

# Young people's use of NHS Direct: A national study of symptoms and outcome of calls for children aged 0-15

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# Young people's use of NHS Direct: A national study of symptoms and outcome of calls for children aged 0-15

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# Keywords

NHS Direct, health services, telephone healthcare, children, young people, telephone triage

# ABSTRACT

### Background

NHS Direct provides 24/7 expert telephone based health information and advice to the public in England. There has been limited research to explore the reasons to why calls are made on behalf of young people which will enable a better understanding of the needs of the population in England.

# Methods

Call rates were calculated for all calls (N=342,641) made to NHS Direct by, or on behalf of, people aged 0-15 during the combined four 'one month' periods (July 2010, October, 2010, January 2011 and April 2011). Chi square analysis and adjusted standardised residuals were calculated to determine differences between symptom, outcome and date/time of call.

# Results

For children aged <1 highest call rates were for 'crying' for both males (n =14, 440, CR= 13.61) and females (n=13654, CR=13.46). Further, high call rates were also received for symptoms relating to 'skin/hair/nails' and 'colds/flu/sickness' for all age groups, whereby, NHS Direct were able to support patients to self-manage and provide health information these symptoms for 59.7% and 51.4% of all cases respectively. Time and age differences were also found.

### Conclusion

This research identifies the characteristics of calls made to NHS Direct relating to young people and how they use the service. This will help with the planning and development of services to meet the needs of young population sub-groups.

# What is already known on this subject?

Highest call usage to NHS Direct is found for calls on behalf of children; however, there has been limited research to explore the national symptomatic and outcome variations within this sub-group.

# What this study adds?

Symptomatic and outcome variations in relation to age and gender are uncovered which will enable the planning and development of health services to meet the needs of young population sub-groups.

# Strengths and limitations of this study

- This is the first study to examine the symptoms and outcome of calls made to NHS Direct for and on behalf of young children (0-15).
- National call data across a one year period (July 2010, October 2010, January 2011, April 2011) was linked to population statistics to determine symptom variations by rates of calls per person per annum.
- Whilst patient data provides important information about the patient it does not take into account the characteristics of the caller.
- This study uncovers the analysis of a large dataset of over 342,000 child-patients whereby aborted calls contributed to around 100,390 missing cases. This data may have uncovered interesting demographic characteristics of those who abort telephone based healthcare services

# BACKGROUND

NHS Direct introduced in 1997[1] provides telephone based 24/7 expert health care advice and information which has aimed to support the public to care for themselves at home or access appropriate health care. However, following the recent white paper 'Equity and Excellence: Liberating the NHS' and Lord Darzi's report 'High Quality Care for All' the way the public access health care information, advice and services on the telephone is set to change, with NHS Direct's core service (0845 4647) being replaced by NHS 111 in England[2, 3].

Children continue to represent one of the highest users of healthcare, for both GP consultations[4, 5] and hospital admissions[6] with research suggesting that two-thirds of hospital admissions (68%, 500,935 of 738,805) were for children aged under 5. This trend has steadily increased over the past 10 years with increased admissions of children aged <1 and 1–4 by 52% and 25% respectively[7]. However, NHS Direct has become a good way to support this population through its increased popularity with research highlighting that the highest users of this service are on behalf of children under five contributing to nearly 25% of all calls[8-11].

However, whilst children are the highest users of NHS Direct, there has been limited research that has explored how this sub-group have engaged with this service. With the opportunity of using NHS Direct call data[12] the present study aims to provide a current snapshot of the symptoms of children aged 0-15 that have used this service, specifically exploring the impact of age, gender and symptomatic variations of uptake. Moreover, this study aims to investigate the outcome of how these symptoms are managed in this sub-group which will provide useful information to current policy makers to know how the NHS better manage demand for healthcare following the on-going interest to manage non urgent emergency admission[6].

# **METHODOLOGY**

## **Dataset and participants**

NHS Direct calls (N=342, 641) were extracted from the Computerised Assessment System (CAS) which is used to enable the nurse and health advisor to support and record consultations with patients. The population for the study was all calls made by, or on behalf of, patients in England aged 0-15 who used NHS Direct for a symptomatic consultation using the core 0845 4647 service in England over a one year period, during the combined month periods of July 2010, October 2010, January 2011 and April 2011.

### Variables

### Date and time of day

The data included the date and time of day of the call and were recoded into three categories: day (7am -3pm), evening (3pm-11pm) and night (11pm – 7am). Calls were also calculated to identify if they were a normal working day or a weekend/bank holiday.

### Age

The threshold of age taken followed previous research that has focused on young cohorts[13]. Children's ages were divided into three groups (<1, 1–3 and 4–15 years) to take into account school age as well as to explore symptomatic differences between the large amount of calls on behalf of young children (0-3) which together represent 66.2% of all calls.

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### Gender

The gender of the patient of the calls was taken to look at gender differences in relation to symptom and outcome. Of the total number of calls 50.8% (N=173,982) were for or on behalf of males with the remaining 49.2% (N=168,659) for or on behalf of female patients.

### Algorithm protocol titles

The algorithms followed were categorised into 14 groups according to the classification and definition of Medical Subject Headings (MeSH)[14] and have been previously applied to NHS Direct data[15]. However, there was one additional group added which included 'colds and flu' because of the large volume of calls with symptoms that were specific to this category. Algorithms were analysed for 258,113 patients, whereby there were 100,390 missing cases which were excluded from analysis.

### **Outcome of calls**

Following the call assessment of patients by nurses who are supported using the CAS system patients are given an outcome following their call. The outcome of calls was categorised into 11 groups: self-care, GP urgent, GP same day, GP routine, health/medication information, accident and emergency service (A&E), 999, community, walk in centre, dental and other (see Table 1).

TABLE 1

# STATISTICAL METHODS

Descriptive statistics were used to examine the use of NHS Direct. To facilitate data analysis and reporting, variables were categorised into appropriate groups. Rates of calls per person per annum (pppa) were calculated (rate,  $\times 10^{-2}$  calls per person per annum) using population estimates based on the 2006 single age population statistics which were revised using 2011 census data[16]. Adjusted

standardised residuals were completed to analyse between group differences for outcome alongside date and time of day.

Cross-tabulations were used to test both outcome differences by algorithm. Missing responses were excluded on an analysis by analysis basis. With a large number of cell sizes for some of the cross-tabulations, it can be difficult to determine which groups have significant differences within the analyses; therefore, standardized adjusted residuals were calculated for each of the cells in order to determine which cell differences contribute to the chi square test results.

# RESULTS

## Age, gender & symptoms

For males, call rate (pppa) for the population of children was analysed according to the algorithm group and age group (Table 2). For children aged <1 the highest call rate was for 'crying' for both males (n = 14, 440, CR= 13.61) and females (n = 13654, CR=13.46), alongside 'digestive problems' for both males (n = 3976, CR=3.75) and females (n = 3637, CR=3.58), and 'skin/hair/nails' for males (n = 3887, CR=3.66) and females (n = 3864, CR=3.81). This was also supported for 'colds/flu/sickness' for males (n = 3765, CR=3.55) and females (n = 3861, CR=3.63), all demonstrating a higher call rate of 3 (pppa). However, 'body temperature' (n = 3238, CR=3.04) for males was substantially higher than for females (n = 6323, CR=2.19).

# TABLE 2

Call rate decreased with increasing age. For ages 1-3 call rate was highest (excluding other) for 'skin/hair/nails' for both males (n=6853, CR=2.26), and females (n=6531, CR=2.26) alongside body temperature change for male (n=6378, CR=2.10) and female children (6323, CR=2.19). Lowest call rates for both genders were 'neurological disorders', 'crying' and 'lumps'. For ages 4-15, call rate continued to decreased, however, highest call rates aside from 'other' were found for 'pain' for both males (n=5415, CR=0.43) and females (n=5371, CR=0.44), 'wounds and injuries' for both males (n=4472, CR=0.35) and females (n=4238, CR=0.35) and 'skin/hair/nails' for males (n=4025, CR=0.32) and females (n=3906, CR=0.32).

