seems to depend on the structure of the market and especially the way fees are regulated and the starting levels of competition. Capitation and salary was associated with more referrals than was the case for FFS. Payment method did not seem to affect levels of prevention activity or patient selection (cream skimming). Size of remuneration also had no effect on activity volume.

The evidence from the review suggests that payment schemes do seem to have an effect on physician behaviour. In particular, variable payment schemes such as fee-for-service were found to be associated with higher levels of volume, lower referral rates and lower prevention activity compared to fixed payment schemes such as capitation and salary, as theory predicts. However, these effects are limited and often negated by other factors that can influence physician behaviour, such as professional norms, patient related factors and market and institutional characteristics. The evidence suggests that blended payment models may have advantages but that there is no evidence to identify the appropriate mix of payment schemes.

1 Introduction

There is an increasing interest and policy emphasis on how UK general practice is organised and funded. Reforms to the NHS in England following the Health and Social Care Act 2012 established a new context for the commissioning of general practice with the establishment of Clinical Commissioning Groups and the shifting of commissioning powers from local Primary Care Trusts to NHS England. This has further focused attention more specifically on the role of general practice as a provider of services to the local community. In 2013 NHS England launched its consultation on the future of primary care services *Improving General Practice – a Call to Action* (NHSE 2013, NHSE 2014) and the Secretary of State for Health has called for practices to play a greater role in supporting vulnerable people, especially older people and people with long-term conditions. The NHS Mandate for 2014-2015 requires NHS England ‘to explore how better integrated out of hospital care can improve care’ (DH 2014:2.4).

This report was commissioned by the Department of Health to provide background evidence to support policy development on primary care. It builds on previous work for NHS England on primary care and has been conducted alongside a second review examining the evidence on primary care and community health services integration (Bramwell et al 2014). It summarises the findings of a review of the available evidence on the effects of payment schemes on primary care physicians.

The review focused on the three main methods of remunerating primary care physicians (Gosden et al. (2001)): (i) fee-for-service (FFS), (ii) capitation and (iii) salary. Although we looked for evidence on the effects of these methods on a wide range of issues (such as organizational structure or non-patient roles of practices) we found that the majority of the evidence in the literature were around the issues of care quantity, supplier induced demand, referrals, patient acceptance and few on prevention. Therefore the review looked and summarized the evidence on the effects of payment only on physicians’ behaviour. We also included studies where there was any mix of the three main payment forms. The paper does not examine pay for performance schemes such as the Quality and Outcomes Framework (QOF) or more generally given the number of recent relevant reviews (eg. Emmert et al 2012, Lagarde et al 2013, Kabiri et al 2014). QOF in particular, has been extensively researched and there are existing comprehensive reviews of QOF’s impact on service delivery and health outcomes (Flodgren et al 2011, Gillam et al 2012, Langdown and Peckham 2014, Scott et al 2011).

2 Background

2.1 The issue

Examining payment structures in primary care is complex as countries organise and fund primary care physician services in different ways. The extent to which funding mechanisms impact on the delivery of healthcare services will not simply depend on the mechanism itself, but also the context within which primary care is delivered – for example, how it is organised, its structure and broader contextual features of the healthcare system. In 2000, Gosden et al. (2000) reviewed the literature on payment methods and concluded “It is noteworthy that so few studies met the inclusion criteria. There is some evidence to suggest that the method of payment of primary care physicians (PCP)

affects their behaviour, but the findings' generalisability is unknown. More evaluations of the effect of payment systems on PCP behaviour are needed, especially in terms of the relative impact of salary versus capitation payments.”(1)

While there is a limited set of studies that have attempted to estimate the effect of primary medical care input on health care delivery and population health, the evidence does suggest that primary care and the way it is funded has important impacts on the delivery of health care services. Macinko et al. (2003) used annual data for eighteen countries over a period of twenty eight years and showed that changes in primary medical care were associated with reductions in mortality. Aakvik and Holmas (2006) used data at municipality level in Norway over 16 years. They found no effect on mortality of the *volume* of GP supply but an effect of composition, with more *contracted* GPs reducing mortality but no effect of more *employed* GPs.

In addition, making comparisons between health systems is complicated by the fact that there is no clearly agreed definition of a primary medical practitioner and the organisational context and health system structures within which they practice differ significantly. In Canada, models of organisational structure and payment systems vary within, and between, Provinces; in Australia, general practitioners usually work with very little nursing support, whilst in the Netherlands general practitioners can negotiate with insurers for funds to provide additional services in their practices, over and above standard GP care. In some countries, such as Canada, the Netherlands and the UK, general practitioners act as gatekeepers to the rest of the healthcare system while in France and the USA there is direct access to specialists. These contextual features of primary medical care services will also influence the impact of funding mechanisms. In addition, few countries operate one single method of funding and often combinations of payment structures are employed creating difficulties in isolating specific payment effects. The review only addresses medical practitioner (GP, Family physician etc.) payment models and does not focus upon other types of primary care services, such as optometry, dental or pharmacy services.

2.2 General practice funding in England

In the UK practices are remunerated through a nationally negotiated contract which is relates to the practice. Prior to 2004 remuneration was via an individual GP contract. This change was important, as it provided a practice-level payment which was no longer dependent upon the number of GP partners in the practice. This removed a significant disincentive to employ salaried doctors, and since 2004 there has been a steady increase in the number of partnerships which employ salaried GPs. There are two main types of contract – General Medical Services (GMS) and Primary Medical Services (PMS), although there is increasing use of Alternative Provider Medical Services contracts (APMS) for private service provision of general practice services to NHS patients. In England, since April 2013, NHS England has been responsible for commissioning the following services in primary care:

- Essential and additional primary care services
- Nationally commissioned enhanced services in primary care (e.g. the NHS health check programme)
- Contraceptive services provided in primary care
- Mental health interventions provided in primary care

- Public health interventions provided in primary care (e.g. tobacco control, alcohol misuse)
- Immunisation services

The core GMS contract, which sets the structure of the financial incentives under which GPs provide 'essential and additional' primary care services, is (and will continue to be) negotiated nationally. Under this contract, GP practices receive three categories of payment: a 'global sum', which is calculated according to a formula (the 'Carr-Hill formula' [ref##]), which takes into account patient numbers (capitation) alongside adjustment factors for age, deprivation, burden of disease etc; pay for performance, known as the 'Quality and Outcomes Framework' (QOF), which provides incentive payments for reaching a number of disease-based targets (making up approximately 20% of practice income); and so-called 'enhanced service' payments. Historically, there have been three types of enhanced services:

- Directed Enhanced Services (DES) - must be provided by the PCT for its population, for example the childhood immunisations programme
- Local Enhanced Services (LES) - locally developed services designed to meet local health needs
- National Enhanced Services (NES) - services to meet local needs, commissioned to national specifications and benchmark pricing. Examples are enhanced care of the homeless, more specialised services for multiple sclerosis and specialised care of patients with depression.

From April 2013, DES and NES services have been the responsibility of the NHS England. Since April 2013 most LES services have been commissioned by Clinical Commissioning Groups (CCGs), but some are also being commissioned by the Local Authority-based Public Health commissioners (e.g. sexual health services). There is considerable variety across the country with respect to the services included in LES schemes (Marks et al 2011), adding to the complexity of the primary care commissioning landscape. Finally, some practices are also in receipt of a 'minimum practice income guarantee' (MPIG). This is an adjustment factor payment that was negotiated in 2004 when the new GMS contract was introduced. Essentially the Carr Hill formula applied consistently would have led to a number of practices (often in rural areas) receiving a significant cut in income. MPIG was intended to be a short term measure to assist the transition, but 10 years later MPIG is still a significant factor for some practices.

Some 30%-40% of UK practices are funded through PMS contracts, which were individually developed to include specific, or area relevant services. These contracts provide a sum which incorporates both a capitation payment and payments for additional services. These were intended to be individually negotiated with the local commissioner, but recent NHS reorganisations have led to a situation in which most PMS contracts are simply rolled forward with little negotiation or monitoring. PMS practices are also eligible for QOF payments. APMS contracts are similar to PMS contracts, but they are open to a wider range of providers, including private and for-profit providers. Under Primary Care Trusts, APMS contracts were subject to strict monitoring against a wide range of key performance indicators, and this responsibility is now held by NHS England. In addition to this contract-related funding UK general practices also receive some support for premises. The exact nature of this support has varied over the years, but has usually included some element of what is

known as ‘notional rent’, which partially reimburses practices for payments that they make in respect to their premises.

