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# Using DEA to estimate potential savings at GP units at medical specialty level

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ABSTRACT

The aim of this paper is to identify benchmark cost-efficient General Practitioner (GP) units at delivering health care in the Geriatric and General Medicine (GMG) specialty and estimate potential cost savings. The use of a single medical specialty makes it possible to reflect more accurately the medical condition of the List population of the Practice so as to contextualize its expenditure on care for patients. We use Data Envelopment Analysis (DEA) to estimate the potential for cost savings at GP units and to decompose these savings into those attributable to the reduction of resource use, to altering the mix of resources used and to those attributable to securing better resource 'prices'. The results reveal a considerable potential for savings of varying composition across GP units.



## 1. Introduction

In the UK health care is free at the point of delivery for all residents. All individuals covered by the National Health Service (NHS) are registered with a General Practitioner (GP) who in turn normally delivers his/her services within a GP unit, or Practice, comprising one or more GPs. The Practice is the gateway for the individual to health care under the NHS. A GP within a Practice is responsible for the clinical decision whether or not to refer a patient for further medical care, (normally at a hospital), the type of initial referral (e.g. inpatient or outpatient treatment) and indeed the medicalspecialty that would be appropriate for the referral. The (primary) medical diagnosis associated with a referral would place the patient in a 'Healthcare Resource Group' (HRG) and the care provider – generally a hospital – will be compensated then by the Primary Care Trust (PCT) at the tariff applicable to that HRG. It is clear therefore that the costs incurred by a PCT for medical care of the patients it covers depend crucially on the clinical pathways the GPs decide upon. This study in effect captures the economic consequences of varying GP choices on pathways, controlling for disease weight, under an implicit assumption that patient outcomes are not compromised albeit they may be reached by alternate pathways.

Our analysis in this paper follows the work initiated in Ref. [23] where 75 GP units have been compared on referral and drug prescription costs. In that paper overall inpatient referrals, outpatient referrals and drug prescription costs were compared amongst GP units controlling for their list population characteristics. The focus on referrals relates to the fact that the way physicians approach such treatment influences several aspects of patient care, including its quality and cost. As mentioned in Ref. [4]; in a survey comparing referral decisions of specialist and primary care physicians, different physicians have different reasons for choosing their referral partners. (In their study they found, for example, that primary care physicians were more likely to be concerned with patient access than specialist doctors).

In Ref. [23] the aim was to understand how Practices compare with each other on costs and volumes of referrals and drug prescriptions. Although differing costs amongst Practices were contextualised by the characteristics of the list population served, those characteristics reflect only indirectly their actual health needs. In order to try to account for the health needs of the people served by the Practice more directly, we need to know the type of diseases they had and the complexity and severity of the condition they presented at the point the Practice decided on a treatment pathway. However, the disease types are varied and for clinical and accounting purposes they are classified in this study into 11 clinical specialties. In addition, within each specialty patients entering the hospital are assigned a primary diagnostic (ICD –International Classification of Diseases) code. It is this code which is principally responsible for placing them within an HRG which in turn

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determines the financial remuneration or payment the care provider will get for the patient episode concerned. In the UK there are several hundred HRGs onto which several thousand ICDs are mapped. Base tariffs for patient (or more precisely 'consultant') episodes within each HRG are set nationally by the Department of Health.

In order to account for the varied health needs of the population, we undertake in this paper a comparative analysis of costs of Practices (we are modelling particularly inpatient and outpatient referrals costs and drug prescription costs) for one particular medical specialty. The specialty analysed is the **General Medicine and Geriatrics** (GMG) combined specialty. This is amongst the specialties representing the highest percentage of the total costs of a Practice. (It represents on average about 22% of total inpatient costs of a Practice and 12% of its total outpatient referral costs.)

Controlling for the GMG related disease weight of each Practice we identify three potential components of cost savings: savings through reducing the volumes of referrals and drugs, savings through switching between types of referrals and/or drugs, and savings through securing a better unit cost profile for referrals and drugs. The latter component may appear counter-intuitive given that most payments for referrals and drugs are standardized and based on 'Payment by Results' (PbR) national tariffs. Nevertheless Practices can to an extent affect unit costs by better targeting providers at referral stage. For example, indicating accurately the disease code applicable to a referral will avoid a referred patient undergoing a second diagnosis in hospital to correct a poorly specified initial one, for which nevertheless a fee would still be paid by the PCT. Similarly, a Practice may press for prompt hospital discharge to reliable family care where applicable thus reducing length of stay and avoiding the possibility of hospital complications and surcharges on the national tariffs.