### Symptom and outcome

Figure 1 presents all outcomes for all three age groups. The highest percentage of calls across all age groups given health information and/or self-care advice, suggesting a combined 47% of all calls for children on behalf of <1, 48.7% of calls on behalf of children 1-3 and 43.9% of all calls made by or

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on behalf of children aged 4-15 were managed with no onward referral was needed. For children aged 1< only 7% of calls were forwarded to Accident and Emergency, which was markedly higher for children aged 1-3 (12.3%) and for children aged 4-15 (13.5%). However, for GP outcomes (urgent/same day/routine) this was higher for children aged <1 (30%) compared to children aged 1-3 (24.5%) and 4-15 (23.5%).

# FIGURE 1

For each symptom cross tabulation was completed to determine the standardised adjusted residuals between groups for outcome (Table 2). 'Dental' and 'mental health' were excluded due to the small number of cases. Chi square analysis confirmed that there was a significant interaction between symptom\*outcome for both males ( $X^2$ = 7141.77, df=1,20, p<.001) and females ( $X^2$ = 6331,57, df=1,20, p<.001). However, as there was little variation this was reported for both genders combined for all ages ( $X^2$ = 13209,13, df=1,20, p<.001).

The symptoms which contributed to the highest urgency was 'respiratory tract' (n=840, 5.1%, ASR=32.7) and 'neurological disorders' (n=51, 8.4%, ASR=12.1) with the highest outcomes being 999. There were a range of symptoms which required the highest GP referral outcome. These symptoms included 'crying' (n=5473, 16.5%, ASR=84.8) and 'pain' where the highest outcome was GP urgent (n=1536, 12%, ASR=28.9). Both 'sensation disorders' (n=1339, 23.4%, ASR=26) and 'lumps' (n=424, 33.6%, ASR=23.2) showed GP routine as the highest outcome. Finally, 'urogenital disorders' (n=935, 31.3%, ASR=25.6), 'body temperature change' (n=4913, 23%, ASR=35.3), and 'digestive problems' (n=2938, 19.3%, ASR16.0) all had the highest outcome of GP same day.

NHS Direct were able to support a wide range of symptoms with self-care and health information being the highest outcomes. These symptoms included 'poisoning and overdose' where highest outcome was self-care (n=5458, 56.6%, ASR=42.4%) and health information (n=1930, 20%, ASR=23.4). This was similar for 'skin/hair/nail' where the highest outcome was also self-care

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# Time and date of call

There was a significant interaction between age and date of call i.e. whether the call was a bank holiday or a weekend compared to a normal working day ( $X^2$ =14.83, df, 2,1, p<.001). From the total number of calls (N=342,641), 59.7% (N=20,671) were made on a weekday with the remaining 40.3% (N=137,970) of calls taken at a weekend or bank holiday during GP closure days, this finding remaining consistent across the three age groups. To identify which cell differences contribute to the chi square test results standardized adjusted residuals were calculated for each of the cells. It was found that for calls taken during weekdays the highest calls were made on behalf of children aged <1 (n=55271, 27%, ASR=2.8), however, for calls during weekends and bank holidays the largest number of calls were made on behalf of 1-3 years (n=52694, 8.2%, ASR=3.7).

Chi square analysis highlighted a significant interaction by age\*time of day ( $X^2=13209.13$ , df, 20, 1, p<.001). From the total number of calls (N=342,641) 11.9% (N=40817) of calls were made during 11pm – 7am, 36.1% (N=123,677) were made during 7am -3pm with the highest amount of calls made within the hours 3pm-11pm (52%: N=178147), with this finding remaining consistent across the three age groups (Figure 2).

# FIGURE 2

To identify which cell differences contribute to the chi square test results standardized adjusted residuals were calculated for each of the cells. Findings highlighted that there were clear age and time differences, whereby for the time period 11pm-7am, the highest amount of calls were made on behalf of children aged 1-3 (n=15711, 38.5%, ASR=3). However, for the time period 7am – 3pm the highest

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calls were on behalf of children aged <1 (n=43352, 27.8%, ASR=9.4), with the highest amount of calls made by or on behalf of children aged 4-15 for the time period 3pm-11pm (n=64726, 36.3%, ASR=12.6).

#### DISCUSSION

### Main findings of this study

There has been controversy to the extent that NHS Direct has managed conditions through the provision of telephone based care, with statistics highlighting that emergency admission rates still remain high, particularly for short-term conditions[7]. However, NHS Direct remains ascertain that they are alleviating A&E and GP services, with findings suggesting that 41% of callers were being advised to treat themselves at home with 11% to A&E and 28% to a GP, whereby it was suggested that if these individuals did not phone, 44% would have gone to their GP with 29% to A&E[17]. Therefore, this research engages with this debate, providing a current understanding of how children use NHS Direct in particular what symptoms they present and how these are managed.

Highest call rates to NHS Direct for children aged <1 was for 'crying' with this group using the service mostly between 7am -3pm. This is consistent with emergency admissions with 'crying' contributing as a main symptom which new-born's present at emergency departments nationally [18]. Whilst excessive crying has been viewed as a normal developmental phenomenon in babies[19] there is little agreement to the treatment or prevalence[20]. Smith (2009) suggests that parents of persistently crying babies need instant reassurance and support to cope whereby health visitors have been viewed as best placed offer this support [20]. However, nurses at NHS Direct have also been well placed to use their clinical judgement in decision-making instantly reassuring parents to help them cope [21] where telephone based health services may be best suited to provide mainly parents with more knowledge and information.

The highest outcome of calls across all age groups was health information and/or self-care advice, with statistics suggesting around 40-50% of all calls made by or on behalf of children aged 0-15 were managed with no onward referral needed. High call rates were particularly high for symptoms

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relating to 'skin/hair/nails' and 'colds/flu/sickness' for all age groups, whereby, NHS Direct were able to support patients to self-manage and provide health information these symptoms for 59.7% and 51.4% of all cases respectively. This suggests that NHS Direct are able to support callers at home more than previous reported[17], with only 7% of calls on behalf of children aged 1< advised to attend A&E and less children aged 1-3 and 4-15 advised to attend to see a GP. However, there was a slight increase of referrals for children aged 1-15 to attend A&E and children aged <1 to see a GP.

The symptoms which contributed to the highest urgency were 'respiratory tract' and 'neurological disorder' with the highest outcomes being 999. Respiratory tract infections, are the most frequent acute problems contributing around 25% of patients who consult within primary care[22, 23] and around 40% of admissions to emergency services[7]. However, NHS Direct have shown to safely support 38.4% of all children with this symptom through the provision of telephone based self-care support and health information. Research has highlighted this to be an effective way of management [24-26] where medical information has proven successful in not only supporting children with respiratory tract infections, but ultimately leading to important reductions in antibiotic prescribing and reduced intention to consult without reducing satisfaction with care[27].

There were time differences noted, for example calls on behalf of children aged 1-3 were highest throughout the night 11pm -7pm. However, for children aged <1, calls peaked during the hours of 7am-3pm, this may suggest that NHS Direct is able to provide parents with instant reassurance of how to support a wide range of symptoms with the possibility of avoiding unnecessary GP visits. For children aged 4-15 call rates were found highest during the times of 3pm-11pm where they had higher reporting of symptoms relating to 'wounds and injuries'. This may be a reflection of when school finishes, whereby NHS Direct were able to support 50% of all children through the provision of self-care support and health information. However, this finding could highlight a gap of knowledge to

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how parents of children can be best supported to look after children following school in relation to the provision of health information to help manage symptoms more effectively.

### LIMITATIONS

This research focused on patient data rather than caller data which does not provide useful information relating to the characteristics of the caller, whereby there is evidence that use of this service is dependent on the socio-demographic characteristics of the caller[9, 28-30]. Further, previous research has suggested that whilst deprivation has been shown to increase uptake [28] it is shown to be reduced in calls about children (<15)[8, 11], therefore, it would be useful to explore the role of deprivation on the utilisation of this service in this cohort.

Although this study used call data from 342,641 child-patients there were 100,390 missing cases which were removed from analysis. Missing call data relating to symptoms is common where calls have been aborted and it is felt that the remaining calls used within the analysis meet the requirements of the research question. Whilst this study analysed four 'one month' periods to capture seasonality this may have caused some bias towards some symptoms recorded, nonetheless future research could explore differences of symptoms relating to seasons to determine significant differences in relation to symptom and outcome which will provide important information relating to demand of calls, and how to best support this cohort.