2.3 Funding mechanism and delivery of primary medical services

Theoretically, changing the income structure and funding mechanisms of primary care services could involve one of the following three effects: changing the number and distribution of services; changing the nature/focus of existing services; or changing the scope of services provided. Using these as a starting point, this review reviews the evidence from the UK and internationally relating to address the following questions:

- Does the funding mechanism effect the volume of supply of primary care services?
- Does the funding mechanism effect what practices do, by changing the way in which services are provided, their quality or changing the balance between existing activities?
- Does the funding mechanism have an impact on the scope of services provided?

2.4 Payment systems and incentives

Economic theory predicts that the payment method generates a set of incentives that influence behaviour. In agency theory terms, the payment method is used by ‘the principal’ (in the healthcare context this can be the government, an insurer or a medical group) in order to induce specific behaviours by ‘the agent’ (the physician). Different payment methods therefore can be used to incentivise and promote different health policy goals. A full theoretical model of physician agency is provided in McGuire (2000). In what follows we set out the main hypothesized effects from theory arising for each payment method.

2.4.1 Fee for service

Fee for service payment is based on the level of activity. Physicians are paid a fee for every unit of care they deliver (e.g. visits, treatments, lab tests) according to a fixed price schedule. In this system financial risk is borne by the payer (patient, state or insurer). Since the payment is linked to output this system is thought to incentivise excessive use of services and increased costs (Ellis and McGuire (1986)). Physicians are incentivised to increase the volume of their activities and also attract more patients, work longer hours and focus on the fee paying services in order to maximise income. Given the asymmetry of information between physicians and patients it is also possible that under this system physicians exploit their informational advantage to encourage over-consumption of treatments beyond the necessary (Evans (1974)). This concept is known as supplier-induced demand. Further, physicians may also reduce the number of referrals to specialists as they have an incentive to provide more services themselves. Physicians also have limited incentives to promote preventive activities, as a healthier population would reduce future revenues, unless preventive interventions are specifically paid for. At the same time FFS is a system that can incentivise physicians to increase their productivity in order to manage their time efficiently and rewards the more productive physicians when patients can choose between physicians.

2.4.2 Capitation

Under capitation contracts, payment is on a per-person basis. Physicians are paid a fixed, up-front rate per person enrolled in their list regardless of the type and amount of services used. The capitated payments are sometimes risk-adjusted in order to account for differences in the age and health distribution of the patient population across physicians. Since the money follows the patient independent of service utilisation, capitation is thought to incentivise cost containment and under-provision of services (even below the clinically necessary levels) (Ellis and McGuire (1986), Ellis and McGuire (1990), Pauly (1990), Blomqvist (1991)). Further, it may induce physicians to shift more care to specialist and hospital services in order to minimize their effort while still retaining the capitation fee (Allard et al. (2011), Blomqvist and Leger (2005)). Thus under capitation the scope and gatekeeper role of general practitioners becomes limited. Physicians may further have incentive to select patients avoiding those with high levels of needs (the so-called ‘cream skimming’), especially when the payment is not risk-adjusted (Newhouse (1996), Barros (2003)). It is also possible that capitation promotes preventive work since under capitation physicians would like to preserve their patients’ health status to avoid future costly treatments.

2.4.3 Salary

Under a salary system the physician’s income depends on the number of periods worked. Physicians are paid a fixed amount of money for a pre specified amount of hours worked regardless of the number of patients seen or the volume or costs of services provided. Therefore physicians are disincentivised to put effort into attracting new patients and/or providing the right amount of care. This payment method is expected as a result to be associated with reduced activity, increased referrals to specialists and hospitals and cream skimming of patients, as physicians concentrate on patients who bring with them the lowest demands.

2.4.4 Blended payment methods

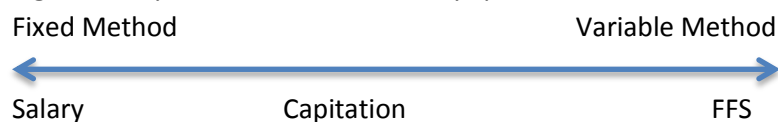
Pure payment methods like the three main ones studied in this review have also been combined into more complex payment methods that purport to have a more desirable mix of incentives, avoiding some of the adverse incentives of simple payment methods (Simoens and Giuffrida 2004). Such models include: (i) partial capitation which combines FFS payments for a subset of services with capitation for services that are less amenable to piece-rate production, (ii) mixed models that blend elements of capitation payment, pay-for-performance incentives and FFS, (iii) bundled payments that pays the accountable provider organisation a fixed amount for the bundle of services required for treatment of an episode of care and (iv) shared savings arrangements, which pay FFS to provider organisations but periodically share savings if total payments are less than a predetermined total healthcare cost (budget) target (Robinson 2001). However, even the most sophisticated blended payment methods cannot fully eradicate incentives to over-treat or under-treat patients created by FFS, capitation and salary (Simoens and Giuffrida 2004, Robinson 2001). In addition, complex payment methods may create their own set of perverse incentives (e.g. gaming the system) (Simoens and Giuffrida 2004).

2.4.5 Summary

Based on the previous discussion and as noted in previous studies (Jegers et al. 2002) one can rank the methods of payment along a variability spectrum determined by the relationship between activities and payments (Wranik and Durier-Copp 2010). According to this classification, FFS is the

most variable, capitation is less variable and salary is the least variable. Blended systems can also be accommodated along this spectrum depending on the mix. For instance, a blend of capitation with FFS is more variable than capitation but less variable than FFS (Wranik and Durier-Copp 2010). Figure 1 portrays this idea.

Figure 1: Payment methods variability spectrum



Source: Wranik and Durier-Copp (2010)

The following table summarizes the hypothesized effects of the three main payment methods on a variety of outcomes.

Table 1: Hypothesized effects of payment methods on health outcomes

Outcome	Theoretical prediction	Hypothesized incentives under each payment method		
		Fee for service	Capitation	Salary
Quantity	The more variable the payment the higher the quantity of care	Increase	Decrease	Decrease
Referrals	The more variable the payment the lower the rate of referrals	Decrease	Increase	Increase
Supplier induced demand	The more variable the payment the stronger the incentive to induce demand	Increase	Decrease	Decrease
Patient selection	The more variable the payment, the weaker is the incentive to select patients	Decrease	Increase	Increase
Prevention	The more variable the payment, the weaker is the incentive to provide preventive care	Decrease	Increase	Increase

2.5 Structure of the report

2.5.1 Methods

This evidence synthesis summarises existing reviews of relevant evidence (where available) and primary studies on funding mechanisms for primary medical care services (GPs, family physicians). A desk based, literature search was undertaken for relevant evidence on physician payment methods and impacts. Titles and abstracts were reviewed and the search was initially restricted to articles published after 1998 although relevant key older papers were also reviewed.¹ The review does not cover funding for other non-physician primary care services. Nor does it address the impact of pay

¹ Studies before 1998 have been reviewed in Gosden et al. (1999), Gosden et al. (2000), and Gosden et al. (2001)

for performance incentive schemes. These may occur alongside any existing funding mechanism and discussions of the impact of such schemes has been extensively discussed and reviewed elsewhere (Flodgren et al 2011, Gillam et al 2012, Langdown and Peckham 2014, Scott et al 2011).

