The epidemiology of teaching and training practices in England

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Abstract (max 250 words)

Background: There is no national picture of teaching and training practices nor the communities they serve. We aimed to describe the association between general practices' engagement with education and their characteristics, locality and patients' health-status and satisfaction.

Methods: Data linkage study of all English practices. Calculation of odds ratios for teaching and training status and practice, locality and patient variables.

Results: Teaching and training practices are larger than practices which do neither (mean list size(SD) 7074(3736), 10112(4934), and 5327(3368) respectively, p<0.001 and have fewer patients per GP (1932(951), 1838(544), and 2117(1585) respectively, p<0.001). Their localities have a higher proportion of White British residents (77.99%(24.17), 81.66%(20.81), 73.07%(26.91), p<0.001). Practices with more GPs (OR 1.21 (95%CI 1.18-1.20)), fewer male GPs (0.45 (0.36-0.55)) and a higher proportion of White British people in their locality (1.30 (1.06-1.60)) were more likely to teach. Practices in rural areas (1.68 (1.43-1.98)), with more GPs (1.22 (1.27-1.39)), more full time equivalent (FTE) GPs (2.68 (1.64-4.40)), fewer male GPs (0.17 (0.13-0.22)) and a higher proportion of White British people in their locality (1.34 (1.02-1.75)) were more likely to train. Teaching and training practices had higher patient satisfaction (0.293 (0.190, 0.397) and (0.563 (0.442, 0.685)) respectively and QOF scores (0.507 (0.211, 0.804)) and (0.996 (0.650, 1.342) respectively than those which did not.

Conclusions: Educationally engaged practices are unrepresentative in serving less ethnically diverse and (for training practices) less urban

environments. Investment is needed to increase the proportion of educational practices in diverse urban localities.

Introduction

General practice in the United Kingdom (UK) has long had difficulty recruiting both sufficient doctors to the discipline and doctors to work in underserved areas:[1,2] In 2012 23% of general practitioners (GPs) in the UK were aged 55 or older[3], necessitating the recruitment of 10,000 general practitioners in the next 10 years to replace this cohort. While Health Education England (HEE) seeks to recruit 50% of UK medical graduates to general practice,[4] in 2009 only 35% of doctors three years after graduation stated that general practice was their first choice of career.[5] Practices working in urban deprived communities which are historically underserved[6,7] have greatest difficulty in recruiting doctors,[1] another manifestation of Tudor-Hart's Inverse Care Law.[8] The locality in which medical students are educated and doctors trained is one determinant of where they eventually practice, although the evidence is confined to the impact of rural medical schools on recruitment to rural practice and this is confounded by multiple other factors.[910] Nevertheless, if learning in urban deprived communities has a similar effect on career choice, the location of teaching and training practices becomes important.

We do know that Scottish postgraduate training practices are less likely to be located in deprived than in more affluent areas[11,12] but we do not have such data for practices in the rest of the UK. Undergraduate teaching practices in East London have larger lists sizes with fewer patients per doctor than non-teaching practices in the same locality[13] and, in Scotland, practices which train postgraduates are larger than those which don't.[12] One group has shown that the patients of English postgraduate training practices are more satisfied

with the care their practice provides than patients of non-training practices [14] but did not report the association of training status with deprivation and rural or urban status. We have previously described the geographical distribution of undergraduate teaching practices in the UK but have not formally examined their association with deprivation or rural or urban status.[15] We now report a study linking our database of undergraduate teaching practices with the English national general practice datasets, describing the association between undergraduate teaching and postgraduate training status with deprivation, ethnicity of those living in the locality, urban and rural status and the self-reported health status of patients served by the practices.