### CONCLUSION

This is the first study to examine the symptoms and outcome of calls made to NHS Direct for and on behalf of young children. It has highlighted that NHS Direct has supported a wide range of symptoms through the provision of health information and self-care support and provides important data relating to symptoms outcome and time of call which will provide useful to plan and develop services to meet the needs of parents and their young children

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All authors contributed of the study conception/design. EC, AG, GR, SL contributed to the data collection. EC, AG, DP conducted the data analysis, critically revised the article and reviewed the draft of the article.

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This research was jointly funded by NHS Direct and the University of Bedfordshire.

# **Competing interests**

None

# Data sharing statement

There is no additional data available

# Ethics

A favourable ethical opinion was obtained from the University of Bedfordshire and Essex 1 Research Ethics Committee (REF: 10/H0301/29). Research governance approval was granted by NHS Direct prior to the study commencing.

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# **Table 1: Definitions of outcome**

### Outcome

Self-care	Advice given on how to look after the problem
GP urgent	Seek urgent appointment with GP
GP Same day	Seek appointment with GP on the same day
GP routine	Seek next available appointment with GP
Health/medication Information	Either information given over telephone or leaflets posted
A&E	Advised to attend accident and emergency appointment
999	Call directed to 999
Community	Referred to community service (includes pharmacy, mental health services, social services, and community nursing
Dental	Referred to a dental service
Walk-in-centre	Advised to attend a local walk-in-centre
Other	Aborted calls, no action required and also where the agency referred to is not specified

Table 2 Volume and rate of calls per person per annum according to age group and algorithm group

Females										
Total										
0.40										
0.46										
0.49										
0.62										
0.18										
0.11										
0.09										
0.23										
0.30										
1 0.90										
9 0.66										
0.04										
0.02										
7 0.77										
3 1.01										
7 1.63										
93 7.94										
1 9 7 3 7 93										

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Figure 2: Distribution of calls by age groups across three time periods

Figure 1: Outcome of triage for each age group (<1, 1-3, 4-15)



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# Table 3: Percentage and number of cases of outcome by symptom

Symptom	9	999	A	&E	De	ntal	He	alth	Self	-care	0	ther	GP r	outine	GP	same	GP ı	irgent	Com	munitv	W	alk in	Т	otal
							Infor	formation								day						centre		
Pain	295	2.3%	926	7.1%	9	.1%	1257	9.7%	3356	25.9%	484	3.7%	1901	14.6%	2722	21.0%	1563	12.0%	160	1.2%	305	2.4%	12978	100.0%
Digestive Problems	36	.2%	381	2.5%	1	.0%	2419	15.8%	4800	31.5%	810	5.3%	2539	16.6%	2938	19.3%	1081	7.1%	106	.7%	151	1.0%	15262	100.0%
Respiratory Tract Problems	840	5.1%	1146	7.0%	0	.0%	1961	12.0%	4305	26.4%	462	2.8%	1961	12.0%	3286	20.1%	1903	11.7%	199	1.2%	260	1.6%	16323	100.0%
Wounds and Injuries	381	1.9%	5477	26.7%	39	.2%	2322	11.3%	7928	38.7%	787	3.8%	1066	5.2%	1053	5.1%	246	1.2%	308	1.5%	881	4.3%	20488	100.0%
Sensation Disorders	17	3%	208	3.6%	6	.1%	709	12.4%	1465	25.6%	448	7.8%	1339	23.4%	912	15.9%	128	2.2%	217	3.8%	282	4.9%	5731	100.0%
Urogenital Disorders	4	.1%	69	2.3%	0	.0%	92	3.1%	261	8.7%	238	8.0%	770	25.8%	935	31.3%	367	12.3%	84	2.8%	167	5.6%	2987	100.0%
Medicine Enquiries	0	.0%	10	.3%	11	.4%	629	21.3%	1852	62.6%	61	2.1%	62	2.1%	108	3.6%	82	2.8%	144	4.9%	1	.0%	2960	100.0%
Poisoning and Overdose	152	1.6%	1694	17.6%	2	.0%	1930	20.0%	5458	56.6%	189	2.0%	53	.6%	88	.9%	46	.5%	11	.1%	12	.1%	9635	100.0%
Skin/Hair/Nail	376	1.3%	1053	3.6%	28	.1%	4859	16.7%	12526	43.2%	499	1.7%	2610	9.0%	4073	14.0%	1010	3.5%	1222	4.2%	768	2.6%	29024	100.0%
Body temp change	553	2.6%	1006	4.7%	6	.0%	2667	12.5%	6847	32.1%	321	1.5%	2756	12.9%	4913	23.0%	1848	8.7%	138	.6%	306	1.4%	21361	100.0%
Lumps	0	.0%	48	3.8%	0	.0%	95	7.5%	264	20.9%	170	13.5%	424	33.6%	129	10.2%	17	1.3%	36	2.9%	80	6.3%	1263	100.0%
Neurological disorders	51	8.4%	94	15.4%	0	.0%	26	4.3%	65	10.7%	22	3.6%	96	15.8%	168	27.6%	79	13.0%	0	.0%	8	1.3%	609	100.0%
Colds and Flu/ Sickness	223	.9%	1651	6.7%	5	.0%	4156	16.9%	8497	34.5%	504	2.0%	3335	13.5%	4827	19.6%	974	4.0%	173	.7%	309	1.3%	24654	100.0%
Crying	1159	3.5%	2810	8.5%	7	.0%	2164	6.5%	6671	20.2%	1344	4.1%	3722	11.2%	8489	25.7%	5473	16.5%	676	2.0%	578	1.7%	33093	100.0%

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# Young people's use of NHS Direct: A national study of symptoms and outcome of calls for children aged 0-15

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# Young people's use of NHS Direct: A national study of symptoms and outcome of calls for children aged 0-15

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# Keywords

NHS Direct, health services, telephone healthcare, children, young people, telephone triage

# ABSTRACT

### Background

NHS Direct provides 24/7 expert telephone based health care information and advice to the public in England. There has been limited research to explore the reasons to why calls are made on behalf of young people. The aim of this study was to examine call rate patterns in younger people to enable a better understanding of the needs of this population in England.

### Methods

Call rates (expressed as calls per 100 persons per annum) were calculated for all calls (N=358 503) made to NHS Direct by, or on behalf of, people aged 0-15 during the combined four 'one month' periods within a year (July 2010, October, 2010, January 2011 and April 2011). Chi square analysis was carried to determine differences between symptom, outcome and date/time of call.

# Results

For infants aged <1 highest call rates were for 'crying' which is used as a universal assessment applied to all babies for both males (n =14, 440, CR= 13.61) and females (n=13654, CR=13.46). Further, high call rates were also received for symptoms relating to 'skin/hair/nails' and 'colds/flu/sickness' for all age groups, whereby, NHS Direct were able to support patients to self-manage and provide health information these symptoms for 59.7% and 51.4% of all cases respectively. There are variations in call rates by call time and age with the highest peaks in children aged 4-15 in the 3pm-11pm period; in children aged <1 in the 7am – 3pm period.

### Conclusion

This is the first study to examine the symptoms and outcome of calls made to NHS Direct for and on behalf of young children. Findings revealed how NHS Direct has supported a wide range of

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symptoms through the provision of health information and self-care support which provides important information about service planning and support for similar telephone based services.

# What is already known on this subject?

Highest call usage to NHS Direct is found for calls on behalf of children; however, there has been limited research to explore the national symptomatic and outcome variations within this sub-group.

# What this study adds?

Symptomatic and outcome variations in relation to age and gender are uncovered which will enable the planning and development of health services to meet the needs of young population sub-groups.

# Strengths and limitations of this study

- This is the first study to examine the symptoms and outcome of calls made to NHS Direct for and on behalf of young children (0-15).
- National call data across 4 one-month periods (July 2010, October 2010, January 2011, April 2011) was linked to population statistics to determine symptom variations by rates of calls per 100 person per annum.
- Whilst patient data provides important information about the patient it does not take into account the characteristics of the caller.
- Whilst this study uncovers the analysis of over 342,000 paediatric-patients there was a large sample of calls removed from analysis (N=100,390) for symptom classifications as these were dealt with by the front end health advisor.