Previous evidence reviews incorporated international articles with many primary studies included from Canada, USA, Norway, UK and the Netherlands (e.g. Gosden et al. (1999), Gosden et al. (2000), Gosden et al. (2001)). Studies included in the reviews spanned qualitative, quantitative, mixed method research and RCTs. We adopted a similar approach drawing on international evidence from countries with developed healthcare systems and where primary medical care is organised in a similar way to the UK – although there distinct differences in the individual contexts of primary medical care delivery between, and within countries. We didn't come across any RCT studies for the period we were searching. However the observational studies included in this review use methodologies (such as instrumental variables and panel data techniques) that are considered to perform better than observational studies included in earlier reviews and overcome more convincingly potential endogeneity concerns. In addition, although we primarily searched for studies that use objective measures of outcomes, we also included a few studies which despite using subjective measures, were thought to be still informative for policy. We found overall 2338 papers of which 36 were included. Searches were conducted through the following databases (search terms for each section are detailed in Appendix 2):

- Cochrane Library (1998-2014)
- PubMed Central (1998-2014)
- EconPapers (RePEc) (1998-2014)

Alongside academic papers, the review included 'grey' literature encompassing documents and reports from the Department of Health, the King's Fund Information and Library Service, the Nuffield Trust, the National Institute for Health and Care Excellence, the Institute for Fiscal Studies, the World Bank and academic books specific to the subject matter.

3 Evidence from the review

3.1 Types of studies

In this section we summarise the evidence from the literature review on the impact of payment schemes on physicians' behaviour. As noted earlier, many aspects of the physician agency theory are still unexplored. So far, the literature has mainly focused on testing hypotheses relating to outcomes that are easier to measure with the available data, such as quantity. This was reflected in our review. The most frequent type of studies we found were studies testing the effect of payment methods on volume (e.g. Sarma et al. 2010b, Sorensen and Grytten 2003) . In these studies volume was most frequently measured with the number of visits. Some studies also used the total hours worked, the length of visits and costs (e.g. Sarma et al. 2010a). Except for volume another common type of studies we encountered were studies testing the effect of payment method on referrals and supplier-induced demand (e.g. Iversen and Luras 2000, Carlsen and Grytten 1998) . Only few studies looked at the effect of payment method on patient cream-skimming and prevention (e.g. Kantarevic and Kralj (2014) and Quast et al. 2008) . In some cases prevention was not studied in a separate

theoretical context as that looking at the effects on volume in general. We also found a few papers looking at the effect of the size of remuneration as opposed to the method of remuneration on the supply of care (e.g. Kralj and Kantarevic 2013) .

In terms of institutional setting, quite a few studies we found came from Norway, Canada and the USA. The reason for this seems to be the variability of payment methods within the country and policy changes of the reimbursement methods that allowed comparisons. For example, in Norway there were two types of physician contracts before 2001 with different reimbursement characteristics while after 2001 the two contracts were replaced with a third one applicable to all physicians (see section 3.2.1 for details on these contracts). Therefore, Norway was a setting with great variation in payment methods that allowed meaningful comparisons in a large number of studies. Similarly for Canada a number of studies exploited the rich range of funding mechanisms for family physicians encountered in the country and provinces such as Ontario as well as policy changes introduced in provinces such as Quebec. The American studies also used either existing variation in the way physicians were paid or variation caused by a policy change. All these studies drew from different available datasets and sometimes the same dataset was used in multiple papers.

3.2 Impacts on physicians' behaviour

In this section we set out the evidence on the payment schemes methods on physicians' behaviour. The focus is on the effect of activity levels (as measured by patient visits, hours of work and length of visits), referrals, supplier induced demand, cream skinning and prevention. We also set out the evidence on the effect of the size of physician remuneration. Interpretation of the evidence findings is complicated by the diverse nature of health systems in different countries. Reference is therefore made to the specific study context so that the evidence is set within an appropriate context with the key findings summarised at the end of each section.

3.2.1 Volume

The effect of physician remuneration on the volume of provided primary care services has been extensively studied in the literature. We identified a number of empirical studies that examined the effect of general practitioners' remuneration method on the number of patient visits, hours of work and costs in a variety of countries and settings. Overall, the empirical evidence from this literature were in accordance with the theoretical prediction that more variable payment schemes linked to volume, such as FFS, are associated with increased supply of services, while capitation and/ or salary are associated with decreased activity.

In Norway comparison of payment methods has been possible as the organisation of the health system in Norway before 2001 allowed municipalities to either employ primary care physicians, or supply services through a contract with a private physician. Physicians in Norway were consequently remunerated in two different ways: private physicians working under a contract with the municipality were remunerated by FFS (70%) plus a fixed grant (30%), while employed physicians received a salary only. About 70% of primary physicians were private and the rest were employed in the municipalities. About 80% of the cost of primary physician services in the municipalities was financed through public budgets while the rest came from patient fees (Sorensen and Grytten 2000). In 2001 this system changed when an organizational reform came into force allowing only for one

type for contract. Primary care physicians' income would comprise of two components: FFS payments and a per capita subsidy. At the individual physician level, the proportion of physician's income from FFS payments as opposed to per capita income would vary mainly due to the varying mix of patients across physicians. On average however, 70% of income was meant to come from FFS and 30% from the per capita subsidy. Under the new system, physicians would have a contract with the municipality and the municipality would pay the per capita subsidy, while FFS payments would be made by the state through the National Insurance Administration (Sorensen and Grytten 2000). Therefore, there was a range of remuneration methods encountered in Norway, both before 2001 and when comparing the system before and after the organizational reform.

Prior to 2001 there were two main payment methods - municipality employed physicians were paid a fixed salary while contract physicians were paid a mix of FFS and a fixed grant. Sorensen and Grytten (2003) the impact of the different contractual methods on the numbers of patient consultations They found that physicians with a FFS component in their remuneration had a higher number of visits (both consultations and other types of contacts). This difference was broken down to FFS physicians working both working longer hours and being more time efficient (they had a higher number of patient contacts per hour).

Comparison of payment methods has also been possible in Canada where there has been substantial variation of remuneration methods for family physicians for a number of years. Three studies, Devlin and Sarma (2008), Sarma et al. (2010a) and Sarma et al. (2010b), exploited the rich range of remuneration methods encountered in Canada.² All three studies used data from the 2004 National Physician Survey which was sent to all licensed family physicians/ general practitioners in Canada during early 2004 with Sarma et al. (2010b) restricting their analysis only to the Ontario sub sample. The focus of these papers was to see how FFS payment schemes compared to a variety of alternative schemes.³ Devlin and Sarma (2008) found that FFS schemes were encouraging physicians to see more patients relative to alternative remuneration schemes and this negative incentive effect increased with the degree of deviation from FFS. Sarma et al. (2010a) showed that physicians working in non-FFS remuneration schemes spent fewer hours on direct patient care in the office, but devoted more hours to direct patient care in other settings and more hours on indirect patient care. Sarma et al. (2010b) showed that physicians paid on a non-FFS had fewer patient visits per week in comparison to those paid under a FFS scheme. It was also found that physicians in group practices had relatively more patient visits compared to physicians in solo practices.

Other Canadian studies have found similar results. Dumont et al. (2008) showed that physicians who changed from FFS to a mixed compensation system (base wage and FFS) in 1999 in Quebec reduced their volume of services, increased the time spent per service and increased their time spent on teaching and administrative duties (tasks that were not remunerated under the FFS system).

² In their papers they mention that in 2004 about 52% of family physicians received 90% or more of their income from FFS while the share of payments to physicians under alternative remuneration schemes has increased to 21% of total payment clinical payments.

³ Alternative schemes included: any method other than FFS, mixed method where 90% or more of income comes from a combination of schemes, a non FFS method where 90% or more of income comes from sources other than FFS, salary, capitation, sessional/per diem/hourly, depending on the study.

Kantarevic and Kralj (2013) found that physicians in Ontario, in 2007 who were paid a blended-capitation model with FFS payments for selected services had fewer services and visits per day but worked the same number of days per year and enrolled the same number of patients compared to physicians paid under FFS. Mayo-Bruinsma et al. (2013) carried out surveys in Ontario (2005-2006) to study the provision of family-centred care in four types of primary care delivery (salary, FFS, capitation, blended remuneration). They found that patient-reported family centred care scores did not vary significantly by model while provider-reported family centred care scores were significantly higher in salaried community health centres than in blended remuneration family health networks.