We use Data Envelopment Analysis (DEA) to compute the potential cost savings at each Practice as we progressively relax the assumptions about the possibility of switching between types of referral and drug use, and introduce the notion of potentially improving on unit costs at each Practice. An implicit assumption is made in our analysis: that Practices deliver similar levels of quality of health care where clinical outcomes are concerned. It is noted that in the context of this study quality of care relates only to the service the Practice provides in terms of referring a patient when appropriate and/or prescribing drugs. It does not relate to the quality of care the patient ultimately receives in hospital and the consequent clinical outcomes. Our approach to an extent captures quality of care where costs are concerned. If the Practice refers when it should not this will show up as cost inefficiency in our model but it will not capture additional discomfort to the patient undergoing potentially unnecessary tests. If the Practice does not refer when it should then this can ultimately result in an emergency admission, which again can show up as higher cost than a planned admission to hospital but again the potential damage to the patient through delayed treatment is not captured. In the case of Practice-prescribed drug treatment our model does not capture the potential ill effects of unsuitable drug treatments but it does capture uneconomic drug prescription. Thus while the model does capture the quality of care in terms of its impact on costs it does not capture impact on the clinical condition of the patient and in that sense we need to assume that Practices deliver similar quality of care in terms of medical outcomes. As variables relating to clinical outcomes were not available to us, we have left quality of clinical care issues to be addressed in future research.

This paper is structured as follows: In Section 2 we present some previous studies on primary health care efficiency, analyzing with some detail those that most closely relate to the approach presented in this paper. In Section 3 we present the models used, and in Section 4 the results for 75 GP units analysed. Section 5 concludes the paper.

## 2. Related literature

Health studies can be undertaken at several levels of analysis (e.g. patient, service department, hospital, primary care units, health districts, etc.). In his most recent literature review in this area [9], reports that 50% of health applications concern hospitals and only about 10% concern primary care (in a total of 17 studies). In Ref. [3] a literature review on primary health care applications is undertaken and the authors report about 21 studies using the DEA methodology.

The studies on primary care have mainly looked at the efficiency of providing the health service, i.e. the efficiency of translating resources available (staff, materials and technology) into health intermediate outputs (such as consultations and treatments of various types). Examples of such studies include [20,25] or [1]. This type of studies can be seen as addressing health care provision from a managerial perspective (as termed by Chilingerian and Sherman [5] as opposed to a clinical perspective, where the focus is on analyzing how a Practice utilizes the minimal quantity of clinical resources (such as consultations, referrals, treatments, and drugs) to achieve a constant quality outcome, when caring for patients with similar diagnosis complexity and severity. These perspectives embody two important concepts in health contexts: that of outputs or intermediate outputs (related to the quantity of care provided) and that of outcomes (related to the quality of care provided) (see [8]). Typically the transformation of inputs into intermediate outputs is seen as an efficiency assessment and the transformation of intermediate outputs into outcomes is seen as an effectiveness assessment [2]. complement these perspectives with a third perspective of assessment related to equity. For that purpose, they define in addition to inputs, intermediate outputs, and outcomes, also local needs. The comparison between the services provided (intermediate outputs) and the local needs yields a measure of relative equity across Practices.

A number of studies, e.g. Refs. [12,16–19,23,26], an have adopted a cost perspective for the assessment of GP units, which can be seen as an additional perspective of analysis relative to the managerial and clinical perspectives noted above. All these studies have compared the costs of providing the service (like referral or medication costs), controlling for certain characteristics of the patients concerned such as age, gender, or level of deprivation. For example [17], used as a control variable the population served by the Practice divided into 22 categories reflecting age, gender, education and employment. These 'output' measures are not intermediate outputs or outcomes as reported above, but they work as control variables for undertaking cost comparisons between Practices.

There are not many studies on primary care that focus on the analysis of a single specialty. Specialty or disease level analysis is more frequent in hospital studies, where the complexity and heterogeneity of services offered and patients treated makes attractive the benchmarking of similar hospital units (like obstetrician departments in Ref. [13]; or intensive care units (ICU) in Ref. [15] or [6] or groups of diseases (e.g. like diabetes in Ref. [10]; or the DRG – Heart Failure and Shock in Ref. [7]. Some examples of studies in primary care focusing on a given specialty/disease are Linna et al. [11], who analysed oral health care in Finnish health centers through a DEA method, Amado and Dyson [2], who analysed diabetes in primary care in the UK using DEA, Thanassoulis et al. [21] who used DEA to assess the provision of perinatal care in district health authorities in the UK, or [14] who used DEA to assess otitis media treatment by primary care physicians in the US. Even if these studies focus on a particular disease they still use different levels of