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# BACKGROUND

NHS Direct introduced in 1997[1] provides 24/7 expert telephone based health care advice and information which has aimed to support the public to care for themselves at home or access appropriate health care. However, following the recent white paper 'Equity and Excellence: Liberating the NHS' and Lord Darzi's report 'High Quality Care for All' the way the public access health care information, advice and services on the telephone is set to change, with NHS Direct's telephone service (0845 4647) being replaced by NHS 111 in England[2, 3]. The new '111' service similarly to NHS Direct provides 24/7 telephone based health, however marked differences focus on it being a free to call service, acting as a first port of call for all urgent but not emergency calls in an attempt to make it easier for the public to access local health services both in and out of hours[4].

Children continue to represent one of the highest users of healthcare, for both GP consultations[5, 6] and hospital admissions[7] with research suggesting that two-thirds of hospital admissions (68%, 500,935 of 738,805) were for children aged under 5. This trend has steadily increased over the past 10 years with increased admissions of children aged <1 and 1–4 by 52% and 25% respectively[8]. However, NHS Direct has become a good way to support this population through its increased popularity with research highlighting that the highest users of this service are on behalf of children under five contributing to nearly 25% of all calls[9-12].

However, whilst children are the highest users of NHS Direct, there has been limited research that has explored how this sub-group have engaged with this service. With the opportunity of using NHS Direct call data[13] the present study aims to examine call rate differences in symptoms of younger people (0-15) that have used this service, additionally exploring the impact of age and gender on uptake. Moreover, this study aims to investigate the outcome of how these symptoms are managed in this sub-group which will provide useful information to current policy makers to know how the NHS

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# METHODOLOGY

# **Dataset and participants**

NHS Direct calls (N=358 503) were extracted from the Computerised Assessment System (CAS) which is used to enable the nurse and health advisor to support and record consultations with patients. The sample in this research is all calls about children aged 0-15 who used NHS Direct for a symptomatic consultation using the core health and information telephone advice line (0845 4647) in England over a one year period, during the combined month periods of July 2010, October 2010, January 2011 and April 2011.

### Variables

#### Date and time of day

The data included the date and time of day of the call and were recoded into three categories: day (7am -3pm), evening (3pm-11pm) and night (11pm – 7am). Calls were also calculated to identify if they were a normal working day or a weekend/bank holiday.

#### Age

The threshold of age taken followed previous research that has focused on young cohorts[14]. Children's ages were divided into three groups (<1, 1–3 and 4–15 years) to take into account school age as well as to explore symptomatic differences between the large amount of calls on behalf of young children (0-3) which together represent 66.2% of all childhood calls.

#### Gender

The gender of the patient of the calls was taken to look at gender differences in relation to symptom and outcome. Gender were analysed for 342,641 patients, with 15,862 missing cases excluded where gender was not reported. There were 50.8% (N=173,982) of calls for or on behalf of males with the remaining 49.2% (N=168,659) for or on behalf of female patients.

### Symptom classification

The symptoms logged were categorised into 14 groups (see Table 3) according to the classification and definition of Medical Subject Headings (MeSH)[15] and have been previously applied to NHS Direct data[16]. However, there was one additional group added which included 'colds and flu' because of the large volume of calls with symptoms that were specific to this category. Symptom classifications logged were analysed for 258,113 patients, whereby there were 100,390 missing cases which were excluded from analysis. Missing data reflects that are closed by the front-end advisor as they are related to simple quick health information related calls that do not warrant a symptom classification or to be discussed with a nurse advisor.

### **Outcome of calls**

Following the assessment by nurses (supported using the CAS system) patients are given an outcome following their call. The outcome of calls were categorised into 11 groups: self-care, GP urgent, GP same day, GP routine, health/medication information, accident and emergency service (A&E), 999, community, walk in centre, dental and other (see Table 1).

# TABLE 1

# STATISTICAL METHODS

Descriptive statistics were used to examine the use of NHS Direct. To facilitate data analysis and reporting, variables were categorised into appropriate groups. Rates of calls per 100 persons per annum were calculated to measure the call usage using population estimates based on the 2006 single age population statistics which were revised using 2011 census data[17]. Chi-square test with adjusted standardised residuals was carried to compare between-group differences for outcome alongside date and time of day.

Cross-tabulations (chi-square tests) were used to test outcome differences by symptom classification. Missing responses were excluded on an analysis by analysis basis (i.e. total responses included will vary across analyses). With a large number of cell sizes for some of the cross-tabulations, it can be difficult to determine which groups have significant differences within the analyses; therefore, adjusted standardized residuals (ASR) were calculated for each of the cells in order to determine which cell differences contribute to the chi square test results. All statistical analyses were carried out using SPSS BMJ Open: first published as 10.1136/bmjopen-2013-004106 on 9 December 2013. Downloaded from http://bmjopen.bmj.com/ on May 19, 2025 at Department GEZ-LTA Erasmushogeschool . Protected by copyright, including for uses related to text and data mining, Al training, and similar technologies.

### **RESULTS**

# Age, gender & symptoms

For males, call rate for the population of children was analysed according to the symptom classification and age groupings (Table 2). For children aged <1 the highest call rate (CR) was for 'crying' for both males (n =14, 440, CR= 13.61) and females (n=13654, CR=13.46), alongside 'digestive problems' for both males (n=3976, CR=3.75) and females (n=3637, CR=3.58), and 'skin/hair/nails' for males (n=3887, CR=3.66) and females (n=3864, CR=3.81). This was also supported for 'colds/flu/sickness' for males (n=3765, CR=3.55) and females (n=3861, CR=3.63), all demonstrating a higher call rate of. However, call rate for 'body temperature' (n=3238, CR=3.04) for males was substantially higher than for females (n=6323, CR=2.19).

# TABLE 2

Call rate decreased with increasing age. For ages 1-3 call rate was highest (excluding other) for 'skin/hair/nails' for both males (n=6853, CR=2.26), and females (n=6531, CR=2.26) alongside body temperature change for male (n=6378, CR=2.10) and female children (6323, CR=2.19). Lowest call rates for both genders were 'neurological disorders', 'crying' and 'lumps'. For ages 4-15, call rate continued to decreased, however, highest call rates aside from 'other' were found for 'pain' for both males (n=5415, CR=0.43) and females (n=5371, CR=0.44), 'wounds and injuries' for both males (n=4472, CR=0.35) and females (n=4238, CR=0.35) and 'skin/hair/nails' for males (n=4025, CR=0.32) and females (n=3906, CR=0.32).

# Symptom and outcome

Figure 1 presents all outcomes for all three age groups. The highest percentage of calls across all age groups given health information and/or self-care advice, suggesting a combined 47% of all calls for children on behalf of <1, 48.7% of calls on behalf of children 1-3 and 43.9% of all calls made by or

FIGURE 1

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on behalf of children aged 4-15 were managed with no onward referral was needed. For children aged 1< only 7% of calls were forwarded to Accident and Emergency, which was markedly higher for children aged 1-3 (12.3%) and for children aged 4-15 (13.5%). However, for GP outcomes (urgent/same day/routine) this was higher for children aged <1 (30%) compared to children aged 1-3 (24.5%) and 4-15 (23.5%).

For each symptom cross tabulation was completed to determine the standardised adjusted residuals (ASR) between groups for outcome (Table 3). . 'Dental' and 'mental health' were excluded due to the small number of cases. Chi square analysis confirmed that there was a significant interaction between symptom\*outcome for both males ( $X^2 = 7141.77$ , df=1,20, p<.001) and females ( $X^2 = 7141.77$ , df=1,20, p<.001) 6331,57, df=1,20, p<.001). However, as there was little variation this was reported for both genders combined for all ages ( $X^2 = 13209, 13, df = 1, 20, p < .001$ ).

The symptoms which contributed to the highest number for urgency was 'respiratory tract' (n=840, 5.1%, ASR=32.7) and 'neurological disorders' (n=51, 8.4%, ASR=12.1) with the highest number of outcomes being 999. There were a range of symptoms which required the highest number for GP referral outcome. These symptoms included 'crying' (n=5473, 16.5%, ASR=84.8) and 'pain' where the highest outcome was GP urgent (n=1536, 12%, ASR=28.9). Both 'sensation disorders' (n=1339, 23.4%, ASR=26) and 'lumps' (n=424, 33.6%, ASR=23.2) showed GP routine as the highest outcome. Finally, 'urogenital disorders' (n=935, 31.3%, ASR=25.6), 'body temperature change' (n=4913, 23%, ASR=35.3), and 'digestive problems' (n=2938, 19.3%, ASR16.0) all had the highest outcome of GP same day.