Several studies from the USA have also provided similar evidence. Catalano et al. (2000) showed that there was a downward shift in the costs of mental health services in Colorado in 1992 in capitated areas compared to FFS areas. Kralewski et al. (2000) found that at the group practice level capitation payment was related to lower clinic costs while at the physician compensation level salary compensation was associated with higher costs. Shen et al. (2004) conducted a survey which showed that physicians tended to conserve discretionary resources under capitated arrangements compared with traditional FFS but there was no significant difference between FFS and capitation in cases of life-saving treatments. Melichar (2009) showed that physicians spent less time with their capitated patients than with their non-capitated patients. Helmchen et al. (2010) studied a large network of primary care clinics in a major urban area of the Midwestern United States and found that family practitioners after switching from a pure salary to a lower base salary plus piece rate system raised the number of their encounters per month, the number of days they spent at the network and the number of preventive procedures that were paid an additional fee. Landon et al. (2011) considered the effect of payments varying by individual productivity, practice financial performance, patient satisfaction surveys, measures of quality and comparative practice profiling compared to the effects of a fixed salary. Their analysis showed that relative to physicians compensated by a fixed salary, physicians with variable payments and also in highly capitated environments had the lowest costs and intensity of care suggesting that participating in a high capitation environment is a strong counter weight to other incentives (such as productivity-based incentives) to provide additional services. Marton et al. (2014) compared two managed care plans that adopted different reimbursement mechanisms for physicians and found that the plan that opted for a FFS reimbursement scheme and handled administration internally saw an increase in physician utilization compared to the plan that adopted a capitation reimbursement scheme and contracted out administrative responsibilities.

Studies from the UK and Finland appear to support the broad nature of these findings suggesting FFS increases patient visits and costs. Henning-Schmidt et al. (2011) used an experiment where medical students in the role of physicians chose among different quantities of medical services depending on patients' health status and remuneration method. They found that physicians provided more services under FFS than under capitation. Gosden et al. (2003) examined the impact of the experimental introduction of salaried contracts in England in 1997. They found that general practitioners in salaried practices spent more time working out-of-hours, had shorter consultations, and prescribed fewer consultations compared to physicians who were paid with capitation and target payments. Kuusela et al. (2004) found from a set of questionnaires sent to Finnish physicians and patients that physicians with a capitation based contract rated their work quality higher than

physicians' in time based contracts. Granlund (2009) showed that private physicians paid under FFS were more likely to veto generic substitution than salaried physicians.

We reviewed a number of papers studying the relationship between primary care physician remuneration method and volume of provided services in a variety of settings and methodologies. All the evidence we reviewed confirmed the theoretical prediction that more variable payment schemes, such as FFS that links payment to output, are associated with higher volume of services than more fixed payment schemes such as capitation or salary. Physicians paid under FFS were found to have a higher number of patient visits, work more hours and spend less time with other aspects of care such as indirect care or teaching and administration duties compared to alternative less variable schemes.

3.2.2 Referrals

A number of studies also looked at the effect of remuneration method on the rate of referrals. In many cases the institutional background and methodology used were the same as in the studies looking at the effect on volume and were summarised in the previous section.

Iversen and Luras (2000) studied the effect of the change of contracts in Norway on referral decisions during the trial period. The results showed that when physicians changed from a FFS plus a fixed grant system to a FFS plus a per capita payment system the rate of referrals to hospitals and specialists increased, although at the same time the size of the fee reduced. Sorensen and Grytten (2003) found that FFS physicians in Norway had fewer referrals than salaried physicians.

Shen et al. (2004) using a randomized survey of American family physicians found evidence that physicians were more likely to refer a capitated care patient to a specialist compared with a patient under FFS. However in life-saving cases, patients' insurance status was found to be unrelated to the physicians' clinical decision.

Gosden et al. (2003) compared the behaviour of physicians in salary practices with physicians that were paid a capitation fee together with target payments after the introduction of the PMS contract in England in 1997. The analysis found that there were no differences in the referral rates between the two types of physicians. However, there were some limitations with this study since the distributions of age and gender between the two types of practices had systematic differences.

The evidence from the review was consistent with the theoretical prediction that referrals will be higher under capitation and salary compared to FFS. Across different countries and settings, capitation and salary was associated with more referrals than it was the case for FFS.

3.2.3 Supplier induced demand

Physicians can increase volume by exploiting their informational advantage to induce demand over the clinically justified level. This is more likely to take place under systems that incentivise volume such as FFS. Quite a few studies in our review looked at the existence of supplier-induced demand. Most of these studies were from Norway and one study was from France. For most of these studies the empirical test consisted of estimating the effect of physician density in an area (captured by the physician/population ratio) on the number of office visits and/or laboratory tests in a context where

physicians were paid (at least to some extent) by FFS. The idea behind this test was that under increased competition and a potential consequent decrease in the number of consultations physicians would compensate for that loss by increasing the intensity of care delivered per encounter. Another set of studies tested for supplier induced demand exploring the relationship between patient list size and physician activity, as physicians with a shortage of patients would be expected to have higher activity per patient. The empirical methods stem from the idea that if a change in the physician's return from inducement is associated with a change in behaviour (e.g. more services recommended), then this is evidence for supplier-induced demand (McGuire 2000).

Most of the early studies in Norway, using the first type of test, did not find evidence of supplier induced demand. Carlsen and Grytten (1998), Sorensen and Grytten (1999) and Grytten et al. (2001) studied the existence of supplier induced demand among contract physicians (paid a FFS and a fixed grant) in Norway in 1995. None of these studies found evidence of supplier induced demand. Grytten and Sorensen (2001) tested for inducement among primary care physicians in Norway using 1998 data and did not find any such evidence.

One study from France, Delattre and Dormont (2003), tested for the existence of supplier-induced demand among French physicians who were paid on a FFS basis with fixed fees using a similar methodology. Their results showed that physicians responded to a rise in the density by increasing the intensity of care per encounter. Thus there were diverging findings between the Norwegian and French studies despite both markets operating a FFS with fixed fees system. This divergence could be explained by differences in the physician density level as physician density is higher in France than in Norway.

A set of studies in our review used the second method of testing for demand inducement. Grytten and Sorensen (2007) studied the effect of patient list size on physicians' output in a mixed capitation system in Norway in 2002. The idea behind this study was to test for the existence of rationing for long patient lists and the existence of inducement for short lists. None of the estimates provided evidence of either rationing among physicians with long lists or inducement among physicians with short lists. However, it is likely that physicians had self-selected into list sizes on the basis of preferences towards family and leisure time versus work. In that case we would not expect to observe increased activity for physicians with short lists and this could explain the lack of evidence of an effect of list size on output.

Iversen and Luras (2000) and Iversen (2004) studied the effect of patient shortage on physicians' output (number of consultations, number of laboratory tests, number of consultations lasting more than 20 minutes) in the context of the Norwegian capitation trial in early 1990s. Iversen and Luras (2000) looked at the short-term effects while Iversen (2004) covered a longer period of time (5 years) after the introduction of the change. The results from the first study showed that constrained physicians had higher income from fees, longer and more frequent consultations and more laboratory tests per listed person than unconstrained physicians. The extended analysis found that this effect was also long lasting since general practitioners who experienced a shortage of patients were found to provide more services per patient even 5 years after the change. Grytten and Sorensen (2008) however, noted that these two previous studies failed to take into account the 'availability effect', i.e. the fact physicians with a deficit of patients (spare capacity) could also see

external patients and have more consultations with them. They tested this hypothesis and found that general practitioners with a deficit of patients had indeed more external consultations.

The evidence we reviewed on the existence of supplier induced demand under a FFS reimbursement system is inconclusive. A number of studies concluded that physicians induced demand by increasing the intensity of care in order to protect their incomes while other studies find evidence against such a possibility. The effect of reimbursement methods on supplier induced demand seems to depend on the structure of the market and especially the way fees are regulated and the starting levels of competition.

3.2.4 Patient pre-selection

There were only a few papers testing empirically the existence of patient selection in primary care. These studies come from countries where there is a more open movement between physicians than in the UK.

Sorbero et al. (2003) examined the determinants of patient switching between primary care physicians with a focus on the interaction between financial incentives and health status or utilization using American data for the period 1994-1995 and comparing physicians receiving a capitation payment and physicians receiving a FFS payment. The results showed that patients with capitated physicians were more likely to switch physicians than similar patients with FFS physicians. This finding was interpreted as either the result of capitated physicians avoiding high-cost patients or of high utilisation patients being more sophisticated.

