

GP practice variation in hospitalisation rates: a study of Partnership Health–enrolled patients

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ABSTRACT

AIM: This project aims to provide information to support the planning and implementation of strategies to reduce hospitalisation. It examines variations in hospital discharge rates between practice populations and the use of special general practice access funding.

METHODS: Practice enrolment data for 345 254 patients enrolled with 102 Partnership Health Primary Health Organisation (PHO) general practices were sent to New Zealand Health Information Service. Data linked to the patient National Health Index (NHI) relating to hospital discharges were attached to the practice enrolment data for the two years ending June 2007 and returned to the researchers with the NHI numbers encrypted. Total discharges were 127 426. The data were analysed for rates of hospital discharges for different population groups and by general practice.

RESULTS: There is a substantial variation in hospital discharge rates between general practices, but this is only partly accounted for by practice population characteristics. Furthermore while there is a strong social gradient in European admissions, this is much less true for Maori. There was also a wide variation between practices in the uptake of High Use Health Cards, special funding for frequent attenders at general practices and 'Care Plus' funding for patients with chronic conditions. Practice deprivation, ethnicity and age only explained a minor part of this variation.

DISCUSSION: The high rate of unexplained practice variation in chronic care management and hospitalisation rates, especially for Maori, is of concern. Further investigation of the causes of such variability is needed as a first step in reducing hospitalisation.

KEYWORDS: Hospitalization; ethnic groups; data collection

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Introduction

Reduction of hospital admissions through greater intensity of care in primary health care has been strongly emphasised in many countries, including New Zealand. The evidence from the experience of Kaiser Permanente, a large United States Health Maintenance Organisation, is that hospital admissions can be halved through appropriate use of the primary care sector.¹ A key factor in this strategy is the organisational integration of primary and secondary care such as is now being addressed by District Health Boards (DHBs).

Canterbury DHB, in conjunction with the primary care sector in Christchurch including

Pegasus Health, have sought to reduce demand upon emergency department and hospital services through primary care alternatives. Attention has now shifted to what has been hailed as the 'Canterbury Initiative'.² General practitioners and specialists are working together to develop and implement mutually acceptable solutions to common problems. One aim is to reduce unnecessary demands on hospital-based care, including admissions.

Despite the importance of reducing hospital admissions, there has been little research examining variations in hospital admission rates between general practices. While studies of medical prac-

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tice variation are well documented in primary and secondary care, both in New Zealand³⁻⁶ and elsewhere,⁷⁻⁸ there has been little research that has specifically examined links between the two. That which has been conducted suggests that sociodemographic characteristics of practices explained most of the variation in overall admission rates and that the general practice characteristics considered added very little.⁹⁻¹⁰

If variation in admission rates cannot be accounted for by differences in patient morbidity, then questions arise regarding equity of access to hospital care, appropriateness of hospital referrals and admissions and the effectiveness of primary care. Given the recent emergence of Primary Health Organisations (PHOs) in New Zealand,

- To determine the extent to which special access funding is associated with practice need characteristics and increased risks of hospitalisation.

Methods

The study is based on patient enrolment data provided by Partnership Health, which represents approximately 75% of the Canterbury district population and is the largest PHO in New Zealand, with an enrolled population of 345 254 in 2007 including 19 712 Maori and 6974 Pacific people. It has over 100 general practices based in Christchurch and Selwyn.¹⁵ It has a broadly-based governance structure with strong representation from community groups including Maori and Pacific people.

Partnership Health, in conjunction with Pegasus Health, has established a comprehensive practice-based database of its enrolled patients. The almost complete recording of patients' National Health Index (NHI) numbers is a key part of this database and enables linkages to be researched between this database and hospital discharges from data held by the New Zealand Health Information Service (NZHIS).

