Primary care consultations in the UK between 2006 and 2015: An analysis of electronic health records

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Abstract

Primary care accounts for the majority of patient contact within the NHS. Over time medical science and healthcare needs change, which may lead to differences in how patients are treated in primary care for good or ill. In this study over 700 million consultations were analysed over a 10 year period between 2006 and 2015 inclusively to examine the trends in how people access primary care. The number of consultations per person per year initially increased in the first two years from 5.81 to 5.92, an increase of 0.11(0.10 to 0.12 95% CI) before declining to 3.7 by 2015, a decrease of 2.21 from the peak in 2008(2.20 to 2.23 95% CI). Consultations were increasingly handled by health care assistants instead of Nurses and GPs, and increased slightly in duration for all types of staff. This reduction in number of consultations is theorized to be a consequence of the 2008 financial crisis and its aftermath, further research is recommended on the impact of economic recessions and austerity policies on health care provision.

Introduction

Primary care services supplied by GP practices, pharmacies, dentists, and optometrists are widely considered the 'cornerstone of a strong healthcare system' (Shi 2012). These health care services offer an entry point into a health care system for all new needs, providing essential medical care and helping patients to coordinate and integrate care provided elsewhere. It is an approach that determines the work of all other levels of health care system, except for emergency hospital admissions, (Starfield B. 2005) as access to secondary care is generally managed by GPs through referrals (Goddard 2009). Primary care services are therefore a significant, necessary, and vital part of the National Health Service (NHS). Part of this importance is due to the fact that in the UK GPs provide universal coverage for the population and account for approximately 90% of all patient contact with the NHS ("Primary Care - NHS Digital"). This unique position of primary care facilities through which the majority of individuals access health care brings the NHS 'as close as possible to where people live and work, and constitutes the first element of a continuing health care process' (World Health Organization, 2003).

Patient interaction with health services directly influences health outcomes as well as improving health service efficiency and reducing costs associated with non-attendance (Akter 2014). Starfield, Shi and Macinko (2005) reviewed evidence of the effects of primary care on health and suggest that primary care improves health because 'health is better in areas with more primary care physicians; people who receive care from primary care physicians are healthier; and characteristics of primary care are associated with better health.' This finding has been repeatedly observed in studies investigating health outcomes within primary care. Results from these studies suggest that areas with a greater supply of primary care physicians had lower rates of mortality (Shi 1992), and an increase in life span (Vogel 1998). Additionally, studies have demonstrated that primary care is directly connected to a 'more equitable distribution of health in populations' (Starfield B. 2005).

Evidence of the health benefits achieved by good primary care facilities are well documented. However, the quantity and types of services used by the public changes over time. One factor that particularly affects which primary care services are accessed is the changes in population characteristics. When the term 'primary care' was first applied in the 1920's the life expectancy for the average male stood at 55 years of age, by 1999 this had risen to 75 years

of age and is continuing to increase, with an average age of 78 expected by 2021 (House of Commons, 1999) . This trend towards an ageing population means that a larger proportion of UK adults will be accessing primary care facilities for age related health issues.

Changes in public health also contribute to the differences in how primary care is used. For example, in 1880 33% of all deaths were caused by infectious and parasitic diseases. In 1997 only 1% of these diseases led to death (House of Commons, 1999). Comparatively, in 1997 43% of deaths were attributed to cancers and 26% to heart disease. In 1880 these diseases were uncommon or undetected and only 10% of all deaths were recorded as being caused by cancer or circulatory difficulties (House of Commons, 1999) These changes in health can be largely attributed to scientific advancements in preventing premature deaths, primarily in children, and improvements in living conditions preventing infectious diseases (Mckeown 2016) These factors combined with countless developments and advancements in public health such as improved water systems and sanitation effectively eliminating deaths caused by infectious diseases. We now, however, are spending more resources on tackling non-infectious, chronic diseases as a result of living longer (disease without death) and un-healthy modern habits (Hickson 2006).

Finally, healthcare policies and procedures have affected how the healthcare system is accessed and used. Today, combining public health practice with research provides a 'basis for political action to address health priorities (Gorsky 2014). Frustratingly, many policies focus on changing individual behaviour and do not account for how the Government can 'enable and support the efforts of society to address those barriers that prevent people from making healthy choices' (Gorsky 2014).