NHS Direct supported a wide range of callers to self-manage their symptoms; the health information was the highest recorded outcome for these calls. These symptoms included 'poisoning and overdose' (low risk unintentional overdose with low toxic substance) where highest number for outcome was

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self-care (n=5458, 56.6%, ASR=42.4%) and health information (n=1930, 20%, ASR=23.4). This was similar for 'skin/hair/nail' where the highest number for outcome was also self-care (n=12,526, 43.2%, ASR=25.9) and health information (n=4859, 16.7%, ASR=24.3). 'Medicine enquiries' showed the highest number for outcome was self-care (n=1852, 62.6%, ASR=29.9) as did 'wounds and injuries' (n=7928, 38.7%, ASR=7.5). For 'colds and flu/Sickness' the number for outcome of the outcome was for health information (n=4156, 16.9%, ASR=22.7).

# Time and date of call

There was a significant interaction between age and date of call i.e. whether the call was a bank holiday or a weekend compared to a normal working day ( $X^2=14.83$ , df=2,1, p<.001). From the total number of calls (N=342,641), 59.7% (N=20,671) were made on a weekday with the remaining 40.3% (N=137,970) of calls taken at a weekend or bank holiday during GP closure days, this finding remaining consistent across the three age groups. To identify which cell differences contribute to the chi square test results standardized adjusted residuals were calculated for each of the cells. It was found that for calls taken during weekdays represented the highest number of calls made on behalf of children aged <1 (n=55271, 27%, ASR=2.8), however, for calls during weekends and bank holidays the largest number of calls were made on behalf of 1-3 years (n=52694, 8.2%, ASR=3.7).

Chi square analysis highlighted a significant interaction by age\*time of day ( $X^2$ =13209.13, df, 20, 1, p<.001). From the total number of calls (N=342,641) 11.9% (N=40817) of calls were made during 11pm – 7am, 36.1% (N=123,677) were made during 7am -3pm with the highest call rate made within the hours 3pm-11pm (52%: N=178147), with this finding remaining consistent across the three age groups (Figure 2).

# FIGURE 2

To identify which cell differences contribute to the chi square test results standardized adjusted residuals were calculated for each of the cells. Findings highlighted that there were clear age and time

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differences, whereby for the time period 11pm-7am, the highest amount of calls were made on behalf of children aged 1-3 (N=15711, 38.5%, ASR=3). However, for the time period 7am – 3pm the highest calls were on behalf of children aged <1 (N=43352, 27.8%, ASR=9.4), with the highest amount of calls made by or on behalf of children aged 4-15 for the time period 3pm-11pm (N=64726, 36.3%, ASR=12.6).

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#### DISCUSSION

# Main findings of this study

There has been much controversy surrounding the extent that NHS Direct has managed to relieve the pressure of overstretched healthcare services [8]. However, NHS Direct survey data shows that they are alleviating A&E and GP services, with 41% of respondents being advised to treat themselves at home with 11% to A&E and 28% to a GP, whereby it was reported that if these individuals did not phone, 44% would have gone to their GP with 29% to A&E[18]. Therefore, this research engages with this debate, providing a current understanding of how children use NHS Direct in particular what symptoms they present and how these are managed.

Highest call rates to NHS Direct for children aged <1 was for 'crying' with this group using the service mostly between 7am -3pm. It is important to note that NHS Direct advisors use the Crying symptom classification for all for all children under 3 months old and is used as a catch all algorithm for safety for children <1 which would have influenced this finding. However, this finding remains consistent with emergency admissions with 'crying' contributing as a main symptom which newborn's present at emergency departments nationally [19]. Whilst excessive crying has been viewed as a normal developmental phenomenon in babies[20] there is little agreement to the treatment or prevalence[21]. Smith (2009) suggests that parents of persistently crying babies need instant reassurance and support to cope whereby health visitors have been viewed as best placed offer this support [21]. However, nurses at NHS Direct have also been well placed to use their clinical judgement in decision-making instantly reassuring parents to help them cope [22] where telephone based health services may be best suited to provide mainly parents with more knowledge and information.

As supported by internal audits the highest outcome of calls across all age groups was health information and/or self-care advice, with statistics suggesting around 40-50% of all calls made by or on behalf of children aged 0-15 were managed with no onward referral needed which supports previous audits [18]. High call rates were particularly high for symptoms relating to 'skin/hair/nails' and 'colds/flu/sickness' for all age groups, whereby, NHS Direct were able to support patients to self-manage and provide health information these symptoms for 59.7% and 51.4% of all cases respectively. This suggests that NHS Direct are able to support more callers at home than previous reported[18], with only 7% of calls on behalf of children aged 1< advised to attend A&E and less children aged 1-3 and 4-15 advised to attend to see a GP.

The symptoms which contributed to the highest urgency were 'respiratory tract' and 'neurological disorder' with the highest outcomes being 999. Respiratory tract infections, are the most frequent acute problems contributing around 25% of patients who consult within primary care[23, 24] and around 40% of admissions to emergency services[8]. However, NHS Direct have shown to safely support 38.4% of all children with this symptom through the provision of telephone based self-care support and health information. Research has highlighted this to be an effective way of management [25-27] where medical information has proven successful in not only supporting children with respiratory tract infections, but ultimately leading to important reductions in antibiotic prescribing and reduced intention to consult without reducing satisfaction with care[28].

An interesting finding was that NHS Direct were able to successfully manage around 60% and 20% of calls relating to 'poisoning and overdose' characterised as low risk unintentional overdose with low toxic substances through the provision of self-care and health information respectively. With ingestion of harmful substances being the most common causes of injury, and subsequently a common reason for referral to A&E, this finding highlights that NHS Direct and essentially telephone based

health care can safely support parents and caregivers to appropriately and safely manage the child's symptoms within their own home [29].

There were time differences noted, for example calls on behalf of children aged 1-3 were highest throughout the night 11pm -7pm. However, for children aged <1, calls peaked during the hours of 7am-3pm, this may suggest that NHS Direct is able to provide parents with instant reassurance of how to support a wide range of symptoms with the possibility of avoiding unnecessary GP visits. For children aged 4-15 call rates were found highest during the times of 3pm-11pm where they had higher reporting of symptoms relating to 'wounds and injuries'. This may be a reflection of when school finishes, whereby NHS Direct were able to support 50% of all children through the provision of self-care support and health information. However, this finding could highlight a gap of knowledge to how parents of children can be best supported to look after children following school in relation to the provision of health information to help manage symptoms more effectively.

# LIMITATIONS

This research focused on patient (child subject of the call) data rather than caller (usually the parent/caregiver) data which does not provide useful information relating to the characteristics of the caller, whereby there is evidence that use of this service is dependent on the socio-demographic characteristics of the caller[10, 30-32]. Furthermore, whilst previous research has suggested that there is an upward trend of access associated with deprivation [30]. However, this finding is not consistent across age, whereby deprivation is shown to be related to lower usage for or on behalf of children (<15)[9, 12]. Therefore, it would be useful to explore the role of deprivation on the utilisation of this service in this cohort' which hopefully clarifies the point being made.

Although this study used a large sample of call data from 358,503 child-patients there were a number of cases managed and closed by front-end advisors therefore (N=100,390) which were removed from

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analysis for symptom classifications. Nonetheless, following pre-checking the remaining calls used within the analysis meet the requirements of the research aim.

This study focused on four 'one month' periods across a year period, whilst it would have been more robust to have captured a full year sample, it was felt that the data would have been excessive with the four months felt to still remain representative of the population uptake in England. There are no national studies to compare this to, however, previous studies that have used a year sample have only had data on that population e.g. older people [16] or have focused on a specific geographic area [12, 31].

Over the four month periods there could have been seasonality differences, of which may have caused some bias towards some symptoms recorded and it would have been interesting to have explored seasonality differences for this cohort. Nonetheless, whilst telephone based healthcare systems such as NHS Direct has the potential for informing public health regarding the epidemiology of communicable diseases for common viruses such as influenza, norovirus [33-36] in the community this research provides an overview of how these symptoms are managed and the representiveness of this data.