Enrolment data for Partnership Health were provided by Pegasus Health. This included the NHI numbers for all patients enrolled to which was attached data relating to practice of enrolment, date of birth, gender, ethnicity, deprivation scores, High Use Health Cards (HUHCs)—a subsidy related to need for high use of general practice consultations—and Care Plus—a subsidy for patients with chronic conditions. The date of the data set was October 2007.

The data were sent directly to the NZHIS by Pegasus Health. The NHI was used to link the Partnership Health enrolment data to the National Minimum Data Set (NMDS) for all hospital discharges totalling 127 246 for those enrolled for the 2½ years ending 30 June 2007. The data added to the Partnership Health data set included ethnicity, and all the other variables associated with a hospital discharge including date of admission and discharge and diagnosis. The linked data from NZHIS was returned to the re-

While studies of medical practice variation are well documented in primary and secondary care, both in New Zealand and elsewhere, there has been little research that has specifically examined links between the two

with their increased focus on equity issues in health policy,¹¹ it is imperative that research investigates such variations.

This study is part of a larger set of studies examining relationships between primary and secondary care in Partnership Health general practices. These include studies of the quality of PHO data compared with hospital data,¹² of hospital general practice/hospital data on cardiological services especially related to Maori,¹³ and of ambulatory sensitive hospitalisations.¹⁴

With such considerations in mind, this paper has three main objectives:

- To examine the extent of the variation in hospital discharge rates between general practices.
- To determine the extent to which this variation can be explained by patient characteristics, in particular deprivation and ethnicity.

searchers with the NHIs encrypted. The NMDS data analysed were based upon the discharges of all patients enrolled with Partnership Health over the two years ending 30 June 2007.

In addition to calculating annual admission rates for age, gender, ethnicity, deprivation (meshblock domicile), HUHCs and Care Plus, crude annual rates were calculated for each general practice. These are defined as the total number of admissions for each general practice per year per 1000 patients registered at that practice. Rates were calculated for all 102 practices for which data were available.

The association between admission rates and possible explanatory factors was investigated via stepwise multiple regression analysis. The analyses of admission rates were undertaken as follows: First, controls were made for practice variations in age and sex by entering these into the model followed by other practice population variables, including deprivation, percentage Maori, percentage Pacific and percentage Asian patients. Second, the same process was then repeated using age/sex and other practice characteristics. The latter included practice size (number of enrolled patients), average number of patients per GP and the proportion of practice populations enrolled in Care Plus and with HUHCs. Third, all practice characteristics were included in the final model. Separate analyses were conducted for total, European and Maori patients.

For the analyses predicting practice variations in the take-up of Care Plus, and in the use of HUHCs, all variables were included in stepwise models, for total, European and Maori patients. The analyses were conducted with SPSS for Windows Version 15.

Results

Practice variations in discharge rates

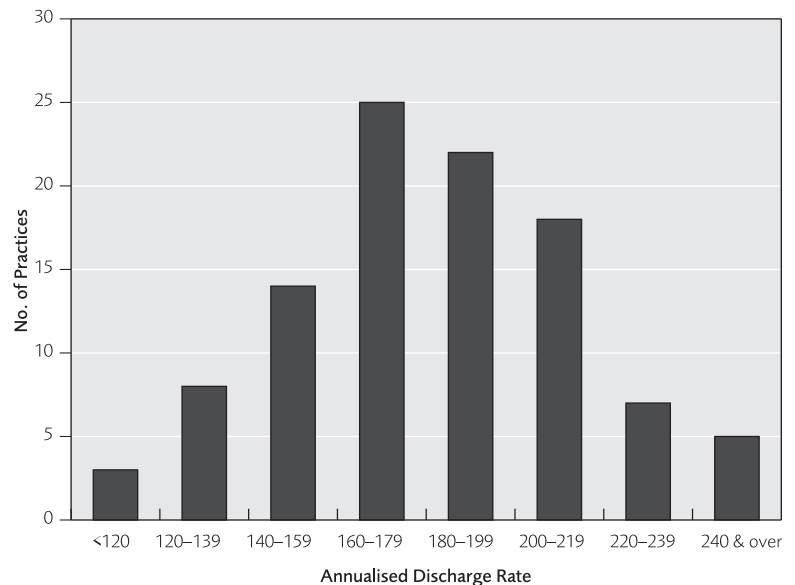
Figure 1 indicates extensive variation in crude discharge rates between practices. Crude discharge rates/1000 ranged from a low of 74/1000 to 353/1000 around the mean of 184/1000 (SD=38.0). The important question is, thus, to what extent can this variation be explained by