Two studies from Canada, Kantarevic and Kralj (2013) and Kantarevic and Kralj (2014) studied the risk-selection behaviour of primary care physicians in Ontario. Kantarevic and Kralj (2013) found no evidence of patient selection as there was no difference between physicians paid a FFS and physicians paid under a blended capitation system. Kantarevic and Kralj (2014) looked at the removal of an incentive used specifically to care for complex and vulnerable patients. Their finding was that the removal of the incentive had no impact on either patient enrolment or cost shifting in the twelve months following the incentive removal. The authors interpreted these results however in the context of the special capitation system in place, which was a blend of capitation, partial cost reimbursement and ex-post fund. The incentive could be diluted therefore because physicians faced limited risk and could shift costs to other providers. Another explanation was that physicians could be motivated by altruism and professional ethics.

We found only very few papers looking at the effect of payment method on patient risk selection. There was no strong evidence in our review that physicians engaged in cream skimming behaviour under any payment method.

3.2.5 Prevention

Few studies in our review studied the effect of reimbursement mechanisms on preventative activities.

The Catalano et al. (2000) study compared prevention services for mental health between for-profit and not-for-profit capitated areas and FFS areas. The study found that in the for-profit capitated area there was an increase in the secondary and tertiary prevention activities compared to the other

areas. Kantarevic and Kralj (2013) found that physicians in a mixed capitation system in Canada were more likely to achieve preventive care bonuses for senior flu shots, toddler immunizations, colorectal screening, pap smears and mammograms than physicians in a FFS model.

Quast et al. (2008) compared physicians in managed care organizations paid via FFS and paid via capitation. The results showed that enrollees in managed care organizations that paid physicians exclusively via FFS were more likely to receive well-child visits and less likely to receive asthma medication prescriptions than patients enrolled with physicians paid via capitation. The reason was that FFS physicians were compensated directly for well-child visits but not for the asthma medications they prescribed.

Tu et al. (2009) compared salaried, capitation and FFS primary care payment models in the management of hypertension. The analysis was conducted using a cross section of physicians in Ontario for a period between November 2004 and September 2005. The results showed that screening rates were similar between the three models but there were differences in treatment (number of patients with hypertension treated) and control rates with capitation physicians having the best treatment and control rates.

There is no clear evidence from the studies we reviewed that there is any systematic relationship between remuneration method and prevention activities. Although there is some evidence that prevention is higher under capitation, the studies we reviewed do not model this relationship explicitly and is thus difficult to draw any conclusions on an underlying mechanism between payment and prevention.

3.2.6 Size of remuneration

We found only a few studies that examined the effect of the size of remuneration per se on physicians' outcomes. Most of these studies were from Norway and one was from the USA. This literature analyses the effect of the size of remuneration through two different effects: the substitution effect and the income effect. When the fee for a specific item of treatment drops, the substitution effect pulls in the direction of reducing treatment in order to substitute the less profitable treatment with other activities where fees are unchanged. The income effect pulls in the opposite direction of higher volume of that treatment in order to compensate for the loss of income. The question of which effect dominates has been studied empirically in the papers we reviewed.

Carlsen et al. (2003) studied the effect of a reduction in the fee per item on the supply of laboratory tests using Norwegian data for the period 1991-1994. The study did not find evidence that the changes affected the supply of laboratory tests. Grytten et al. (2008) looked at the effect of an increase in the fees for the most commonly used procedures in Norway for the years 1995-2000. They found that the fee changes had no effect on the service production. Gjelsvik (2009) also looked at the effect of fee reduction for laboratory tests in Norway for years 2001-2004. The study showed that there this change had no income effect on the level of laboratory tests analyzed in office. There was evidence of a substitution effect, indicating that physicians changed the composition of the tests and a evidence of a spillover effect from primary care to specialist care as physicians who experienced a loss of income from the office laboratory tests ordered more of their tests from clinical laboratories. Munkerud (2012) looked at the effect of changes in the remuneration of

laboratory tests in a context where these financial incentives were in conflict with medical practice and recommendations. While the fees for laboratory tests in office in 2004 in Norway were reduced, recommendations promoted the use of laboratory analyses in office. The hypothesis tested was that an increase in laboratory fees would not affect or only slightly increase the probability of performing tests in office in the presence of the recommendation. This hypothesis was confirmed by the empirical analysis. This was interpreted as evidence that physicians are also affected by ethical considerations that may counteract financial incentives.

Clemens and Gottlieb (2014) is an American study that investigated the effect of physician payment changes on health care supply exploiting the plausibly exogenous area-specific price shocks induced by the 1997 Medicare consolidation of the areas across which it adjusted physician payments. The study showed that health care supply had a large and long-run elasticity with respect to reimbursement rate. This was observed mainly for elective procedures and less so for less discretionary services suggesting that physicians value patient health and services with clear benefits or harm are less responsive. There was also modest evidence that reimbursement rates influenced investment decisions in technology.

There was no conclusive evidence with regards to the effect of the remuneration size on treatment volume. There was some evidence of a substitution effect, an income effect and a spill over effect although this is based on a few studies. There was also some evidence that physicians are not solely influenced by financial motives but also by professional norms and ethical considerations.

3.2.7 Summary

We identified a number of papers that examined the differences in physicians' activity levels between different remuneration methods. The main hypothesis tested in this literature is whether FFS generates higher activity levels compared to other systems, such as capitation or salary. In this literature activity is usually measured with the number of patient visits and number of services provided. The papers we reviewed provided evidence in support of this hypothesis. The evidence suggested that a FFS mechanism whether as stand-alone or in a mixed system together with other payment methods is associated with higher levels of output. This finding is consistent across studies and countries. Overall the papers we reviewed provided some evidence of supplier-induced demand in the context of FFS payments. Most of the reviewed papers concluded that FFS incentivised over-provision. Where studies did not find evidence of this the lack of evidence could be explained by other factors such as professional guidelines or norms.

The papers we reviewed also provide evidence that there are differences in referral rates between the different types of payment measures. Physicians being paid under salary and capitation were found to have more referrals than physicians paid under FFS.

The papers we reviewed did not provide any strong evidence of an effect of the size of the remuneration fees on physicians' production levels. However the number of papers was very small and most of them were restricted to one country.

There were only a few papers studying patient selection in primary care. These studies related to countries where movement between physicians is more open compared to the UK. There wasn't any

strong evidence suggesting that there is patient selection among primary care physicians based on different remuneration methods.

There were a few studies that studied the effect of remuneration schemes on specific preventive services. There was some evidence that capitated physicians are more likely to provide preventive services than FFS physicians. One paper found that physicians paid via FFS performed more prevention services but this resulted from the fact that these services were incentivised by the FFS scheme.

4 Discussion

This review examined the effects of different remuneration schemes in primary care. The focus was on the effects on physicians' behaviour. We found that only a few aspects of the impacts of remuneration schemes were studied in the literature (e.g. service volume, referrals, supplier induced demand, patient selection and prevention) while other aspects (e.g. organizational structure) were not addressed. The most common hypotheses tested in the literature relate to differences between FFS and capitation or salary with respect to volume of services, referrals, supplier-induced demand, patient cream skinning and preventive services. The evidence we found on these effects supported the theoretical predictions in general. We found evidence to demonstrate that that service volume is higher under FFS, referrals are higher under capitation and prevention is higher under capitation. There was also some evidence that supplier-induced demand can be present in the context of a FFS payment scheme. There was no evidence that remuneration method led to cream skinning. Similar observations have been made in previous reviews (e.g. Gosden et al. 2000).

At the same time they found that being part of a group practice lead to reductions in direct patient care in other settings and indirect patient care when compared to solo practices. While there is evidence in the literature that physicians' behaviour can be influenced through financial remuneration the literature also referred to other factors that affect physicians' and the impact of the financial incentives conveyed by different remuneration schemes. Two of these factors most commonly referred to were the importance of professional norms and competition in the market of physicians.