# CONCLUSION

This is the first study to examine the symptoms and outcome of calls made to NHS Direct for and on behalf of young children. It has highlighted that NHS Direct has supported a wide range of symptoms through the provision of health information and self-care support and provides important data relating to symptoms outcome and time of call. Moreover, it highlights the increasing role of telephone based healthcare in England and how the use of technology can provide instant support and reassurance to parents through the provision of clinical knowledge and information to empower them to support many symptoms. As the new 111 telephone based service is rolled out nationally research should now focus on how this new service can further support the health of younger population groups and the impact this has on demand for other health services.

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All authors contributed of the study conception/design. EC, AG, GR, SL contributed to the data collection. EC, AG, AC, DP, SL conducted the data analysis, critically revised the article and reviewed the draft of the article.

# Funding

This research was jointly funded by NHS Direct and the University of Bedfordshire.

# **Competing interests**

None

# Data sharing statement

No additional data available

# Ethics

A favourable ethical opinion was obtained from the University of Bedfordshire and Essex 1 Research Ethics Committee (REF: 10/H0301/29). Research governance approval was granted by NHS Direct prior to the study commencing.

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# **Table 1: Definitions of outcome**

# Outcome

Self-care	Advice given on how to look after the problem
GP urgent	Seek urgent appointment with GP
GP Same day	Seek appointment with GP on the same day
GP routine	Seek next available appointment with GP
Health/medication Information	Either information given over telephone or leaflets posted
A&E	Advised to attend accident and emergency appointment
999	Call directed to 999
Community	Referred to community service (includes pharmacy, mental health services, social services, and community nursing
Dental	Referred to a dental service
Walk-in-centre	Advised to attend a local walk-in-centre
Other	Aborted calls, no action required and also where the agency referred to is not specified

Table 2 Volume and rate of calls per 100 population per annum (CR) according to age group and symptom classification group

		Males									Females									
Symptom classification group	<1		1-3		4-15		Total		<1		1-3		4-15		Total					
2	Ν	CR	Ν	CR	Ν	CR	Ν	CR	Ν	CR	Ν	CR	Ν	CR	Ν	CR				
3 Pain	220	0.21	1034	0.34	5415	0.43	6669	0.40	180	0.18	777	0.27	5371	0.44	6328	0.40				
4 Digestive problems	3976	3.75	2624	0.86	1352	0.11	7952	0.48	3637	3.58	2574	0.89	1195	0.10	7406	0.46				
5 Respiratory tract	2908	2.74	3501	1.15	2152	0.17	8561	0.51	2592	2.55	3143	1.09	2043	0.17	7778	0.49				
Wounds & Injuries	1996	1.88	4253	1.40	4472	0.35	10721	0.64	1894	1.87	3835	1.33	4238	0.35	9967	0.62				
Sensation disorders	478	0.45	1147	0.38	1233	0.10	2858	0.17	481	0.47	1123	0.39	1290	0.11	2894	0.18				
Urogenital disorders	165	0.16	430	0.14	722	0.06	1317	0.08	58	0.06	627	0.22	995	0.08	1680	0.11				
Medicine enquiries	401	0.38	446	0.15	634	0.05	14881	0.09	360	0.35	433	0.15	691	0.06	1484	0.09				
Dental problems	129	0.12	692	0.23	3098	0.25	3919	0.23	94	0.09	617	0.21	2892	0.24	3603	0.23				
<b>2</b> Poisoning and overdose	686	0.65	2960	0.98	1245	0.10	4891	0.29	678	0.67	2883	1.00	1182	0.10	4743	0.30				
3 Skin/Hair/Nail	3887	3.66	6853	2.26	4026	0.32	14766	0.88	3864	3.81	6531	2.26	3906	0.32	14301	0.90				
4 Body temperature change	3238	3.04	6378	2.10	1276	0.10	10882	0.65	2923	2.88	6323	2.19	1243	0.10	10489	0.66				
5 Lumps	170	0.16	221	0.07	238	0.02	629	0.04	178	0.18	231	0.08	228	0.02	637	0.04				
Meurological disorders	40	0.04	98	0.03	150	0.01	288	0.02	-35	0.03	86	0.03	200	0.02	321	0.02				
Colds/Flu/Sickness	3765	3.55	5045	1.66	3622	0.29	12432	0.74	3861	3.63	4972	1.72	3614	0.30	12267	0.77				
Crying	14440	13.61	2524	0.83	166	0.01	17130	1.02	13654	13.46	2346	0.81	158	0.01	16163	1.01				
Other	747	0.70	13448	4.43	12785	1.01	26980	1.61	740	0.73	12653	4.38	13139	1.09	26057	1.63				
Total	37236	35.09	51654	17.01	42612	3.37	131502	7.86	35054	34.55	49154	17.00	42385	3.52	126593	7.94				

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# Table 3: Percentage and number of cases of outcome by symptom

Symptom	999 A&E		Dental Health			Self-care		Other		GP routine		GP same		GP urgent		Community		Walk in		Total				
							Infor	mation	I						da	ay					cen	tre		
	Ν	%	Ν	%	Ν	%	Ν	%	Ν	%	Ν	%	Ν	%	Ν	%	Ν	%	N	%	Ν	%	Ν	%
Pain	295	2.3	926	7.1	9	.1	1257	9.7	3356	25.9	484	3.7	1901	14.6	2722	21.0	1563	12.0	160	1.2	305	2.4	12978	100
Digestive Problems	36	.2	381	2.5	1	.0	2419	15.8	4800	31.5	810	5.3	2539	16.6	2938	19.3	1081	7.1	106	.7	151	1.0	15262	100
Respiratory Tract Problems	840	5.1	1146	7.0	0	.0	1961	12.0	4305	26.4	462	2.8	1961	12.0	3286	20.1	1903	11.7	199	1.2	260	1.6	16323	100
Wounds and Injuries	381	1.9	5477	26.7	39	.2	2322	11.3	7928	38.7	787	3.8	1066	5.2	1053	5.1	246	1.2	308	1.5	881	4.3	20488	100
Sensation Disorders	17	3	208	3.6	6	.1	709	12.4	1465	25.6	448	7.8	1339	23.4	912	15.9	128	2.2	217	3.8	282	4.9	5731	100
Urogenital Disorders	4	.1	69	2.3	0	.0	92	3.1	261	8.7	238	8.0	770	25.8	935	31.3	367	12.3	84	2.8	167	5.6	2987	100
Medicine Enquiries	0	.0	10	.3	11	.4	629	21.3	1852	62.6	61	2.1	62	2.1	108	3.6	82	2.8	144	4.9	1	.0	2960	100
Poisoning and Overdose	152	1.6	1694	17.6	2	.0	1930	20.0	5458	56.6	189	2.0	53	.6	88	.9	46	.5	11	.1	12	.1	9635	100
Skin/Hair/Nail	376	1.3	1053	3.6	28	.1	4859	16.7	12526	43.2	499	1.7	2610	9.0	4073	14.0	1010	3.5	1222	4.2	768	2.6	29024	100
Body temp change	553	2.6	1006	4.7	6	.0	2667	12.5	6847	32.1	321	1.5	2756	12.9	4913	23.0	1848	8.7	138	.6	306	1.4	21361	100
Lumps	0	.0	48	3.8	0	.0	95	7.5	264	20.9	170	13.5	424	33.6	129	10.2	17	1.3	36	2.9	80	6.3	1263	100
Neurological disorders	51	8.4	94	15.4	0	.0	26	4.3	65	10.7	22	3.6	96	15.8	168	27.6	79	13.0	0	.0	8	1.3	609	100
Colds and Flu/ Sickness	223	.9	1651	6.7	5	.0	4156	16.9	8497	34.5	504	2.0	3335	13.5	4827	19.6	974	4.0	173	.7	309	1.3	24654	100
Crying	1159	3.5	2810	8.5	7	.0	2164	6.5	6671	20.2	1344	4.1	3722	11.2	8489	25.7	5473	16.5	676	2.0	578	1.7	33093	100
Total (N)	4087		16573		114		25286	5	64295		6339		22634		34641		14817		3474		4108		196368	

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# Young people's use of NHS Direct: A national study of symptoms and

# outcome of calls for children aged 0-15

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# Keywords

NHS Direct, health services, telephone healthcare, children, young people, telephone triage

# ABSTRACT

## Background

NHS Direct provides 24/7 expert telephone based health care information and advice to the public in England. There has been limited research to explore the reasons to why calls are made on behalf of young people. The aim of this study was to examine call rate patterns in younger people which willto enable a better understanding of the needs of thise population in England.

