Annual night visiting rates in 129 general practices in one family health services authority: association with patient and general practice characteristics

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SUMMARY

Background. *Rates of night visiting by general practitioners have increased steadily over the last 30 years and vary widely between general practices.*

Aim. *An ecological study was carried out to examine night visiting rates by general practices in one family health services authority, and to determine the extent to which differences in night visiting rates between practices could be explained by patient and practice characteristics.*

Method. *The study examined the variation in annual night visiting rates, based on night visit fees claimed between April 1993 and March 1994, among 129 general practices in Merton, Sutton and Wandsworth Family Health Services Authority, London.*

Results. *Practices' annual night visiting rates varied from three per 1000 to 75 per 1000 patients. The percentages of the practice population aged under five years and aged five to 14 years were both positively correlated with night visiting rates (r = 0.38 and r = 0.35, respectively), as were variables associated with social deprivation such as the estimated percentage of the practice population living in one-parent households (r = 0.24) and in households where the head of household was classified as unskilled (r = 0.20). The percentage of the practice population reporting chronic illness was also positively associated with night visiting rates (r = 0.26). The percentages of the practice population aged 35 to 44 years and 45 to 54 years were both negatively associated with night visiting rates (r = −0.34 and r = −0.31, respectively) as was the estimated list inflation for a practice (r = −0.31). There was no significant correlation between night visiting rates and the distance of the main practice surgery from the nearest hospital accident and emergency department. There was also no association between night visiting rates and permission to use a deputizing service. In a stepwise multiple regression model, the multiple correlation coefficient was 0.56 with four factors (percentage of the practice population aged under five years, percentage aged 35–44 years, percentage who were chronically ill and estimated list inflation) explaining 32% of the variation in night visiting rates.*

Conclusion. *Only about one third of the variation in night visiting rates between practices could be explained by patient and practice variables derived from routine data. Population-based research using data collected on individual patients and practices is required to improve current understanding of the patient and practice characteristics that influence the demand for night visits and of why night visiting rates vary so widely between practices.*

Keywords: night visits; out of hours; consultation rates; practice population; comparative studies.

Introduction

GENERAL practitioners in the United Kingdom are responsible for providing general medical services to their patients for 24 hours a day. Many general practitioners find one aspect of this responsibility, that of providing care at night, particularly demanding.[1] Rates of night visiting have increased steadily over the last 30 years and consequently general practitioners have developed a variety of methods to deal with night visits including extended rotas, general practice cooperatives and the use of deputizing services.[2] Despite this, general practitioners remain dissatisfied with the current system for dealing with calls from patients at night and would like to see it changed.[3,4] However, night visiting rates are known to vary widely between general practices for reasons that are not altogether clear.[2,5] Night visits are paid on a fee for service basis and can consume considerable health service resources. Thus, variations in night visiting rates between general practices raise questions over whether health services are being used equitably and appropriately.[6]

In a previous study, it was shown how patient and general practice characteristics could be used to examine variations in cervical smear uptake rates between general practices in Merton, Sutton and Wandsworth Family Health Services Authority, London.[7] This paper examines night visiting rates in the general practices in the same authority, and attempts to understand the reasons for practice variation in rates by determining what proportion of the variation in night visiting rates could be explained by patient and practice characteristics.

Method

The family health services authority provided the following data for 133 practices that were administratively accountable to it: total list size; the number of night visits (visits requested and made between 22.00 hours and 08.00 hours) for which fees were claimed between 1 April 1993 and 31 March 1994; the number and sex of practice partners; whether the practice had permission to use a deputizing service; whether the practice was computerized; whether it employed a practice nurse or a practice manager; and the distance (in kilometres) between the main practice surgery and the nearest hospital accident and emergency department.

Two practices only had patients living in residential institutions and two other practices did not claim for any night visits.

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These four practices were excluded from the analysis and results are presented for the remaining 129 practices. Eighty nine per cent (596 617 of 667 754) of the patients registered with these 129 practices lived in the Merton, Sutton and Wandsworth Family Health Services Authority area.