Methods

We used routinely collected and published data on English general practices from the GP Patient Survey,[16] the general practice Quality Outcomes Framework (QOF),[17] and our dataset of undergraduate teaching practices.[15] We linked these datasets using practice identifiers and postcodes and then linked them to census Lower Layer Super Output areas (LSOAs, areas of between 1000 and 3000 residents) as an indicator of practice demographics.[18]

From the LSOA linked census data we took:

The Index of Multiple Deprivation 2004 (IMD)[19]: This is a composite measure of deprivation in geographical areas in the UK (see box 1) calculated using Geoconvert, an online geography matching service provided by UK Data Service census support.[20] We split practices' deprivation ranks into quintiles

and considered the lowest quintile to be deprived relative to the rest, as differences at the less deprived end of the scale are less significant clinically than the comparison between deprived and not deprived .[21]

Ethnicity: The ethnicity of patients is not available at practice level so we used the percentage of residents in the LSOA in which the practice was situated which were White British from the 2011 census as a proxy.[22]

Rural-Urban status: We dichotomised the eight National Statistics Rural and Urban Classification of Output Areas (July 2004) categories [23] (calculated using Geoconvert [20]) into urban and rural (see box 1).[23]

From the Health and Social Care Information Centre:

Practice list size: the number of patients registered with each practice in January 2014.[24]

Practice medical workforce: the number, gender and full time equivalent (FTE) number of GPs at each practice in England by type (GP provider, GP other, GP registrar or GP retainer). The mean full time equivalence worked by GPs (excluding registrars (residents)) and number of patients per FTE GP was calculated for each practice as on 30 September 2012.[25]

Practice Quality of care: Quality of clinical care was measured using Quality and Outcomes Framework (QOF) scores (see box 1).[17] We used the data for 2012-13.[26]

From the General Practice Patient Survey[16]:

Patient satisfaction: The General Practice Patient Survey (GPPS) is sent biannually to a sample (stratified by practice) of patients registered with English general practices and is available as practice level data.[16] We have used data from December 2013.[27] We used ten items relating to overall patient experience (see box 1).[28] Nine items were scored on five-point scales, one (q22) was scored on a three-point scale but has been weighted out of five for the purpose of analysis. Mean scores for each item per practice have been calculated. The scores for the ten questions have been summed to give an overall patient satisfaction score out of 50.

Patients' health status: The mean patients' health status (EQ-5D-5L[29]) for each practice was calculated using the frequency counts of responses to the Euroquol questions within the GP patient survey (see box 1). The scores for each question have been summed to give an overall health status score.

Teaching and training status: Between 2011 and 2013, we collected the post codes of all practices which taught for every medical school in the UK.[15] These postcodes were matched to the postcodes of the practices in the other datasets. When there was more than one practice in a single postcode, we reviewed practice websites to determine the teaching practice. A practice with one or more trainees reported on the workforce census was considered to be a training practice.[14]

Data analysis

We used SPSS version 20 (SPSS Inc., Chicago, IL) for all analyses and considered p-values less than 0.05 to be statistically significant. All analyses were at the practice level.

We used independent t-tests to compare the percentage of responders to the GPSS in the most deprived and less deprived localities. We used Chi-Square for trend to examine trends between practices which neither teach undergraduates nor train postgraduates, teach undergraduates, train postgraduates and both teach undergraduates and train postgraduates. The selection of undergraduate teaching practices is generally less rigorous than for postgraduate training practices,[30,31] and practices which do both are likely to be more engaged with education and training than those which do one or the other.

We have presented categorical variables as frequencies with percentages and continuous variables as means with their standard deviation. We used univariate logistic regression analyses to calculate separate odds ratios for rural and deprived practices' teaching or training status. We compared the demographic data from the LSOAs containing practices with different teaching and training status using analyses of variance (ANOVAs). Because of heterogeneity of variance, we used the Brown-Forsythe F test [32] to determine the F-ratio. We conducted post-hoc analyses using the Games-Howell procedure[33] with backwards stepwise multivariate logistic regression analyses to determine which demographic variables were associated with teaching and training. We investigated the associations of practices' teaching and training status with patient satisfaction and QOF score using multivariate linear regression analyses and adjusted for FTE GPs, patient list size, number of GPs, proportion of GPs who were male, rurality, deprivation and percentage White British population.

Results

Of the 8,207 practices in England, 1568 (19.1%) only taught undergraduates and at least 988 (12.0%) only trained registrars. At least 1266 (15.4%) both taught undergraduates and trained postgraduate registrars. We were unable to match the teaching and training status of 431 (5.3%) practices.