WHAT GAP THIS FILLS

What we already know: Despite the improving quality of general practice enrolment data, very little analysis has been undertaken to explore the use of the data in linking primary and secondary care utilisation.

What this study adds: A new approach to analysis using the National Health Index numbers to link general practice data with other data sources, including national data on deprivation and ethnicity, demonstrates how primary health organisation data can reliably contribute to a district database.

Figure 1. Annualised discharge rates for GP practices



variation in practice populations or by other practice characteristics?

Table 1 presents the results of the stepwise regression models containing age and other practice population characteristics. Three practice population characteristics emerged as significant predictors of total discharges: mean deprivation, Maori ethnicity and the percentage of Asian patients, the presence of whom tended to reduce admission rates. Similar results were obtained for European but not for Maori patients. Here both predictors were different and the cumulative R^2 was much lower than for the other two models (0.271 vs 0.558 and 0.583). Also it is interesting that European discharge rates were higher in practices with a higher proportion of Maori (even after accounting for deprivation) and Maori rates

Table 1. Stepwise regression models for total discharge rates

Factors included in model	Coefficient	P-value	R ²	Cumulative R ²
Total patients				
% patients 0–4	4.64	0.001		
% patients 65 and over	1.64	0.001		
Males per 100 females	0.03	0.799	0.092	0.092
Mean deprivation	11.86	0.001	0.382	0.474
% Maori	2.66	0.001	0.067	0.541
% Asian	-1.25	0.003	0.042	0.583
European				
% patients 0–4	6.16	0.001		
% patients 65 and over	1.40	0.001		
Males per 100 females	-0.09	0.931	0.088	0.088
Mean deprivation	11.64	0.001	0.434	0.522
% Maori	1.84	0.006	0.036	0.558
Maori				
% patients 0–4	2.25	0.027		
% patients 65 and over	1.53	0.165		
Males per 100 females	-0.07	0.615	0.014	0.014
Mean deprivation	20.78	0.001	0.186	0.200
% European	1.01	0.005	0.040	0.240
% Pacific	1.52	0.047	0.031	0.271

Table 2. Hospital discharge rates for Partnership Health enrolled patients by Care Plus and High Use Health Cards

	Standardised discharge rate	95% confidence limit
Care Plus	511	(499.7–522.3)
No Care Plus	177	(175.3–178.7)
Ratio	2.9	
HUHC	701	(665–736)
No HUHC	168	(166.3–169.7)
Ratio	4.2	

were also high in practices with more European and Pacific patients, although the effect of these factors was small compared to the effects of deprivation. Nevertheless, what is important is that ethnic mix had effects independent of deprivation in all three models.

While there was a significant relationship, after controlling for age and sex, between the proportion of patients enrolled in Care Plus and hospitalisation rates, the effect disappeared when

further controls were made for deprivation and other practice population characteristics.

Practice variations in enrolment in Care Plus

Partnership Health patients enrolled in Care Plus and with HUHCs have much higher discharge rates than those without, with the former being 2.9 times more likely to experience a hospital episode and the latter 4.2 times (Table 2). However, the question arises as to the extent to which GP practices vary in the extent to which they have developed chronic patient care programmes, like Care Plus, compared to HUHCs which is a subsidy approach tied to the number of GP visits.