The annual night visiting rate was calculated as the number of night visit fees claimed between 1 April 1993 and 31 March 1994 per 1000 patients on the practice list. Several sociodemographic variables were calculated for each practice using data as of 31 March 1993 from the family health services authority's age–sex register and 1991 census data for the 67 electoral wards in the authority (Appendix 1). The census-derived variables for each practice were calculated by assigning a value for each variable to each patient based on the electoral ward in which they lived and then for each practice, averaging these assigned values for the patients registered with the practice.[7] An estimate of list inflation was calculated for each practice. First, a measure of list inflation was calculated for each electoral ward based on the difference between the family health services authority estimates (from the age–sex register) and census estimates of electoral ward populations. Secondly, the estimates of list inflation for electoral wards were used to calculate an expected percentage list inflation for each practice in the same way as the other census-derived variables had been produced. Demographic variables were calculated directly from the family health services authority age–sex register.

Statistical analysis

Because night visiting rates are positively skewed, the log of the rate was used in all the analyses and, where appropriate, geometric means are presented. Using the log transform helps to reduce the skew in both the distribution of night visiting rates and in the residuals from a regression model.

The logs of the night visiting rates for the practices were correlated with the practice sociodemographic variables using Pearson's product moment coefficient. Correlations were defined as statistically significant if the *P* value obtained from a two-tailed test of significance was less than 0.05.

Forwards stepwise multiple regression was used to construct a model with the log of the night visiting rate as the dependent variable, and the sociodemographic and practice variables as the independent variables. Because rates are multiplicative in nature, it is advantageous to consider the multiplicative effect on night visiting rates of each variable in the regression model. This can be done by calculating the standardized regression effect of each variable in the model: the standardized regression effect was defined as the percentage increase in the predicted night visiting rate attributable to a one standard deviation increase in the value of a variable.[8,9]

The fit of the multiple regression model was examined in three ways. First, a Poisson regression model was fitted and the goodness of fit examined. Because of the lack of fit of this model, the methods of Pocock and colleagues were then used to fit a model which allowed for both Poisson sampling variation and unexplained variation (in effect, this fits a model intermediate between a Poisson model and a normal regression model).[9] Thirdly, the residual for each practice from the regression analysis was plotted on an ordnance survey grid map to determine if there was any geographical clustering of residuals (that is, did practices that were located close together have more similar night visiting rates than were predicted by the regression model?).

Results

A total of 16 674 night visit fees were claimed between 1 April 1993 and 31 March 1994 by the 129 practices in the study. The overall annual night visiting rate was 25.0 per 1000 patients (16 674 of 667 754); night visiting rates for individual practices ranged from 2.6 per 1000 to 75.1 per 1000 (median 22.3 per 1000, interquartile range 17.2 per 1000 to 29.7 per 1000). The distribution of night visiting rates among the practices was positively skewed (Table 1).

Night visiting rates and practice characteristics

Annual night visiting rates were highest in practices with three or four practice partners (geometric mean 27.0 per 1000) and lowest in practices with two partners (geometric mean 20.2 per 1000) but differences between practices with a different number of partners were not statistically significant. No significant differences were found in mean annual night visiting rates between: practices with and without a woman general practitioner partner (22.4 per 1000 versus 22.3 per 1000), practices that had permission to use a deputizing service and those that did not (22.0 per 1000 versus 23.3 per 1000), computerized and non-computerized practices (22.8 per 1000 versus 21.5 per 1000), practices with and without a practice nurse (22.7 per 1000 versus 21.4 per 1000), and practices with and without a practice manager (22.4 per 1000 versus 22.2 per 1000). There was also no significant correlation found with the distance of the main practice surgery from the nearest hospital accident and emergency department.

Night visiting rates and patient characteristics

The strongest positive correlations between annual night visiting rates and age were with the percentage of the practice population aged under five years and aged 5–14 years (Table 2). There were significant negative correlations with the percentage of the practice population aged 35–44 years and 45–54 years. There was no significant association between annual night visiting rate and the percentage of the practice population aged 65 years and over.

Table 1. Annual night visiting rates in 129 general practices in Merton, Sutton and Wandsworth Family Health Services Authority.