The GP Patient Survey received responses from 943,138 (35%) of the 2,709,782 patients surveyed.[27] Patients from practices in areas in the highest quintile for socioeconomic deprivation were less likely to respond than those from less deprived practices (28.2% vs. 39.0%, mean difference=10.8%, independent samples t test, t=40.1, p<0.001).

Socioeconomic deprivation

Practices which only teach undergraduates (n=303, 19.3%), only train registrars (n=120, 12.4%) or both teach and train (n=180, 14.2%) are less likely to serve deprived communities than practices which are not engaged in teaching or training (n=882, 22.8%) (Chi-Square for trend = 70.9, p<0.001).

Rurality

Rural-Urban indicators were available for 7,970 (97.1%) practices: 1215 (14.8%) of general practices are in rural areas. Practices which only teach (n=235, 15.0%), only train (n=232, 23.9%) or both teach and train (n=211, 16.7%) are more likely to be in rural areas than practices which do neither (n= 524, 13.6%) (Chi-Square for trend = 27.0, p<0.001).

Ethnicity (table 1)

Non-teaching and training practices serve populations with a lower proportion of White British people then teaching practices (mean difference = -4.9%, p<0.001), training practices (mean difference = -8.6%, p<0.001) and teaching and training practices (mean difference = -5.4%, p<0.001) (Brown-Forsythe F (3, 7363) = 46.4, p<0.001).

Workforce (table 1)

The mean (SD) number of GPs in an English general practice is 4.6 (3.0), working a mean full time equivalence of (SD) 0.86 (0.15), resulting in a mean (SD) of 3.9 (2.6) full time equivalent (FTE) GPs per practice. The mean (SD) percentage who are male is 56.6% (26.6).

Non-teaching and training practices had fewer GPs than teaching practices (mean difference = -1.32, p<0.001), training practices (mean difference = -3.30, p<0.001), and teaching and training practices (mean difference = -3.82, p<0.001) (Brown-Forsythe F (3, 7772) = 786.0, p<0.001). GPs in non-teaching and non-training practices work a greater full time equivalence than those in teaching practices (mean difference = 1.6%, p=0.003). No significant differences were seen between any other groups.

Non-teaching and training practices had a larger proportion of male GPs than teaching practices (mean difference = 8.1%, p<0.001), training practices (mean difference = 14.5%, p<0.001), and teaching and training practices (mean difference = 15.9%, p<0.001) (Brown-Forsythe F (3, 7772) = 256.8, p<0.001).

Patient list size (table 1)

Non-teaching and training practices had fewer patients than teaching practices (mean difference = -1747, p<0.001), training practices (mean difference = -4785, p<0.001), and practices which both taught and trained (mean difference = -5019, p<0.001) (Brown-Forsythe F (3, 7700) = 649.6, p<0.001). However, the number of patients per FTE GP was greater in practices which neither taught nor trained than taught (mean difference = 184.9, p<0.001), trained (278.6, p<0.001) or taught and trained (358.2, p<0.001) (Brown-Forsythe F (3, 7700) = 66.6, p<0.001).

Patients' health status (table 2)

Patients in teaching and training practices had lower scores (reflecting lower morbidity) on all but the Anxiety/depression domain of the EQ-5D-5L resulting in better overall health status (p<0.002 for each) than patients of non-teaching and training practices. Comparing training practices to non-teaching and training practices, differences were seen on three of five domains; mobility (p=0.005), self-care (p<0.001), pain and discomfort (p=0.03) and overall (p=0.006), (for example, Overall (EQ-5D-5L) scores were 7.311 (0.924), 7.332 (0.666) and 7.235 (0.565) for non-teaching, teaching, training and teaching and training practices respectively). The only difference noted between teaching practices and non-teaching and training practices was on the domain of anxiety and depression, where higher morbidity was reported for teaching practices (p=0.01).