Analysis of the Qresearch database in 2007 showed that consultations per patient were rising from 3.9 per person per year in 1995 to 5.3 per person per year in 2006.(Hippisley-Cox J 2007) Furthermore consultations had shifted from 77% GP to 62% GP over the period with a corresponding increase in nurse consultations, and from 3% telephone consultations to 10% over the same period.

The present study aims to analyse how the general population has accessed primary healthcare between 2006 and 2015. Analysing both the quantity of consultations as well as their characteristics, what trends can be discerned over that period and if they are consistent with previous findings.

Materials & Methods

The Health Improvement Network (THIN) Database was used to gather data for this project. The THIN database is a highly detailed Primary Care Research database with information on all primary care activity that may change, or contribute to the change of primary care activity over time. It is considered representative of the general population and has sufficient coverage to allow for a high level of confidence in the generalisability of results (Blak 2011). The data used were extracted on the 6th of January, 2017. Ethical approval for the study was obtained on the 12th of May 2017 from the IMS Scientific Review Committee with reference 17THIN037.

GP practices were excluded from a year of analysis where they never obtained computerisation, acceptable mortality recording or acceptable computer use. Or where they obtained any one of these after the first of January of the year in question.

Acceptable computer use for a practice was defined as entering on average at least two therapy records, one medical record and one additional health data record per patient per year (Horsfall L 2013).

If staff access computer results in order to enter details from lab results or letters from secondary care but do not flag themselves as doing so this may be recorded as if it were a consultation. GP practices where the proportion of recorded results or letters compared to other types of consultation was lower than the mean proportion were thus excluded to eliminate practices with potentially poor reporting standards.

Patients were only counted when they had been registered in the practice for the full year under analysis. They also had to have a patient flag representing either an acceptable record or acceptable but transferred out as deceased without additional death information. Visitors who were not registered at the practice were considered separately.

The Role of the person performing the consultation was broken down into GP, Nurse or Health Care Assistant using a code list (Appendix 1) Another code list was used to portion consultations up into Regular Practice Visit, Out of Hours Practice Visit, Home Visit, or Telephone Appointment. (Appendix 2)

Consultation duration is a measure of how long the patient file is open on the computer, consultations of duration zero were excluded as having been caused by some automatic process.

Consultations in which the staff member was flagged as administrative staff were excluded. When calculating distribution of role types, those consultations without a flagged role were excluded. A single analysis was done between 2006 and 2015 with no exclusions except for eliminating entries flagged as administrative in order to ensure trends were not likely to be a result of the method of analysis.

Consultations less than two minutes or longer than one hour were excluded from all analysis on consultation duration as these are more likely to be cases where the record either was not open for the whole consultation, or was left open for some time after the consultation

concluded. Consultation duration only examined those consultations which occurred in person at the practice.

Costs per consultation were based on the Unit Costs of Health and Social Care's 2015/2016 prices (Curtis 2016) by the Personal Social Service Research Unit (PSSRU). Direct care costs, such as possible assisting nurses were not included, but qualification costs were. GP costs were calculated using the cost per hour of patient contact from the PSSRU. Nurse costs were only available per hour so cost per hour of patient contact were calculated by assuming the same ratio of cost per hour to cost per hour of patient contact as GPs. Costs of healthcare assistants was based on hourly cost at Band 3, and multiplied in the same way as Nurses for cost per hour of patient contact.

The Population of the UK and England for each of the years in question was determined by using the Office of National Statistics (ONS) Reports. ("Overview of the UK population – Office for National Statistics").

Data for how many people were registered with a GP in England in 2015 and 2016 were obtained from NHS digital.(Digital 2015, Digital 2016). The difference between the registered population and the actual English population determined by ONS were averaged and used as an estimate of over-registration. The count of patients registered in each year was then reduced by this percentage in order to provide results as if the registered population was the same as the actual population.

Results

Table 1 shows how each stage of the initial data cleaning reduced the number of patients included for analysis. This number increased over the period, from 2.05 million to 2.50 million. This is faster than the growth in the UK population and increases the coverage from 3.38% to 3.87% over the ten years studied(Table 2). The mean age increased from 41.24 to 42.41, an increase of 1.17 years. Median age for the participants was higher than the median age of the population at 41 in 2006 compared to 39, and 43 in 2015 compared to 40.