Arrow (1963) has argued that professional norms play a major role in markets without the typical competitive market characteristics such as the health care markets that are characterised by asymmetric information. Medical doctors are thus often assumed to be constrained by professional norms and ethical considerations. The papers reviewed here suggest that professional norms appear to have an influential effect as well as financial incentives. Grytten and Sorensen (2007) concluded that the lack of evidence in favour of supplier induced demand was because physicians were guided by ethical and medical norms. Similarly, Munkerud (2012) found only a small effect of remuneration on physicians' behaviour in a context where financial incentives and medical guidelines pushed physicians in opposite directions. Because of the small effect, it was concluded that the financial incentives were diluted because they were in conflict with medical recommendations and existing medical practice and that therefore economic incentives alone were not an effective tool. Kantarevic and Kralj (2014) did not find evidence of risk-selection arising as a

result of payment schemes and suggested that this could be because physicians were motivated by altruism and professional ethics.

We included some papers in the initial review that referred to remuneration among a range of other factors (Whiting et al 2007, Scott 2001). These identified that remuneration method was only one of a number of factors that influence physician behaviour. For example, Whiting et al (2007) identified five groups of factors that influence the ordering of diagnostic tests including diagnostic factors, therapeutic and prognostic factors, patient-related factors, doctor-related factors, and policy and organization-related factors. Physician payment method was only one of many organisational factors. Similarly Scott (2001) has identified the importance on non-pecuniary influences.

Competition between physicians can also influence the extent of the financial incentives. A few papers in our review studied the effect of physician competition, as measured by physician density. Grytten and Sorensen (2001) did not find any effect of physician density on physician outcomes while Delattre and Dormont (2003) found an effect of physician density: general practitioners paid under FFS responded to a rise in competition (density) by providing more intensive care in order to compensate for the decrease in the number of consultations. These findings highlight the importance of market characteristics in understanding the effect of financial incentives across countries with differences in physicians' markets.

None of the papers identified for inclusion in this review addressed the effect of remuneration schemes on the organisational structure of primary care. We did, however, identify some evidence relating to the effect of organisational structure on physicians' behaviour and also on the interaction between organisational structure and remuneration schemes. After the introduction of a mixed compensation system in Quebec in 1999 a study was undertaken to examine the different impacts of the change. Dumont et al. (2008) compared the amount of time spent on administrative and teaching tasks by physicians under FFS with physicians under a mixed system. They found that after physicians changing from a FFS to a mixed system spent more time on administrative and teaching tasks which were activities not remunerated under FFS. The Gosden et al. (2003) study that compared physicians under a PMS contract (salary) and physicians under a GMS contract (capitation and target payments) also looked at the effect of payment scheme on administrative duties. The results showed that salaried physicians spent less time on practice administration. However, there were some limitations with this study since the distributions of age and gender between the two types of practices had systematic differences.

One of the papers selected for review also examined the effect of organisational structure on physicians' behaviour and on the interaction between organisational structure and remuneration schemes. Sarma et al. (2010) found that solo family physicians who work with specialists undertake fewer patient visits than those who do not and that having a nurse practitioner, nurse or midwife in the practice did not matter for the number of visits. They so found differences between solo and group practices (although these were not related to the type of remuneration). They found that working in a group did not have any effect on direct patient care in a clinic.

5 Conclusion

The results of this review support the findings of earlier reviews on physician payment methods (Gosden et al. (2000)). This review only found limited evidence on the impact of the method of remuneration on physician behaviour in relation to service provision. While this review was not a systematic review we undertook a comprehensive search of databases and did not identify many studies. Gosden et al. (2000) identified the need for more and better studies of payment structures. Despite this, we were only able to identify a small number of high quality research studies and no RCT or case control studies. Most papers were Canadian or Scandinavian where there have been experiments with remuneration methods – in particular the exploration of non FFS models and comparing different remuneration methods.

There was no evidence that remuneration methods impacted organisational aspects of primary care physician practice such as practice size, workforce mix or range of services. Although there is evidence that financial incentives matter for physicians and that blended systems could balance incentives better, the papers included in the review did not provide evidence on the optimal mix of payment schemes.

The extent to which the findings of this review are directly applicable to the UK context and the funding of general practice is questionable. Many of the papers have limited relevance to the UK where general practice is already funded through a mixed methods approach of capitation together with targeted payments combined with fee for service/pay-for-performance (e.g. QOF). As such current funding patterns do not fall into an explicitly capitation or FFS remuneration model. There are GPs funded only by salary but they are normally members of practices funded through mixed methods with salaries paid by the practice rather than a third party.

The context within which UK general practice operates is also different to other countries – even where there are some shared characteristics such as a single-payer financed health system, family physicians having a gate-keeping role, rostered patient lists and localised practice. UK general practice has evolved within a restricted supply model (the now defunct role of the Medical Practitioner committees and more recently managed primary care services (e.g. through Primary Care Groups and Trusts) and a system of generally open patient registration but with little inter-practice patient transfer. General practice is also regulated through both the national contract and professional governance systems. Since 2004 general practices have also been funded as a practice organisation rather than through individual GP payments with the allocation of remuneration agreed within the practice. As Robinson and Megerlin (2007) have argued in a review of payment methods in the US and France “*The organizational challenges facing physician payment reforms stem from the multi-agent, multi-task nature of medicine, especially for patients with chronic conditions.*” (69). In this sense it is unlikely that remuneration methods alone have an impact and attention needs to be paid to other approaches to influencing behaviour and practice.

More research on the effects of remuneration is needed. This will need to be context specific. Studies that have examined the Quality and Outcomes Framework on GP behaviour have found significant changes in practice and in the organisation of practice workforces (Gillam et al 2012, Scott et al 2011). This pecuniary influence of a pay-for-performance scheme on practitioners and practices supports some of the key findings from this review. This reflects the similarity between QOF and FFS

payments. However, as with identifying the optimum mix of payment methods there is no research that explores the impact of pay for performance systems in relation to core remuneration method. Research on remuneration and payment methods also needs to take into account the influence on non-pecuniary factors.

Key conclusions:

- Payment schemes do seem to have an effect on physician behaviour in terms of the quantity of activity they undertake.
- These effects are limited and often negated by other factors that influence physician behaviour such as professional norms, patient related factors, prognosis etc.
- There is still a limited evidence base on the effects of remuneration methods impact on the productivity and quality of primary care physicians.

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Appendix 1: Characteristics of included studies on primary care physician payment methods

Study	Payment scheme(s)	Sample	Study methodology	Outcomes
Volume, referrals and prevention				
<i>Norway</i>				
Iversen and Luras (2000)	FFS, Capitation	Data on referrals from 27 general practitioners in the municipality of Trondheim, Norway for two periods (January-March 1993 and January-March 1996)	Random effects model	The rate of referrals to hospitals and specialists increased after changing to a capitation component of the payment.
Sorensen and Grytten (2003)	Salary, Mixed (FFS and fixed grant)	Sample of 1639 primary care physicians, randomly drawn from the register of the Norwegian Medical Association in 1998	Cross section survey, Regression analysis, Instrumental variables	FFS physicians had more patient visits. FFS physicians worked longer hours and were more time efficient. Physicians' preferences were found to change in the long run after the introduction of the FFS system. FFS physicians had fewer referrals than salaried physicians. FFS physicians had fewer referrals than salaried physicians.
<i>Canada</i>				
Devlin and Sarma (2008)	FFS, non FFS, Mixed, Salary	Sample of 7352 physicians from the 2004 National Physician Survey (sample restricted to physicians who conducted at least 10 patient visits per week and who worked 10-80 h/week in direct patient care)	Cross section survey, Regression analysis, Instrumental variables	FFS physicians had more patient visits relative to alternative remuneration schemes
Sarma et al. (2010a)	FFS, non FFS, Mixed, Salary	Sample of 10,457 physicians from the 2004 National Physician Survey	Cross section survey, Regression analysis, Instrumental variables	Non-FFS physicians spent fewer hours on direct patient care. They spent more hours to direct patient care in other settings (e.g. home care) and indirect patient care (e.g. teaching/education, reports etc.)
Sarma et al. (2010b)	FFS, Salary, Capitation, Sessional/ Per diem/ Hourly, Mixed	Sample of 2677 physicians from the 2004 National Physician Survey, Ontario sample	Cross section survey, Regression analysis, Instrumental variables	Non-FFS physicians conducted fewer patient visits per week in comparison to those paid under a FFS scheme. Physicians in group practices had more patient visits per week than physicians in solo practices.
Dumont et al. (2008)	FFS, Mixed (base wage and FFS)	Panel survey of physicians (CQM) and administrative data (RAMQ) 1996-2002	Panel data, Fixed effects, Censoring models	Physicians paid under a mixed system reduced the volume of services, increased the time spent per service and increased the