When entered into backward stepwise multivariate logistic regression analyses, the variables which were independently associated with training status were (OR, 95%CI): rurality (1.68, 1.43 to 1.98), number of GPs (1.33,

1.27 to 1.39), FTE GPs (2.68, 1.64 to 4.40), proportion of GPs male (0.17, 0.13 to 0.22) and ethnicity (percentage of local population White British) (1.34, 1.02 to 1.75). For teaching status the associated variables were: number of GPs (1.21, 1.18 to 1.23), proportion of GPs male (0.45, 0.36 to 0.55) and ethnicity (1.30, 1.06 to 1.60). (Table 2).

Patient satisfaction

Patients of non-teaching and training practices had higher scores than teaching practices ($p=0.03$) and teaching and training practices ($p<0.001$) with the overall experience of making an appointment but there was no difference between training practices and non-teaching and training practices ($p=0.1$) and overall satisfaction with opening hours. Otherwise, teaching practices, training practices and teaching and training practices had higher scores than non-teaching and training practices on each of the patient satisfaction questions and the composite measure of patient satisfaction (all $p<0.001$). (Table 3).

In multivariate linear regression analyses adjusted for deprivation, rurality, ethnicity, patient list size, number of GPs, FTE GPs and percentage of GPs who were male, teaching status (B=0.293, 95% CI 0.190 to 0.397) and training status (0.563, 0.442 to 0.685) were both associated with higher patient satisfaction (Table 5).

Quality of care

With the exception of patient experience (where no difference was seen between teaching practices and non-teaching and training practices), teaching

practices, training practices, and teaching and training practices scored higher than non-teaching and training practices on all QOF domains (all p<0.001) (Table 4). For example the QOF total scores were 95.3% (7.8), 96.7% (6.2), 97.9% (2.6) and 98.0 (3.7) respectively for non-teaching, teaching, training and teaching and training. When entered into backwards stepwise multivariate linear regression analyses adjusting for deprivation, rurality, ethnicity, list size, number of GPs, FTE GPs and percentage of GPs who were male, teaching status (B=0.507, 0.211 to 0.804) and training status (0.996, 0.650 to1.342) were both associated with a greater total QOF score (Table 5).

Discussion

Summary

We have shown that English general practices which teach undergraduates and train postgraduates are located in and therefore probably serve rural communities with a higher proportion of White British residents and their patients report less physical morbidity than practices which do not. The patients of training practices report better mental health than non-teaching and non-training practices and undergraduate teaching practices. The quality of care provided as measured by QOF scores and patient satisfaction shows a similar pattern. While teaching and training practices have more patients they also have more doctors of whom more are female, and fewer patients per FTE doctor. There is a clear ‘dose-response relationship’ for most variables with the differences being greatest between teaching and training practices and practices which neither teach nor train, then train only then teach only.

Strengths and weaknesses of the study

We report for the first time a relationship between practice teaching and training status, ethnicity of its locality and its urban or rural designation (of training practices) but not deprivation. These are novel data. We combined routinely collected data with novel data (undergraduate teaching status) which has allowed demonstration of a 'dose-response relationship' between 'intensity' of engagement with education and training' and most independent variables thus increasing confidence that the observed effects are real. We have used routine methods to dichotomise rural and urban status[23] and to identify practices located in deprived communities.[21] We have also used a population based measure of morbidity with data from almost 1,000,000 people.[2729]

However, the results are critically dependent on the accuracy of linking practice data between data-sets and of the data-sets themselves. The routinely linked data were linked using the unique practice identifier which ensures accuracy. The undergraduate teaching database was linked using practice post codes which provided a unique identifier for 90% of records and we matched the rest manually. Only 5% of records could not be matched. Ashworth et al. have previously shown that assigning postgraduate training status using this methodology is correct for 95% of practices.[14] There is no routinely available data on the IMD sores or ethnicity of practice lists so we inferred both from census data with the attendant risks of ecological bias.[34] The practice workforce data did not include details of locum doctors working in practices, and did not distinguish between practices with general medical