Table 1: Exclusions (Thousands)

	Initial Count	Partial Year Registration	Error Flags	Excluded by practice	Remaining	Corrected for over registration
2006	6194.374	350.026	890.160	2818.271	2135.917	2053.361
2007	6353.158	362.174	972.811	2855.823	2162.350	2078.772
2008	6509.733	346.219	1060.035	2848.520	2254.959	2167.802
2009	6665.897	330.598	1148.448	2877.369	2309.482	2220.217
2010	6834.568	341.497	1243.687	2909.431	2339.953	2249.511
2011	6995.929	337.627	1347.191	2945.400	2365.711	2274.273
2012	7163.887	336.561	1445.110	2973.176	2409.040	2315.927
2013	7331.349	337.021	1542.903	2999.116	2452.309	2357.524
2014	7479.065	306.158	1636.058	2990.433	2546.416	2447.994
2015	7632.255	260.898	1726.425	3041.063	2603.869	2503.226

Table 2: Patient Characteristics						
	THIN Patients (Millions)	**UK Population (Millions)**	**Proportion in THIN**	**Mean Age**	**Median Age (Interquartile)**	**ONS Median Age (Interquartile)**
2006	2.0534	60.8271	3.38%	41.24	41(23:58)	39(21:57)
2007	2.0788	61.3191	3.39%	41.27	41(23:59)	39(21:57)
2008	2.1678	61.8238	3.51%	41.29	41(23:59)	39(21:57)
2009	2.2202	62.2605	3.57%	41.38	42(23:59)	39(21:58)
2010	2.2495	62.2605	3.61%	41.50	42(23:59)	40(21:58)
2011	2.2743	63.2851	3.59%	41.62	42(23:59)	40(21:58)
2012	2.3159	63.7050	3.64%	41.74	42(23:60)	40(21:58)
2013	2.3575	64.1057	3.68%	41.87	42(23:60)	40(21:58)
2014	2.4480	64.5968	3.79%	42.12	43(23:60)	40(21:58)
2015	2.5032	64.7158	3.87%	42.41	43(23:60)	40(21:58)

Table 3 shows the breakdown of consultations over this period. Consultations initially increased from 353.64 million in 2006 to 366.22 million in 2008. This represented an increase of 0.11 consultations per person per year(0.10 to 0.12 95% CI) from 5.81 in 2006 to 5.92 in 2008. After this however both the total number of consultations and the number of consultations per person declined each successive year finally reaching 240.03 million consultations, or 3.71 consultations per person per year, by 2015. This was a decrease of 2.21 consultations per person per year(2.20 to 2.23 95% CI) or a reduction of 34.5% in total consultations and 37.4% in consultations per person per year from the peak in 2008. With no data cleaning beyond filtering out entries flagged as administrative and entries of 0 second duration, there was still a 35.16% reduction in consultations per person per year between 2006 and 2015.

Table 3: Number of Consultations						
	Registered Patient Consults (Thousands)	**Visitor Consults (Thousands)**	**Total THIN Consults (Thousands)**	**Participants (Thousands)**	**UK Consults (Millions)**	**Consults Per Person(SD)**
2006	11774.680	163.248	11937.928	2053.361	353.639	5.814(6.5)
2007	12150.214	160.027	12310.241	2078.772	363.124	5.922(6.7)
2008	12677.073	164.240	12841.313	2167.802	366.223	5.924(6.9)
2009	12853.531	161.615	13015.146	2220.217	364.978	5.862(6.9)
2010	12486.934	148.957	12635.891	2249.511	349.728	5.691(6.8)
2011	12551.199	141.821	12693.020	2274.273	353.203	5.581(6.9)
2012	12667.143	133.323	12800.466	2315.927	352.107	5.527(7.0)
2013	11936.430	118.891	12055.321	2357.524	327.808	5.114(6.8)
2014	11099.239	99.287	11198.526	2447.994	295.503	4.575(6.5)
2015	9211.104	73.414	9284.518	2503.226	240.032	3.709(5.9)

51.2% of patients registered were female, 48.8% male, compared to 50.8% female, and 49.2% male in the general population(ONS, 2017). The average number of consultations per person for women was 6.32 and 4.43 for males, a difference of 1.89(1.88 to 1.90 95% CI) consultations per person per year. Consultations for females were 13.02 seconds longer on average(12.86 to 13.12 95% CI) at 10.91 minutes compared to 10.69 minutes for men. Table 4 shows the distribution of consultations by age band over the period with the proportion of consultations for older patients increasing over the period.