Even more so than for discharge rates, Figure 2 indicates a considerable variation between practices in patient enrolment in Care Plus. Just over half of the Partnership Health practices had enrolment rates of less than 1%, while 12 practices had rates of enrolment over 5% and seven of these were over 10%.

Of the practice population and other characteristics, only the former help predict practice variations in Care Plus enrolment. For all patients, the percentage of Maori and the percentage aged 75 years and over are the main predictors. This is also true for European patients, while for Maori only the percentage of Maori in a practice emerged as a significant predictor. Other variables, such as practice size, were not significant. For HUHCs the results (not shown) are similar, with older patients and deprivation being the main predictors in all three models (R^2 of 0.251, 0.313 and 0.124 respectively).

Discussion

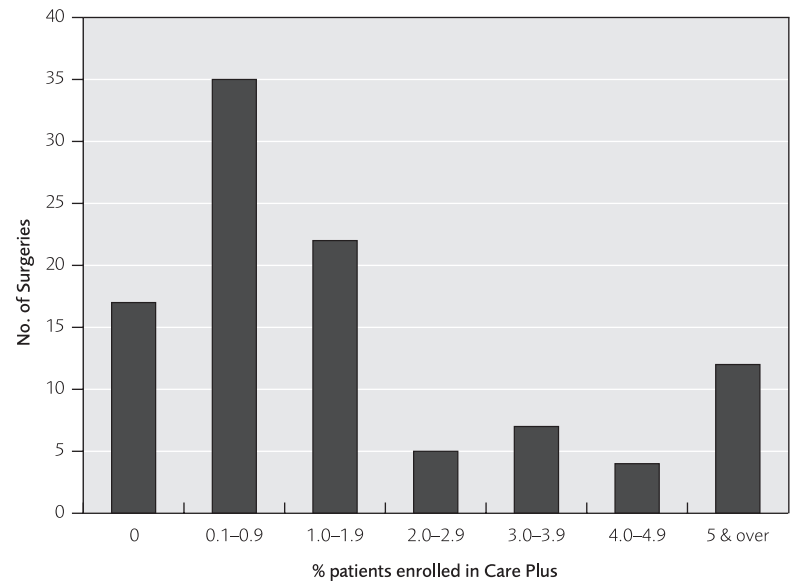
There are two important findings of this research. First, the study confirms substantial variations in discharge rates between general practices in the Partnership Health PHO, with the highest rates more than double those of the lowest. The mean admission rate of 184 per 1000 is almost identical to that reported by an English study.⁹ Thus, while the level of practice variation in the current study is not unexpected, it is important because of the need to better understand

the reasons for such differences. There is no universal standard on what constitutes a normal range of practice variation in admission rates, but clearly in an era of fiscal constraints and limits on the ability of hospitals to provide patient care, increasing our understanding of patient pathways to hospital and the role of GPs as 'gatekeepers' would seem to be a high priority.

While, as in other studies,⁹⁻¹⁰ practice population characteristics were found to be the most significant factors explaining practice differences in discharge rates, these factors explained only 63% of the variation in total discharge rates, 58% of the variation in European rates, but only 26% of the variation in Maori rates. Other measures of primary care service provision, such as practice, were insignificant. Substantial variation therefore remained.

The most likely explanation, as suggested by the numerous studies of medical practice variation, which is ubiquitous in the health sector, is general practitioner variability in the assessment and treatment of patients. Variations in clinical decision-making could occur for a variety of reasons, including uncertainty in diagnoses,¹⁴ which is associated with higher rates of investigations and follow-up and increased chances of referral to hospital.¹⁵ Pressure from patients,¹⁶ GP relationships with local specialists⁹ or patterns of social exclusion in primary care have also been suggested as contributory factors. With respect to the latter, overseas research indicates that the quality of care, especially in terms of consultation time, is less in more disadvantaged practices.¹⁷⁻¹⁸ While GP utilisation rates for

Figure 2. Practice variations in enrolment in Care Plus



deprived groups have increased in recent years,¹¹ if social and ethnic variation exists in the quality of treatment provided to patients by GPs, then unmet need is likely to result in increased hospitalisation. This may well be one factor leading to relatively high rates of hospitalisation among Maori attending less deprived practices and why there was a lack of any clear relationship between practice deprivation and Maori hospitalisation rates.