No. of night visits per 1000 patients	No. of practices
0–9.9	8
10.0–19.9	37
20.0–29.9	52
30.0–39.9	18
40.0–49.9	7
50.0–59.9	4
60.0–69.9	1
70.0–79.9	2

Table 2. Mean percentages of patients in age groups in the 129 practices and correlations between proportions in age groups and logs of annual night visiting rates.

Age group (years)	Mean % of patients in age group (range)	Correlation coefficient r^a
0–4	*5.8* (*1.4* to *12.2*)	0.38 ***
5–14	*10.4* (*4.1* to *18.1*)	0.35 ***
15–24	*12.6* (*5.9* to *25.7*)	0.08
25–34	*22.0* (*13.5* to *46.7*)	–0.06
35–44	*14.4* (*10.3* to *23.4*)	–0.34 ***
45–54	*11.5* (*5.9* to *16.4*)	–0.31 ***
55–64	*9.0* (*1.4* to *14.2*)	–0.12
65+	*14.4* (*1.1* to *26.5*)	0.03

[a]Between patient's age and log of annual night visiting rates. Two-tailed test of significance: ***$P<0.001$.

There were significant positive correlations between annual night visiting rates and the percentage of the population reporting chronic illness, the percentage eligible for deprivation payments based on 1991 census data, the percentage in one-parent households, and the percentage of the population in households where the head of household was in socioeconomic group 11 (Table 3). There were significant negative correlations between annual night visiting rates and list inflation, the percentage of the population having changed their address in the last year, and the percentage in households where the head of household had been born in a new commonwealth country or in Pakistan.

Multiple regression analysis

Entering the variables listed in Tables 2 and 3 into a forward stepwise regression model with an entry criterion of $P = 0.05$ resulted in four variables being included in the model (Table 4). The multiple correlation coefficient was 0.56, with the four variables explaining 32% of the variation in annual night visiting rates. The percentage of the practice population aged under five years was a positive predictor of annual night visiting rates, as was the percentage of the practice population reporting chronic illness. The percentage of the practice population aged 35–44 years and the estimated list inflation for a practice were both negative predictors of annual night visiting rates. The standardized regression effects were greatest for the practice population aged under five years and the percentage with chronic illness; increases of one standard deviation in these variables led to a 20.3% and a 13.5% change, respectively, in the predicted annual night visiting rate for a practice.

The goodness of fit of the multiple regression model was examined by fitting a Poisson regression model. This was done in *GLIM*[10] by regressing the number of visits on the four explanatory variables with log of list size as an offset and a log link function. This resulted in a model with a scaled deviance of 2264 on 126 degrees of freedom, suggesting a marked lack of fit. This was not unexpected because the night visiting rates were based on large numbers of events and thus sampling error would be expected to account for only a small percentage of the unexplained variation in night visiting rates. This was confirmed using the method of Pocock and colleagues.[9] This method revealed that only 5% of the unexplained variation was due to sampling error and that an ordinary linear regression was therefore appropriate. When the residuals for each practice from the regression analysis were plotted on an ordnance survey grid map, no geographical clustering of residuals was found.

Table 3. Mean values of sociodemographic variables and correlations between these values and logs of annual night visiting rates.

Variable[a]	Mean (range)	Correlation coefficient r[b]
List inflation (% difference)	*9.0* (*–16.7* to *20.5*)	–0.31***
Chronic ill (% population)	*10.8* (*8.4* to *15.9*)	0.26**
Deprivation 1991 (% population)	*11.8* (*0* to *76.3*)	0.25**
Change of address (% population)	*12.8* (*7.3* to *17.6*)	–0.25**
One parent (% population)	*4.8* (*1.8* to *10.0*)	0.24**
Unskilled (% population)	*2.5* (*0.7* to *5.0*)	0.20*
Born in new commonwealth country/Pakistan (% population)	*13.4* (*3.5* to *32.4*)	–0.18*
Ethnic minority (% population)	*15.5* (*4.7* to *36.2*)	–0.15
Elderly alone (% pensioners)	*6.2* (*4.1* to *9.6*)	0.14
Deprivation 1981 (% population)	*8.9* (*0* to *93.9*)	0.11
Jarman underprivileged area score	15.9 (–5.3 to 33.0)	0.10
Not owner occupied (% population)	*36.5* (*9.9* to *60.3*)	0.09
Unemployed (% economically active population)	*9.8* (*5.1* to *15.8*)	0.06
Distance from A and E (km)	2.4 (0.2 to 4.6)	–0.02
No car (% population)	*36.7* (*19.4* to *54.3*)	0.01
Overcrowding (% population)	*6.5* (*2.2* to *11.7*)	0.01