Table 4: Age distribution of consultations

	0-19	20-39	40-59	60-79	80-99
2006	11.59%	19.12%	27.33%	30.91%	11.04%
2007	11.78%	18.89%	26.98%	31.23%	11.12%
2008	11.79%	18.78%	26.80%	31.29%	11.34%
2009	12.02%	18.74%	26.63%	31.18%	11.43%
2010	11.81%	18.49%	26.69%	31.30%	11.71%
2011	11.47%	18.20%	26.95%	31.36%	12.03%
2012	11.60%	18.01%	27.06%	31.18%	12.16%
2013	11.64%	17.81%	26.89%	31.34%	12.33%
2014	11.51%	17.67%	26.60%	31.39%	12.84%
2015	11.45%	17.82%	26.71%	31.17%	12.85%

The proportion of visits that were in clinic during regular hours decreased slightly over the period, from 94.95% in 2006 to 92.59% in 2015.(Table 5) This was primarily due to an increase in telephone consultations, from 4.06% of all consultations in 2006 to 6.28% in 2015. Home visits also increased slightly, while out of hours clinic visits decreased slightly.

Table 5: Types of Consultations

	Regular Practice Visit	Home Visit	Out of Hours	Telephone
2006	94.95%	0.76%	0.23%	4.06%
2007	94.67%	0.78%	0.18%	4.38%
2008	94.05%	0.97%	0.18%	4.80%
2009	93.54%	0.97%	0.20%	5.29%
2010	93.43%	0.95%	0.19%	5.43%
2011	93.33%	0.95%	0.19%	5.53%
2012	92.97%	0.93%	0.19%	5.92%
2013	92.68%	0.92%	0.20%	6.20%
2014	92.60%	0.92%	0.19%	6.29%
2015	92.59%	0.94%	0.19%	6.28%

Table 6 shows that the proportion of consultations handled by GPs has decreased steadily from 2006 to 2015, from 65.69% to 62.26%. However while the proportion handled by

Nurses initially increased from 24.63% in 2006 to 25.09% in 2007, it then also began to decrease down to 24.04% in 2015. The difference was made up for by the number of consultations handled by healthcare assistants, which increased mostly steadily over the period from 9.68% in 2006 to 11.70% in 2015.

Table 6: Consultation Staff

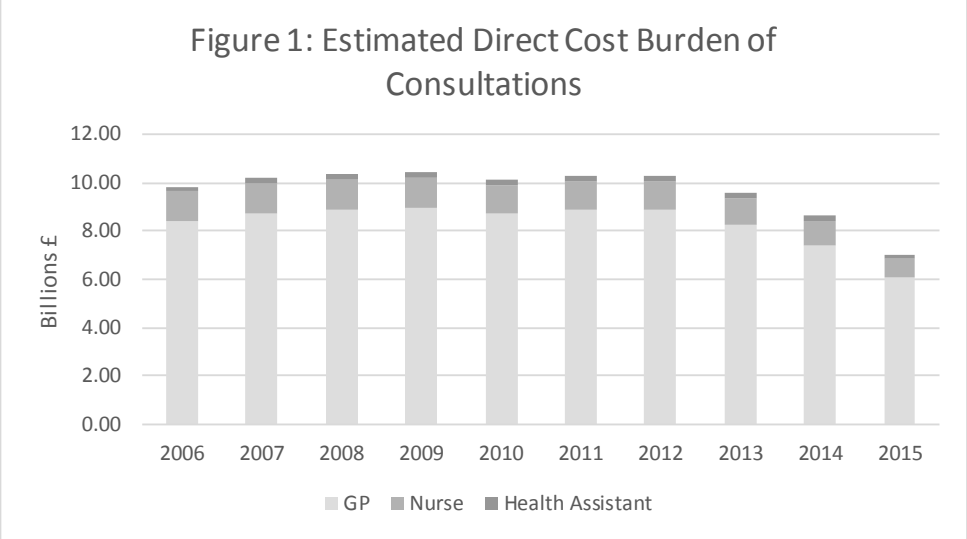
	GP	Nurse	Assistant
2006	65.69%	24.63%	9.68%
2007	65.03%	25.09%	9.89%
2008	64.74%	24.81%	10.44%
2009	64.88%	24.64%	10.48%
2010	64.95%	24.40%	10.65%
2011	64.62%	24.23%	11.15%
2012	64.87%	23.76%	11.36%
2013	64.31%	24.22%	11.47%
2014	64.41%	23.81%	11.79%
2015	64.26%	24.04%	11.70%