services (GMS) and personal medical services (PMS) contracts. As not all GP training programmes are fully recruited to and there is a surplus of approved training practices, there are a number of practices which will be approved training practices that we will have considered as non-training practices as they had no trainees in the year of data collection. We have not been able to conduct the sensitivity analyses performed by Ashworth et al.[14] There is no national dataset of practices which train foundation year two doctors so we do not know how they fit in the picture. The data were collected at different times from the UK census 2011, teaching status (collected between 2011 and 2013), practice staff and training status data (Sept 2012) and list size, GP patient satisfaction and QoF data (December 2013 to March 2014) although any error with this is likely to be small. We have not calculated index scores for EuroQol. Data was only available at practice level which would make an index score for the practice meaningless and sum domain scores correlate well with index scores.[35]

We have used practices' QOF scores as a proxy for quality of care, as the best available measure. While there is evidence that mortality has decreased since the introduction of the QOF in 2004[36], individual practices' performance do not appear to be associated with mortality, rather deprivation was seen to be the greatest predictor.[37] We have adjusted for deprivation in this analysis.

Finally, association does not infer causality: being a teaching and/or training practice is associated with fewer patients per doctor, more doctors per practice and larger list sizes and therefore likely more practice resources

which may enable better care and the spare capacity to engage in education and training rather than the obverse.

Comparison with existing literature

This study complements our previous study reporting the geographical distribution of teaching practices[15] by formally examining the relationship with urban-rural status and deprivation and the work of Ashworth et al.[14] describing the relationship of training status with patient satisfaction by demonstrating that most aspects of patient satisfaction improve with practice involvement in education and training and that this has persisted into another year's datasets. In 2001, Gray et al[13] demonstrated that, in a cohort of 161 practices in East London, teaching practices were larger but had fewer patients per doctor and provided better quality of care measured using a limited range of indicators. Nationally teaching and training practices provide better quality of care measures against QOF indicators. They also reported lower health service income and lower vacancy rates in teaching practices; we do not have equivalent national data. Scottish training practices are less likely to be located in deprived areas[1112] but, after controlling for locality ethnicity, this is not the case in England. These Scottish studies did not include teaching status or measures of quality of care or patient satisfaction. We have extended Llanwarne *et al.'s* [28] finding of weak significant relationships between patient satisfaction and quality of care to their association with engagement with teaching and training.

Implications for practice

Health Education England's mandate includes the objective 'to lead a process to ensure sufficient staff are trained… in the right locations...' because 'healthcare students have… taken up work close to… where their training was undertaken, leading to workforce imbalances across many areas of the country'.[4] These data demonstrate the need to recruit undergraduate teaching and post graduate training practices which serve more ethnically diverse populations.

Conclusion

Teaching and training practices are not representative of English general practices: they are more rural, and care for patients who are more likely to be white with better health status than practices which don't. Training GPs in predominately white and rural practices has implications for recruitment to underserved areas. Urgent investment is needed to increase numbers of teaching and training practices which serve diverse urban populations.

Contributorship: RKM had the idea for this study. SPG managed the collection of the undergraduate teaching practice database. ER collated and linked the databases and conducted analysis under the supervision of RKM. ER wrote first draft of the paper which was revised by RKM before final approval by all authors. RKM is guarantor for the work.

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Ethics approval: As this was a data linkage study of existing databases none of which held individual patient data, research ethics approval was not required.

Competing interests: All authors have no competing interests to declare.

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Status

What is already known in this area.

- Undergraduate medical students are placed at general practices that are widely distributed throughout the country, little is known about the characteristics of these practices.

What this work adds.

- The characteristics of general practices in England which provide teaching for undergraduate students and training for postgraduate trainees are not representative of English general practice in terms of ethnicity, urban-rural status and morbidity.

- Both the teaching of undergraduates and the training of postgraduates are associated with small increases in quality of care and patient satisfaction.

- Teaching and training practices are in the wrong place to help with the recruitment crisis and are exposing students and trainees to inadequate levels of ethnic diversity to fully prepare them for future practice.

Suggestions for future work or research.

- Urgent investment is needed to increase numbers of teaching and training practices which serve diverse urban populations.

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