The second important finding of this research is the independent and often divergent effect of ethnicity on hospitalisation rates. While Maori had the highest rates of admission, these were

Table 3. Stepwise regression models for enrolment in Care Plus

Factors included in model	Unstandardised coefficient	Beta	P-value	Cumulative R ²
Total patients				
% Maori	0.24	0.33	0.001	0.079
% 75 years and over	0.22	0.29	0.003	0.159
European				
% 75 years and over	0.29	0.39	0.001	0.132
% Maori	0.27	0.31	0.001	0.226
Maori				
% Maori	0.28	0.36	0.001	0.129

inadequately explained by social demographic characteristics—in particular, deprivation. By contrast, after controlling for age, sex and deprivation, practices with larger Asian populations had much lower rates of hospitalisation. These ethnic differences cannot be attributed to deprivation, but rather likely reflect the influence of other factors such as cultural variations in individual lifestyles, differences in dietary behaviour—the latter perhaps reflecting the length of residence of Asian immigrant groups in New Zealand (the ‘migrant’ effect). Better access to primary care on the part of Asian patients may also be a contributory factor.

The third important finding is that the uptake of Care Plus is relatively incomplete and highly variable between practices. These variations were only partly accounted for by age and ethnicity, but most of the practice variation in enrolment was unexplained by practice population characteristics. This is an important finding given

In light of these findings, we suggest that there are three areas in particular where further research is necessary. First, with respect to local practice variations in admissions, it would be desirable to undertake a more in-depth study of GP referral decisions in high and low income practices. Increased understanding of the referral process and the organisational environments affecting GPs’ ‘gatekeeping’ role would seem to be a high priority, especially given some research showing that a relatively high proportion of referrals may be inappropriate.²⁰ A start has been made in this regard by examining patterns of avoidable hospitalisation,²¹ since this factor has been used extensively as an indicator of access to, and the overall effectiveness of, primary health care.

Second, particular attention is needed to address ethnic variations in admission rates between practices and particularly why there is little of a social gradient in Maori rates of hospitalisation.

Increased understanding of the referral process and the organisational environments affecting GPs’ ‘gatekeeping’ role would seem to be a high priority, especially given some research showing that a relatively high proportion of referrals may be inappropriate

the high hospitalisation rates of Care Plus (and HUHC) patients. For example, a previous study based in Christchurch South Health Centre¹⁹ showed that the 8.6% of patients with an HUHC generated 31.5% of discharges, 42.4% of bed days and had a longer average length of stay. Identifying such patients and ensuring that appropriate, more intensive, care is provided may be a strategy to significantly reduce their impact upon hospital services.

Finally, GP practices with higher rates of enrolment in Care Plus did not have lower rates of hospitalisation. This may be due to improved monitoring of conditions and a greater likelihood of arranged admissions among a group of patients who previously were less likely to access primary care.

Thirdly, with respect to Care Plus, further work is needed to assess why patient enrolment in this programme has been so low and why so much variation occurs across individual practices. Also, given the cross-sectional nature of this study, it was not possible to assess the longer-term implications of Care Plus on hospitalisation rates.

This study suggests that GP practices exhibit considerable variation in patterns of hospital admission and that practice population characteristics are particularly important in explaining this. Nevertheless, some of the variation can also be attributed to other practice characteristics, in particular the availability of special need funding designed to limit hospitalisation rates among older and more deprived patients.