The average duration of consultations increased over the period for all types of staff(Table 6). GP consultations increased from an average of 10.10 minutes in 2006 to an average of 10.89 minutes in 2015, an increase of 47.4 seconds(47.04 to 47.76 95% CI). Nurses from 11.70 minutes in 2006 to 12.12 minutes in 2015, an increase of 25.2 seconds(24.38 to 26.02 95% CI) and healthcare assistants from 9.08 minutes in 2006 to 9.39 minutes in 2015, an increase of 18.6 seconds(17.36 to 19.84 95% CI). GP consultations were on average 1.240 minutes shorter than Nurse consultations(1.238 to 1.242 95% CI), and 1.367 minutes longer on average then consultations by healthcare assistants(1.364 to 1.370 95% CI).

Table 6: Consultation Duration in Minutes(SD)

	GP	Nurse	Assistant
2006	10.1(5.3)	11.7(6.2)	9.08(5.3)
2007	10.27(5.3)	11.68(6.2)	9.17(5.4)
2008	10.42(5.4)	11.71(6.2)	9.15(5.4)
2009	10.54(5.4)	11.72(6.2)	9.09(5.4)
2010	10.69(5.5)	11.84(6.3)	9.45(5.5)
2011	10.77(5.5)	11.89(6.2)	9.4(5.5)
2012	10.83(5.5)	11.97(6.3)	9.3(5.5)
2013	10.86(5.6)	11.96(6.3)	9.29(5.6)
2014	10.83(5.6)	12.01(6.3)	9.21(5.5)
2015	10.89(5.6)	12.12(6.3)	9.39(5.6)

Figure 1 shows how the combination of consultation type, duration and frequency has influenced the cost burden of consultations over the 10 year period. Costs rose from 9.83 billion in 2006 to a peak of 10.44 billion in 2009 before declining to 7.03 billion by 2015 in 2015/2016 prices.



Discussion

The results from this study are consistent with other research; the number of consultations per person in 2006 of 5.8 is very similar to the number of consultations per person in 2006 of 5.3 found by Hippisley-Cox J, F. J and Heaps M (2007). The difference may be due this research counting consultations by visitors in addition to registered patients, by methodological differences in calculating population sizes or by differences in the underlying populations of the GP practices included. Similarly, both the initial trend towards increasing consultations per person and consultations shifting from GPs to nurses matches the 2007 paper. The consultation duration of 10.1 minutes for GPs and 11.7 for Nurses is quite similar to previous findings. (Hobbs 2016) (Elmore 2016)

This makes the reversal of many of these trends in or around 2008 to be all the more striking. Consultations per person per year began to decline steadily, and the proportion of consultations done by Nurses also began to decline. It is possible that this is the result of some methodological change in the way practices were recording information, it is also possible that it is due to increasing efficiency in treatments that require patients to see the GP less often. If this were the case earlier increases in number of consultations per person may have been the result of steadily increasing proper computer recording and not a true increase in the number of underlying consultations.

It is very likely however that the financial crises of 2008 and the resulting public sector pay freeze and recession played a large role in the reversal of the previous trends. Research has shown that Health Care Assistants are being increasingly used in Primary care(Andrews H 2007), and it is likely that limitations in the number of nursing staff would increase reliance upon them.

Financial pressure may lead to changes in the recorded consultations per person through several mechanisms. De-prioritizing administrative work or recording may lead to decreased recording of events or an increase in errors in recording. Difficulties in hiring or replacing staff may lead to increase wait time for patients who will either opt to not visit the surgery at all, or to rely on other aspects of the health system, such as going to a hospital or relying on care provided by social services or friends and family. Previous research has shown that unplanned attendances at accident and emergency (A&E) have been increasing and that in 2012-2013 26.5% on these attendances were preceded by the patient being unable to obtain a GP appointment(Cowling 2014). GPs who are under pressure might be more likely to refer patients to specialists where further consultations for that condition will no longer be captured by primary care systems. Other research has highlighted the concerns for the UK's nursing workforce as a result of the financial crisis and its aftermath (Wray 2013)

Results suggested that the duration of consultations continued to increase steadily throughout this period is a good indication that GPs and Nurses were not responding by providing less complete care. While heartening from the perspective of the patient, this also meant the cost burden of consultations decreased more slowly than the number of consultations. It is not clear from this research why the durations were increasing, it could be that care is becoming more complicated, or that patients are presenting with more complicated issues. The population mean age did increase during the study and increased age is associated with declining health status (Wensing 2001).