				time spent on teaching and administrative tasks compared to physicians paid under FFS
Kantarevic and Kralj (2013)	FFS, Blended (capitation, FFS)	Cohort of 3655 physicians in Ontario in years 2006 and 2010. Data was obtained from several administrative sources maintained by the Ontario Ministry of Health and Long-term care	Difference-in-difference matching	Physicians under the mixed system provided fewer services and visits per day but worked the same number of days per year and enrolled the same number of patients compared with physicians in the FFS model. Physicians in the mixed system were also more likely to achieve preventive care bonuses for senior flu shots, toddler immunizations, colorectal screening, pap smears and mammograms than physicians in a FFS model.
Mayo-Bruinsma et al. (2013)	Salary, FFS, Capitation, Blended	Cross section surveys in Ontario, 2005 and 2006	Cross sectional study, Multivariate regression analysis	Patient-reported scores regarding the provision of family-centred care did not vary significantly by primary care model. Provider-reported scores were significantly higher in community health centres than in family health networks
Tu et al. (2009)	FFS, Salary, Capitation	Data on 135 primary care physicians with three different models of care, abstracted from 28 adult patient charts randomly selected from each physician	Cross sectional chart abstraction study, Logistic regression	Screening rates were similar between the three models but there were differences in treatment and control rates with capitation physicians having the best treatment and control rates
<i>USA</i>				
Catalano et al. (2000)	FFS, Capitation (not-for-profit and for-profit)	Colorado health centres, clinics and hospitals participating in the Colorado Capitation Demonstration Project, October 1994 – June 1997	Interrupted time series	Downward shift in total costs for all services, total costs for inpatient care and the number of inpatients treated in the capitated areas (both profit and not-for-profit) compared to FFS areas. There was also an increase in the number of children treated in secondary and tertiary prevention services.
Kralewski et al. (2000)	FFS, Capitation, Salary, Revenue sharing, Compensation based on productivity	86 clinics of 57,123 patients that contracted with Blue Cross Blue Shield of Minnesota during 1995. Most clinics were located in Minnesota; Wisconsin, Iowa, South Dakota and North Dakota were also represented.	Cross sectional study, multivariate regression analysis, instrumental variables	At the group practice level, capitation was related to lower clinic costs. This effect was smaller when FFS with withhold payment was included. At the physician compensation level within the clinics, payment based more on revenue sharing was related to lower patient care costs than payment related to productivity or salary. Salary compensation was strongly associated with higher costs.
Shen et al. (2004)	FFS, Capitation	2% random sample of physicians from the American Academy of Family Physicians	Cross section survey in which patient insurance status (FFS or capitation) was randomly incorporated into 4	Capitation was associated with higher conservation of discretionary resources compared with FFS. There was no effect of the compensation method in cases of life-saving treatments. Capitation was also associated with more referrals compared to FFS. In life-savings cases, patients' insurance status was

			clinical scenarios using a Latin square design	unrelated to the referral decision.
Melichar (2009)	Capitation, non-capitation	1998 National Ambulatory Medical Care Survey. The survey was distributed to 1226 office-based physicians and collected information about a random sample of weekly ambulatory patient encounters	Panel data analysis	Capitated patients had visits that were statistically significant shorter than patients who were not capitated
Helmchen et al. (2010)	Salary, Mixed (salary plus piece rate)	Four year sample (2003-2006) of 59 physicians and 1.1 million encounters in a network of primary care clinics	Pre-post design with trend and physician fixed effects	Physicians paid under the mixed payment system raised the number of their encounters per month compared to when paid by salary. They also raised the number of days they spent at the network each month and the number of procedures eligible for additional payment.
Landon et al. (2011)	Salary, variable payments (varying by productivity, practice financial performance, patient satisfaction, comparative practice profiling)	2,211 primary care physicians from the 2004-2005 Community Tracking Study Physician Survey. Linked to administrative data for 250,000 Medicare enrollees	Cross sectional analysis, Linear regression	Relative to physicians compensated by a fixed salary, physicians with variable payments in highly capitated environments had the lowest costs and intensity of care.
Marton et al. (2014)	FFS, Capitation	Sample of children in two Kentucky areas living in the regions and continuously enrolled in Medicaid, 1997-1999	Quasi-experimental approach exploiting the timing and county-specific implementation of Medicaid mandates in two contiguous regions	Capitated primary care physicians achieved significant reductions in physician utilizations
Quast et al. (2008)	FFS, Capitation	Data on all Medicaid MCOs in a state between January 2004 - December 2004; Sample restricted to relatively healthy children	Probit regression analysis	Enrolees in managed care organizations that paid physicians exclusively via FFS were more likely to receive well-child visits and less likely to receive asthma medication prescriptions than patient enrolled with physicians paid via capitation
<i>Other</i>				
Gosden et al. (2003)	Salary, Capitation and target payments	10 practices in England in which general practitioners switched to salaried contracts without moving practice. This sample was matched to the PMS practices in terms of the number of whole time equivalent	Controlled before and after analysis	Salaried practices spent more time working out-of-hours and in direct patient care. Salaried physicians provided shorter consultations and prescribed fewer consultations. The list size per physician was higher for salaried physicians because of staffing policies. No differences were found with respect to

		general practitioners and deprivation amongst the patient population. The period covered 1 week periods in the first year of PMS (1998-1999) and one year later (1999-2000)		referral rates between the two types of physicians.
Kuusela et al. (2004)	Capitation, Time-based contract	81 general practitioners with their patients from four health care centres in Finland; 2191 encounters	Cross-sectional study based on paired questionnaires answered by patients and general practitioners	Physicians in the capitation based contract rated their work quality higher than the physicians' in the time based contract.
Granlund (2009)	Salary, FFS, FFS with capitation	Data on 5.1 million prescriptions sold in the county of Västerbotten, Sweden from January 2003 to October 2006	Odds ratio model	FFS physicians were more likely to oppose generic substitution than salaried physicians
Henning-Schmidt et al. (2011)	FFS, Capitation	42 medical students were recruited via an online recruitment system (20 of them participated in FFS and 22 in capitation)	Laboratory experiment	Physicians under FFS provided more services than under capitation.
Supplier induced demand				
<i>Norway</i>				
Carlsen and Grytten (1998)	FFS	1 month in 1995 data from the National Insurance Administration on 1,617 physicians with 360,914 visits	Cross section analysis, Instrumental variables	No evidence of supplier induced demand
Sorensen and Grytten (1999)	FFS	1 month in 1995 data from the National Insurance Administration on 1,415 physicians with 619,246 contacts	Cross section analysis, Instrumental variables	No evidence of supplier induced demand
Grytten and Sorensen (2001)	FFS, Salary	Sample of all contract physicians and salaried physicians in the Norwegian Medical Association in 1998; 1995 data on FFS physicians from the National Insurance Administration	Cross section analysis, Instrumental variables	No evidence of supplier induced demand
Grytten et al. (2001)	FFS	1 month in 1995 from the National Insurance Administration of 1,927 contract physicians	Cross section analysis, Instrumental variables	No evidence of supplier induced demand
Grytten and Sorensen (2007)	Mixed capitation (per capita payment and FFS)	2002 Extensive Questionnaire Survey of Norwegian Primary Physicians and Survey	Cross section analysis, Instrumental variables	No evidence of inducement among physicians with short lists