#### Methods

Call rates (expressed as calls per 100 persons per annum) were calculated for all calls (N=358 503342,641) made to NHS Direct by, or on behalf of, people aged 0-15 during the combined four 'one month' periods within a year (July 2010, October, 2010, January 2011 and April 2011). Chi square analysis was carried to determine differences between symptom, outcome and date/time of call.

#### Results

For infants aged <1 highest call rates were for 'crying' which is used as a universal assessment applied to all babies for both males (n =14, 440, CR= 13.61) and females (n=13654, CR=13.46). Further, high call rates were also received for symptoms relating to 'skin/hair/nails' and 'colds/flu/sickness' for all age groups, whereby, NHS Direct were able to support patients to selfmanage and provide health information these symptoms for 59.7% and 51.4% of all cases respectively. There are variations in call rates by call time and age with the highest peaks in children aged 4-15 in the 3pm-11pm period; in children aged <1 in the 7am – 3pm period.

#### Conclusion

This is the first study to examine the symptoms and outcome of calls made to NHS Direct for and on behalf of young children. Findings revealed how NHS Direct has supported a wide range of

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Reviewer 2: Comment 1 – An aim is provided determine the differences that this study focus 

 determine the differences that this study focuses of i.e. differences in call rates.

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 to text and data mining, Al training, and similar too f call rates is provided

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a th information and self-care s g and support for similar telephone base symptoms through the provision of health information and self-care support which provides important information about service planning and support for similar telephone based services.

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Highest call usage to NHS Direct is found for calls on behalf of children; however, there has been limited research to explore the national symptomatic and outcome variations within this sub-group.

# What this study adds?

Symptomatic and outcome variations in relation to age and gender are uncovered which will enable the planning and development of health services to meet the needs of young population sub-groups.

# Strengths and limitations of this study

- This is the first study to examine the symptoms and outcome of calls made to NHS Direct for and on behalf of young children (0-15).
- National call data across <u>4 one-month periods a one year period</u> (July 2010, October 2010, January 2011, April 2011) was linked to population statistics to determine symptom variations by rates of calls per 100 person per annum.
- Whilst patient data provides important information about the patient it does not take into account the characteristics of the caller.
- <u>Whilst</u> <u>+</u><u>t</u>his study uncovers the analysis of <u>a large dataset of</u> over 342,000 paediatric-patients whereby there was a large sample of calls removed from analysis (<u>N=100,390</u>) for symptom classifications as these were dealt with by the front end health advisor.

**Comment [ejc4]:** Reviewer 1: Comment **5** this has been changed to clearly highlight that it we not over a one year period.

NHS Direct introduced in 1997[1] provides 24/7 expert telephone based health care advice and information which has aimed to support the public to care for themselves at home or access\_appropriate health care. However, following the recent white paper 'Equity and Excellence: Liberating the NHS' and Lord Darzi's report 'High Quality Care for All' the way the public access health care information, advice and services on the telephone is set to change, with NHS Direct's core-telephone\_service (0845 4647) being replaced by NHS 111 in England[2, 3]. The new '111' service-similarly to NHS Direct provides 24/7 telephone based health, however marked differences focus on it being a free to call service, acting as a first port of call for all urgent but not emergency calls in an attempt to make it easier for the public to access local health services both in and out of hours[4].

**Comment [ejc5]:** Reviewer 1 Comment 4 The reviewer suggests to change this to aiming – **b** however, we argue that it should stay the same as w are not sure what the future holds particularly.

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Children continue to represent one of the highest users of healthcare, for both GP consultations[5, 6] and hospital admissions[7] with research suggesting that two-thirds of hospital admissions (68%, 500,935 of 738,805) were for children aged under 5. This trend has steadily increased over the past 10 years with increased admissions of children aged <1 and 1–4 by 52% and 25% respectively[8]. However, NHS Direct has become a good way to support this population through its increased popularity with research highlighting that the highest users of this service are on behalf of children under five contributing to nearly 25% of all calls[9-12].

However, whilst children are the highest users of NHS Direct, there has been limited research that has explored how this sub-group have engaged with this service. With the opportunity of using NHS

Direct call data[13] the present study aims to examine call rate differences in symptoms of younger people (to provide 0-15) that have used this service, additionally exploring the impact of age and gender on uptake. a current snapshot rvice, specifically exploring the impact of age, gender and symptomatic Moreover, this study aims to investigate the outcome of how these symptoms are managed in this subgroup which will provide useful information to current policy makers to know how the NHS better manage demand for healthcare following the on-going interest to manage non urgent emergency admission[7].

# **Comment [ejc7]:** Reviewer 1: Comment **5** has now been changed to clearly provide the at the study.

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# **METHODOLOGY**

#### **Dataset and participants**

NHS Direct calls (N=358 503342, 641) were extracted from the Computerised Assessment System (CAS) which is used to enable the nurse and health advisor to support and record consultations with patients. The population sample in this research is all calls about children aged for the study was all calls made by, or on behalf of, patients in England aged 0-15 who used NHS Direct for a symptomatic consultation using the core health and information telephone advice line (0845 4647) service in England over a one year period, during the combined month periods of July 2010, October 2010, January 2011 and April 2011.

#### Variables

# Date and time of day

The data included the date and time of day of the call and were recoded into three categories: day (7am -3pm), evening (3pm-11pm) and night (11pm - 7am). Calls were also calculated to identify if they were a normal working day or a weekend/bank holiday.

Reviewer 2: Comment 5 This aim also address s comment by providing a clear aim. Comment [ejc8]: Reviewer 2 Comment 1 total calls are 358, 503 and this has been changed Also for gender missing calls were different are total calls are directed Also for gender missing calls were different a has been adjusted

Comment [ejc9]: Reviewer 2 Comment has been changed to reflect the suggested rep

Comment [ejc10]: Reviewer 2 Comment 7: Th hopefully explains what the main core service at NHS Direct provided when the study took plag aining, and similar technologies. Comment [ejc10]: Reviewer 2 Comment

# Age

The threshold of age taken followed previous research that has focused on young cohorts[14]. Children's ages were divided into three groups (<1, 1–3 and 4–15 years) to take into account school age as well as to explore symptomatic differences between the large amount of calls on behalf of young children (0-3) which together represent 66.2% of all childhood calls.

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# 

# Gender

The gender of the patient of the calls was taken to look at gender differences in relation to symptom and outcome. <u>Gender were analysed for Of the total number of calls342,641 patients, with 15,862</u> <u>missing cases excluded</u> where gender was not reported. <u>There were 50.8%</u> (N=173,982) <u>of calls</u> were for or on behalf of males with the remaining 49.2% (N=168,659) for or on behalf of female patients.

# Algorithm protocol titles Symptom classification

The algorithms followedsymptoms logged were categorised into 14 groups (see Table 3) according to the classification and definition of Medical Subject Headings (MeSH)[15] and have been previously applied to NHS Direct data[16]. However, there was one additional group added which included 'colds and flu' because of the large volume of calls with symptoms that were specific to this category. Algorithms-Symptom classifications logged were analysed for 258,113 patients, whereby there were 100,390 missing cases which were excluded from analysis. Missing data reflects that are closed by the front-end advisor as they are related to simple quick health information related calls that do not warrant a symptom classification or to be discussed with a nurse advisor.

# **Outcome of calls**

Following the assessment by nurses (supported using the CAS system) patients are given an outcome following their call. Following the call assessment of patients by nurses who are supported using the CAS system patients are given an outcome following their call. The outcome of calls were categorised into 11 groups: self-care, GP urgent, GP same day, GP routine, health/medication information, accident and emergency service (A&E), 999, community, walk in centre, dental and other (see Table 1).

## TABLE 1

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similar technologies.

# STATISTICAL METHODS

Descriptive statistics were used to examine the use of NHS Direct. To facilitate data analysis and reporting, variables were categorised into appropriate groups. Rates of calls per <u>100</u> persons per annum were calculated to measure the call usage using population estimates based on the 2006 single age population statistics which were revised using 2011 census data[17]. Chi-square test with adjusted standardised residuals was carried to compare between-group differences for outcome alongside date and time of day.