[a]Details of variables are given in Appendix 1. [b]Between variable and log of annual night visiting rates. A and E = accident and emergency department. Two-tailed test of significance: *$P<0.05$, **$P<0.01$ and ***$P<0.001$.

Table 4. Standardized regression effect of predictors of annual night visiting rates in the multiple regression model.

Variable	Standard deviation (%)	Standardized regression effect (%)
% of practice population:		
Aged under five years	*1.8*	*20.3***
Aged 35–44 years	*2.0*	*–8.7**
Chronically ill	*1.4*	*13.5***
% list inflation	*6.1*	*–9.1**

*$P<0.05$, **$P<0.01$, ***$P<0.001$.

Discussion

This is the first study to examine the variation in annual night visiting rates between general practices in one family health services authority since the imposition of the 1990 contract for general practitioners,[11] when the regulations concerning night visits were altered. The overall annual night visiting rate of 25 per 1000 practice population compares with reported rates in previous population-based studies of: nine per 1000 in 1973–74 (England);[12] 16 per 1000 in 1981 (Nottinghamshire);[13] six per 1000 in 1983 (Maidstone health district);[14] and 32 per 1000 in 1992 (Berkshire).[15] Rates of night visiting by individual general practices in the present study ranged from three per 1000 to 75 per 1000, approximately a 30-fold variation. The differences in night visiting rates may be caused by: differences in the characteristics of the patients registered with individual practices (patient factors), differences in the way in which general practitioners deliver care (practice factors), artefactual errors in the data, and chance.

There were significant positive correlations between annual night visiting rates and the percentage of the practice population aged less than five years and aged between five and 14 years, findings consistent with previous studies which have found that children accounted for a large proportion of out-of-hours workload.[16-18] Annual night visiting rates were also positively correlated with the census-derived variable for chronic illness (that is, practices with patients in electoral wards with high levels of chronic illness had higher night visiting rates), and with the census-derived variables for the proportion of one-parent families and unskilled households. No significant correlation was found between annual night visiting rates and the percentage of the practice population aged 65 years and over.

There was no significant correlation between mean annual night visiting rates and the distance of the main practice surgery from the nearest hospital accident and emergency department but this finding should be treated with caution as most practices in Merton, Sutton and Wandsworth Family Health Services Authority are not far from an accident and emergency department. Other practice factors, such as the presence of a woman general practitioner partner, permission to use a deputizing service, computerization status and whether or not the practice had a practice nurse or practice manager, were also not associated with high or

low night visiting rates. This study was unable to examine the way in which general practitioners deliver care, for example, how accessible they were to their patients during the daytime, or their style of consultation. There was also no information on the way in which general practices used deputizing services. For example, some practices that used deputizing services may have screened requests for night visits. Only routinely collected data were used in the present study and the lack of information on how practices organize and deliver out-of-hours care to their patients was a major limitation of the study.

In the multiple regression analysis, four important variables were identified. The percentage of the practice population aged under five years and the percentage with chronic illness were both positive predictors of night visiting rates. The percentage of the practice population aged between 35 and 44 years and the estimated list inflation for the practice were both negative predictors of night visiting rates, The regression model explained 32% of the variation in night visiting rates with the age structure of the practice population (those in the 0–4 years age group) being the most important factor influencing rates. In a previous paper, patient and practice characteristics explained 52% of the variation in cervical smear uptake rates between general practices in the same family health services authority.[7] The demand for night visits may be influenced by patient and practice factors that cannot be measured easily using routine data, such as the social and clinical characteristics of the patients registered with general practices and the way in which practices deliver care.