		Data of the Norwegian Population		
Iversen and Luras (2000)	Mixed capitation (per capita payment and FFS)	Data from the Norwegian capitation experiment for each physician's practice for the municipalities that participated in the experiment. Two representative periods of 14 days one in March 1994 and in March 1995. Included only physicians with more than 500 persons on the list and income data of sufficient quality were included	Regression analysis	Physicians with a shortage of patients have higher income, longer and more frequent consultations and more laboratory tests per listed person than unconstrained physicians
Iversen (2007)	Mixed capitation (per capita payment and FFS)	Data from the Norwegian capitation trial that included four municipalities and run from 1993 to 1996. Data are collected for years 1994-1998.	Regression analysis, Probit model, Random effects with selection correction model	Physicians with a shortage of patients were found to provide more services per patient even five years after the change
Grytten and Sorensen (2008)	Mixed capitation (per capita payment and FFS)	2002 survey of all Norwegian regular general practitioners	Regression analysis, Instrumental variables	Physicians with a shortage of patients had more external consultations. This was evidence of an availability effect that should be taken into consideration when studying demand inducement
<i>Other</i>				
Delattre and Dormont (2003)	FFS	Random draw of a tenth of the whole population of the French self-employed physicians collected by the public health insurance. The panel covers years 1979-1993	Panel data analysis	There was evidence of induced demand. General practitioners were found to respond to a rise in the density of physicians in the area by increasing the intensity of care delivered per encounter in order to compensate for the decrease in the number of consultations
Patient pre-selection				
<i>USA</i>				
Sorbero et al. (2003)	FFS, Capitation	Administrative enrolment and claims or encounter data for 1994-1995 from three independent associations and one large multispecialty medical group in New York, Ohio, Idaho and California	Regression analysis with physician fixed effects	Patients with capitated physicians were more likely to switch physicians than similar patients with FFS physicians. This result was either the result of capitated physicians avoiding high-cost patients or that high utilisation patients may be more sophisticated
<i>Canada</i>				
Kantarevic and Kralj (2014)	Blended capitation (capitation, partial cost)	Data for all patients enrolled as complex/vulnerable between April 2009	Panel data analysis, Difference-in-difference	There was no impact of the removal of a financial incentive used to enrol vulnerable patients on patient enrolment or cost

	reimbursement, ex-post fund)	and March 2011, combined from the Ontario Health Insurance Plan, the Client Agency Program Enrolment and the Corporate Provider Database	model	shifting. This could be the result of the fact that incentives were diluted because physicians faced limited risk and could shift costs to other providers and because physicians could be motivated by altruism and professional ethics
Kantarevic and Kralj (2013)	FFS, Blended (capitation, FFS)	Cohort of 3655 physicians in Ontario in years 2006 and 2010. Data was obtained from several administrative sources maintained by the Ontario Ministry of Health and Long-term care	Difference-in-difference matching	No evidence of patient selection. Both types of physicians enrolled patients with expected primary care expenditures.
Size of remuneration				
<i>Norway</i>				
Carlsen et al. (2003)	Mixed (FFS and fixed grant)	Data on contract physicians obtained from the Social Security Offices 1991-1994	Probit models	Changes in the remuneration and changes in private economy have no effect on the number of laboratory tests taken
Grytten et al. (2008)	FFS	2,650 FFS physicians for the years 1995-2000	Regression analysis	Changes in fees had no income effect on service production
Gjelsvik (2009)	FFS	Panel of 2,083 physicians for the period 2001-2004	Panel data analysis, Fixed effects	No evidence of income effect on the service level for laboratory tests from a reduction in reimbursement fees. There was evidence of a substitution effect whereby physicians changed their composition of laboratory tests to tests that were more expensive when fees decreased. Also evidence of spill over effects as physicians who experienced a loss of income ordered more of their laboratory tests from clinical laboratories.
Munkerud (2012)	Mixed (FFS and capitation fee)	Unbalanced panel of 3,849 general practitioners from the month of October for 4 years (2001-2004) with 1,399,626 encounters	Random effects probit models	An increase in fees led to a small significant increase in use
<i>USA</i>				
Clemens and Gottlieb (2014)		1997 data on Medicare claims data of the 206 Medicare fee schedule areas in the United States	Analysis of treated and control areas using the exogenous area-specific price shocks	Areas with higher payment increases experienced significant increases in health care supply. This effect was observed for elective procedures, while services with clear benefit or harm were not as responsive. There was modest evidence that reimbursement rates influenced investment decisions in technology and such diffusion of technology would increase the direct effect of reimbursement

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Appendix 2

Cochrane Library

1. MeSH descriptor Family Practice, this term only in MeSH
2. MeSH descriptor Physicians, Family, this term only in MeSH
3. primary next care in Record Title or primary next care in Abstract
4. primary next health next care in Record Title or primary next health next care in Abstract
5. general next practice* in Record Title or general next practice* in Abstract
6. family next practice* in Record Title or family next practice* in Abstract
7. general next practitioner* in Record Title or general next practitioner* in Abstract
8. family next physician* in Record Title or family next physician* in Abstract
9. family next doctor* in Record Title or family next doctor* in Abstract
10. primary next care next practitioner* in Record Title or primary next care next practitioner* in Abstract
11. gp in Record Title or gps in Record Title or gp in Abstract or gps in Abstract
12. (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11)
13. MeSH descriptor Gatekeeping, this term only in MeSH
14. gpwsi* in Record Title or gpwsi* in Abstract
15. gp* near special near interest* in Record Title or gp* near special near interest* in Abstract
16. practitioner* near special near interest* in Record Title or practitioner* near special near interest* in Abstract
17. outreach next clinic* in Record Title or outreach next clinic* in Abstract
18. specialist* next clinic* in Record Title or specialist* next clinic* in Abstract
19. satellite next clinic* in Record Title or satellite next clinic* in Abstract
20. liaison near/3 (service* or provid* or provision* or organis* or organiz* or deliver* or attachment*) in Record Title
21. liaison near/3 (service* or provid* or provision or organis* or organiz* or deliver* or attachment*) in Abstract
22. gatekeep* in Record Title or gatekeep* in Abstract
23. shared next care in Record Title or shared next care in Abstract
24. integrated near/2 care in Record Title or integrated near/2 care in Abstract
25. discharge next (guideline* or procedure* or arrangement* or routine*) in Record Title
26. discharge next (guideline* or procedure* or arrangement* or routine*) in Abstract
27. (primary or gp or gps) near/3 (secondary next care) in Record Title
28. (primary or gp or gps) near/3 (secondary next care) in Abstract
29. (practice* or practitioner*) near/3 incentive* in Record Title or (practice* or practitioner*) near/3 incentive* in Abstract
30. "models of care" or "model of care" in Record Title or "models of care" or "model of care" in Abstract

31. (#13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30)
32. (#12 AND #31)

Pubmed

1. physician incentive plans [mesh]
2. physicians [mesh:exp]
3. incentiv* ti,ab.
4. (economic or financial or payment or reimburs* or reward* or fee*) ti,ab.
5. #3 and #4
6. #2 and #5
7. fees and charges [mesh:exp]
8. (capitation fee or fee-for-service plans or fees, medical, or fees, pharmaceutical or fees, pharmaceutical or prescription fees, or rate setting and review) [mesh]
9. budgets [mesh:exp]
10. healthcare financing [mesh]
11. income [mesh]
12. capitation or capitated or capitating
13. fee-for-service
14. salary
15. compensation or compensatory
16. payment* and (capped or level* or linear* or Medicaid* or medicar* or non-linear* or per-patient* or per-episode* or per-visit* or performance or prospectiv* or retrospectiv* or reward* or schedule* or system* or target*)
17. #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16
18. physicians [mesh:exp]
19. group practice [mesh: exp]
20. primary health care [mesh]
21. general practice [mesh]
22. community and (doctor* or physician* or practice* or practitioner*)
23. family and (doctor* or physician* or practice* or practitioner*)
24. general and (doctor* or physician* or practice* or practitioner*)
25. #18 or #19 or #20 or #21 or #22 or #23 or #24 #25 or #26 or #27
26. #17 and #25

EconPapers (RePEc)

1. incentiv*and (financial* or economic or monetary)
2. incetiv*
3. payment and (blend* or non-linear* or linear* or threshold* or prospectiv* or retrospectiv*)

4. physician* compensation
5. capitation*
6. fee-for-service
7. salary*
8. #1 or #2 or #3 or #4 or #5 or #6 or #7
9. physician*
10. primary care
11. general practitioner*
12. family doctor*
13. #9 or #10 or #11 or #12
14. #8 and #13