In the light of these results, and in view of the recent development of PHO performance measures,¹⁵ we suggest that particular attention is needed to address variation between practices, especially in terms of ethnic differences in admission rates and in the uptake of access funding which appears to be inequitable.

We suggest that health services research, while it has studied either primary or secondary care, has largely ignored the interface between these two sectors. In view of the development of integrated and managed care models of primary health care in many countries over the last decade,¹¹ this is an important omission in such studies and one that needs to be rectified if we are to have a fuller understanding of spatial and temporal trends in hospitalisation.

References

1. Feachem R, Sekhri N, White K. Getting more for their dollar: a comparison of the NHS with California's Kaiser Permanente. *BMJ*. 2002;324:135–43.
2. New Zealand Doctor. Canterbury's Hot Initiative. 1 July 2009;17. www.nzdoctor.co.nz
3. Davis P, Gribben B, Lay-Yee R, Scott A. How much variation in clinical activity is there between general practitioners? A multi-level analysis of decision-making in primary care. *Jour Health Serv Res Policy*. 2002;7:202–208.
4. Davis P, Gribben B, Scott A, Lay-Yee R. The 'supply' hypothesis and medical practice variation in primary care: testing economic and clinical models of inter-practitioner variation. *Soc Sci Med*. 1999;50:407–418.
5. Love T, Dowell AC, Salmond C, Crampton P. Quality indicators and variation in primary care: modelling GP referral patterns. *Fam Pract*. 2004;21:160–165.
6. Brown L, Barnett JR. Influence of bed supply and health care organisation on regional and local patterns of diabetes related hospitalisation. *Soc Sci Med*. 1992;35:1157–1170.
7. Verstappen W, Riet GT, Van der Weijden T, Hermesen J, Grol R. Variation in requests for imaging investigations by general practitioners: a multi-level analysis. *Jour Health Serv Res Policy*. 2005;10:25–30.
8. Wilkin D, Smith A. Explaining variation in general practitioner referrals to hospital. *Fam Pract*. 1987;4:160–169.
9. Reid FDA, Cook DG, Majeed A. Explaining variation in hospital admission rates between general practices: cross sectional study. *BMJ*. 1999;319:98–103.
10. Saxena S, George J, Barber J, Fitzpatrick J, Majeed A. Association of population and practice factors with potentially avoidable admission rates for chronic diseases in London: cross sectional analysis. *Jour Royal Soc Med*. 2006;99:81–89.
11. Barnett JR, Barnett P. Reinventing primary care: the New Zealand case compared. In: Crooks, VA and Andrews, GJ (editors). *Primary health care: people, practice, place*. London: Ashgate; 2008. p 149–165.
12. Malcolm L, Barnett R. General practice records can provide a more reliable data base for district health services analysis than national hospital data: analysis of Partnership Health general practice data. Submitted for publication.
13. Malcolm L, Barnett R. Utilization of inpatient cardiology services including by Maori: a study of hospital discharges for patients enrolled with Partnership Health practices for the two years ending June 2007. *N Z Med J*. In press.
14. Barnett R, Malcolm L. Practice and ethnic variations in avoidable hospital admission rates in Christchurch, New Zealand. *Health & Place*. 2010;16:199–208.
15. Partnership Health. Partnership Health Annual Report. Christchurch: Partnership Health; 2008.
16. Wyke S, Campbell G and Maciver S. Provision of, and patient satisfaction with, primary care services in a relatively affluent area and a relatively deprived area of Glasgow. *Br J Gen Pract*. 1992;42:271–75.
17. Furler JS. The inverse care law revisited: impact of disadvantaged location on accessing longer GP consultation times. *Med J Aust*. 2002;177:80–83.
18. Malcolm L, Wright L, Carson S. Integrating primary and secondary care: the case of Christchurch South Health Centre. *N Z Med J*. 2000;113:514–7.
19. Ministry of Health. Review of the Implementation of Care Plus. Wellington 2006.

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COMPETING INTERESTS

None declared.