Variables associated with social deprivation did not enter the multiple regression model, a finding which at first sight conflicts with the results of some previous studies.[12,19] Chronic illness in Merton, Sutton and Wandsworth Family Health Services Authority is, however, associated with social deprivation (for example, the correlation between the percentage of the population reporting chronic illness and the percentage of people living in households that are not owner occupied is 0.62; unpublished data) and this may mask an association between deprivation and night visiting rates. When chronic illness was replaced in the regression model by the estimated percentage of people living in households that were not owner occupied, the revised regression model explained a similar percentage of the variation in night visiting rates (unpublished data).

There are some potential sources of error in the calculation of night visiting rates. First, some practices may not have claimed for all the night visits they carried out. However, in view of the relatively high fees paid for night visits in 1993–94 (higher rate £46.65, lower rate £15.55) this seems unlikely, and the number of night visits claimed for is probably a reasonably accurate estimate of the number actually carried out. Secondly, population estimates derived for geographical areas from family health services authority age–sex registers often overestimate the actual population of the same areas, a phenomenon known as list inflation.[20] List inflation is usually greatest in areas with high population turnover, and general practices in such areas are likely to have more patients registered with them than actually use their services. Any rates calculated for these practices will therefore tend to underestimate the true rate (because the denominator population is increased), and this is reflected in the statistically significant negative correlations between night visiting rates and the variables for both change of address (a measure of population turnover) and list inflation (an estimate of the difference between the registered practice population and the true practice population). Thirdly, night visiting rates were calculated using population data for the practices as of 31 March 1993 whereas the visits themselves were carried out between 1 April 1993 and 31 March 1994. This will result in some differences between the denominator populations used to calculate the rates and the actual practice populations in 1993–94 but these differences are unlikely to be large. Finally, the night visiting rate for any practice will be subject to sampling (random) error, with the amount of error being greater in the smaller practices. However, taking this into account in the regression analysis by giving greater weight to larger practices made little differences to the regression coefficients or their standard errors. The present study was ecological in nature and associations at the population level may not hold at the individual level (the ecological fallacy).[21]

Out-of-hours work imposes a considerable strain on general practitioners. The present study shows that night visiting rates vary widely between practices and that only about one third of the variation in rates could be explained using patient and practice characteristics derived from routinely available data. Because the study was ecological in design, it cannot demonstrate causal associations; for example, it does not prove that under five-year-olds are responsible for a high proportion of night visits. However, the study does highlight the need for more detailed research on the factors that influence night visiting rates, and on what an appropriate night visiting rate for a practice might be. For example, are practices with very high or very low rates providing appropriate care? Do the hours of availability of general practitioners influence night visiting rates? How do individual general practitioners deal with requests for night visits? What is the role of education of patients by their general practitioners in the appropriate use of out-of-hours care? Much of the previous research on night visiting has been carried out in single practices, but because of the wide variation in night visiting rates, findings from any one practice are difficult to generalize to other practices. Future research on night visits should therefore use a representative sample of general practices. Population-based research of this nature (both quantitative and qualitative), using data collected on individual patients and general practices, has the potential to improve current understanding of the patient and practice characteristics that influence night visiting rates and of why night visiting rates vary so widely between general practices.

Appendix 1. Sociodemographic variables derived from family health services authority data and ward census data.

Variable	*Description*
List inflation	% difference between family health services authority and census estimates of practice population.
Elderly alone	% of pensioners living alone.
Jarman underprivileged area score	Score for practice.
Unemployed	% of economically active population who are unemployed.
	% of practice population:
Chronic ill	Reporting limiting long-term illness.
Deprivation 1991	Eligible for deprivation payments based on 1991 census data.
Change of address	Having changed address in previous year.
One parent	In one-parent households.
Unskilled	In households where head of household in socioeconomic group 11.
Born in new commonwealth country/Pakistan	In households headed by a person born in new commonwealth country or Pakistan.
Ethnic minority	Belonging to non-white ethnic group.
Deprivation 1981	Eligible for deprivation payments based on 1981 census data.
Not owner occupied	In households not owner occupied.
No car	In households without a car.
Overcrowding	In households with more than 1.5 persons per room.

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