Given how much less expensive nurses are to train and employ than GPs, results that demonstrate a reversal of the trend from Nurses handling an increasing number of consultations to them handling steadily less over time should be an issue of concern. This needlessly increases the economic burden of primary care and while healthcare assistants are even cheaper than Nurses to employ they are also unregulated and unable to carry out many types of care. This may lead to poorer health outcomes if they are relied upon too heavily and limits their ability to substitute for other healthcare professionals.

As an investigation of routinely collected electronic health records, this study has several limitations. Data are collected incidentally and not for the purposes of research, changes in how staff use the systems lead to changes in the data which may not reflect true shifts in the underlying causes. While data cleaning steps are utilized to diminish these effects, they will not always be entirely successful and may introduce biases of their own.

The number of people registered with a GP in the UK exceeds the population of the UK. This study attempts to compensate for the over registration effect by reducing the population used in the study as a denominator by the difference between the UK population and UK registered patient counts in 2015 and 2016. However as many individuals resident in the UK may not be registered, this is a crude approximation and does not account for potential changes in the over registration rate over time.

The study population was slightly older and with a slightly higher proportion of women than the general population, both of which may lead to a slight overestimation in the number and duration of consultations.

Without data that links a visitor to a GP surgery who is not normally registered there back to their original GP practice it is not possible to know information about them beyond what

occurred in their appointment. This study has assumed that the practices used received approximately the same number of health care visitors as the rest of the UK, but this leads to estimates of registered consults against visitor consults being less reliable.

As a study that used only primary care data, any burden that is taken on by other parts of the health care system will be missed. If patients are relying more upon secondary care or social care services, they will not be captured in this study.

When calculating costs, only direct care costs are considered. This will not consider if a GP was assisted by someone during a consultation, as well as what costs might be for overheads, or for tests, treatments, prescriptions or referrals ordered.

More research into the relationship between economic downturns, austerity policies and the impacts on primary care is needed. Decreasing public health itself has an adverse impact on the economy as it reduces the healthy working population(Suhrcke 2006) which may mean that putting pressure on primary care service provision in response to an economic downturn causes the situation to worsen instead of improve. It is also possible that the burden of care is being shifted to other aspects of the health service that may expend more resources to treat the same problems. Untreated health problems in primary care could for instance worsen before being treated in secondary care by which point they may be far more expensive to treat.

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Appendix One: Role Code List		
001	Senior Partner	GP
002	Partner	GP
004	Associate	GP
005	GP Rota	GP
007	Locum	GP
008	GP Registrar	GP
010	Sole Practitioner	GP
047	Salaried Partner	GP
050	GP Retainer	GP
011	Practice Nurse	Nurse
012	Health Visitor	Nurse
013	Community Nurse	Nurse
014	Midwife	Nurse
015	Pyschiatric Nurse	Nurse
036	School Nurse	Nurse
045	Mental Handicap Nurse	Nurse
202	Other Nursing and Midwifery	Nurse
033	Other healthcare professional	Assistant
003	Assistant	Assistant

Appendix Two: Type Code List		
001	Clinic	GP Practice
003	Follow-up/routine visit	GP Practice
009	Surgery Consultation	GP Practice
011	Acute Visit	GP Practice
014	Repeat Issue	GP Practice
018	Emergency Consultation	GP Practice
022	3rd Party Consultation	GP Practice
034	Walk-in Centre	GP Practice
038	Minor Injury Service	GP Practice
039	Medicine Management	GP Practice
100	Community Clinic	GP Practice
036	Co-op surgery consultation	GP Practice
002	Night Visit, deputising service	Out of Hours
004	Night visit, local rota	Out of Hours
006	Night visit, practice	Out of Hours
007	Out of hours, practice	Out of Hours
008	Out of hours, non practice	Out of Hours
032	Twilight visit	Out of Hours
110	Night Visit	Out of Hours
024	Children's home visit	Home Visit
027	Home visit	Home Visit
028	Hotel visit	Home Visit
030	Nursing home visit	Home Visit
031	Residential home visit	Home Visit
037	Co-op home visit	Home Visit
010	Telephone call from a patient	Telephone
021	Telephone call to a patient	Telephone
035	Co-op telephone advice	Telephone
115	Telephone Consultation	Telephone