Cross-tabulations (chi-square tests) were used to test outcome differences by algorithmsymptom classification. Missing responses were excluded on an analysis by analysis basis (i.e. total responses included will vary across analyses). With a large number of cell sizes for some of the cross-tabulations, it can be difficult to determine which groups have significant differences within the analyses; therefore, standardized adjusted standardized residuals (ASR) were calculated for each of the cells in order to determine which cell differences contribute to the chi square test results. All statistical analyses were carried out using SPSS

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# RESULTS

## Age, gender & symptoms

For males, call rate for the population of children was analysed according to the symptom classificationalgorithm gr and age groupings oup and age group (Table 2). For children aged <1 the highest call rate (CR) was for 'crying' for both males (n =14, 440, CR= 13.61) and females (n=13654, CR=13.46), alongside 'digestive problems' for both males (n=3976, CR=3.75) and females (n=3637, CR=3.58), and 'skin/hair/nails' for males (n=3887, CR=3.66) and females (n=3864, CR=3.81). This was also supported for 'colds/flu/sickness' for males (n=3765, CR=3.55) and females (n=3861, CR=3.63), all demonstrating a higher call rate of. However, <u>call rate for</u> 'body temperature' (n=3238, CR=3.04) for males was substantially higher than for females (n=6323, CR=2.19).

#### TABLE 2

Call rate decreased with increasing age. For ages 1-3 call rate was highest (excluding other) for 'skin/hair/nails' for both males (n=6853, CR=2.26), and females (n=6531, CR=2.26) alongside body temperature change for male (n=6378, CR=2.10) and female children (6323, CR=2.19). Lowest call rates for both genders were 'neurological disorders', 'crying' and 'lumps'. For ages 4-15, call rate continued to decreased, however, highest call rates aside from 'other' were found for 'pain' for both males (n=5415, CR=0.43) and females (n=5371, CR=0.44), 'wounds and injuries' for both males (n=4472, CR=0.35) and females (n=4238, CR=0.35) and 'skin/hair/nails' for males (n=4025, CR=0.32) and females (n=3906, CR=0.32).

#### Symptom and outcome

Figure 1 presents all outcomes for all three age groups. The highest percentage of calls across all age groups given health information and/or self-care advice, suggesting a combined 47% of all calls for children on behalf of <1, 48.7% of calls on behalf of children 1-3 and 43.9% of all calls made by or

on behalf of children aged 4-15 were managed with no onward referral was needed. For children aged 1 <only 7% of calls were forwarded to Accident and Emergency, which was markedly higher for children aged 1-3 (12.3%) and for children aged 4-15 (13.5%). However, for GP outcomes (urgent/same day/routine) this was higher for children aged <1 (30%) compared to children aged 1-3 (24.5%) and 4-15 (23.5%).

#### FIGURE 1

For each symptom cross tabulation was completed to determine the standardised adjusted residuals (ASR) between groups for outcome (Table 32). (Table 2). (Dental' and 'mental health' were excluded due to the small number of cases. Chi square analysis confirmed that there was a significant interaction between symptom\*outcome for both males ( $X^2$ = 7141.77, df=1,20, p<.001) and females ( $X^2$ = 6331,57, df=1,20, p<.001). However, as there was little variation this was reported for both genders combined for all ages ( $X^2$ = 13209,13, df=1,20, p<.001).

The symptoms which contributed to the highest <u>number for</u> urgency was 'respiratory tract' (n=840, 5.1%, ASR=32.7) and 'neurological disorders' (n=51, 8.4%, ASR=12.1) with the highest <u>number of</u> outcomes being 999. There were a range of symptoms which required the highest <u>number for</u> GP referral outcome. These symptoms included 'crying' (n=5473, 16.5%, ASR=84.8) and 'pain' where the highest outcome was GP urgent (n=1536, 12%, ASR=28.9). Both 'sensation disorders' (n=1339, 23.4%, ASR=26) and 'lumps' (n=424, 33.6%, ASR=23.2) showed GP routine as the highest outcome. Finally, 'urogenital disorders' (n=935, 31.3%, ASR=25.6), 'body temperature change' (n=4913, 23%, ASR=35.3), and 'digestive problems' (n=2938, 19.3%, ASR16.0) all had the highest outcome of GP same day.

NHS Direct supported a wide range of callers to self-manage their symptoms; the health information was the highest recorded outcome for these calls. These symptoms included 'poisoning and overdose' (low risk unintentional overdose with low toxic substance) where highest number for outcome was

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self-care (n=5458, 56.6%, ASR=42.4%) and health information (n=1930, 20%, ASR=23.4). This was similar for 'skin/hair/nail' where the highest number for outcome was also self-care (n=12,526, 43.2%, ASR=25.9) and health information (n=4859, 16.7%, ASR=24.3). 'Medicine enquiries' showed the highest number for outcome was self-care (n=1852, 62.6%, ASR=29.9) as did 'wounds and injuries' (n=7928, 38.7%, ASR=7.5). For 'colds and flu/Sickness' the majority-number for outcome of the outcome was for health information (n=4156, 16.9%, ASR=22.7).

### Time and date of call

There was a significant interaction between age and date of call i.e. whether the call was a bank holiday or a weekend compared to a normal working day ( $X^2$ =14.83, df=2.1, p<.001). From the total number of calls (N=342,641), 59.7% (N=20,671) were made on a weekday with the remaining 40.3% (N=137,970) of calls taken at a weekend or bank holiday during GP closure days, this finding remaining consistent across the three age groups. To identify which cell differences contribute to the chi square test results standardized adjusted residuals were calculated for each of the cells. It was found that for calls taken during weekdays represented the highest number of calls were-made on behalf of children aged <1 (n=55271, 27%, ASR=2.8), however, for calls during weekends and bank holidays the largest number of calls were made on behalf of 1-3 years (n=52694, 8.2%, ASR=3.7).

Chi square analysis highlighted a significant interaction by age\*time of day ( $X^2=13209.13$ , df, 20, 1, p<.001). From the total number of calls (N=342,641) 11.9% (N=40817) of calls were made during 11pm – 7am, 36.1% (N=123,677) were made during 7am -3pm with the highest amount of callscall rate made within the hours 3pm-11pm (52%: N=178147), with this finding remaining consistent across the three age groups (Figure 2).

#### FIGURE 2

To identify which cell differences contribute to the chi square test results standardized adjusted residuals were calculated for each of the cells. Findings highlighted that there were clear age and time

differences, whereby for the time period 11pm-7am, the highest amount of calls were made on behalf of children aged 1-3 (N=15711, 38.5%, ASR=3). However, for the time period 7am - 3pm the highest calls were on behalf of children aged <1 (N=43352, 27.8%, ASR=9.4), with the highest amount of calls made by or on behalf of children aged 4-15 for the time period 3pm-11pm (N=64726, 36.3%, ASR=12.6).

### Main findings of this study

There has been <u>much</u> controversy to thesurrounding the extent that NHS Direct has managed to relieve the pressure of overstretched healthcare services conditions through the provision of telephone based care, with statistics highlighting that emergency admission rates still remain high, particularly for short term conditions[8]. However, NHS Direct survey data shows that they area salleviating A&E and GP services, with 41% of respondents being advised to treat themselves at home with 11% to A&E and 28% to a GP, whereby it was reported that if these individuals did not phone, 44% would have gone to their GP with 29% to A&E[18]. Therefore, this research engages with this debate, providing a current understanding of how children use NHS Direct in particular what symptoms they present and how these are managed.

Highest call rates to NHS Direct for children aged <1 was for 'crying' with this group using the service mostly between 7am -3pm. It is important to note that NHS Direct advisors use the Crying symptom classification for all for all children under 3 months old and is used as a catch all algorithm for safety for children <1 which would have influenced this finding. However, this finding remains consistent with emergency admissions with 'crying' contributing as a main symptom which newborn's present at emergency departments nationally [19]. Whilst excessive crying has been viewed as a normal developmental phenomenon in babies[20] there is little agreement to the treatment or prevalence[21]. Smith (2009) suggests that parents of persistently crying babies need instant reassurance and support to cope whereby health visitors have been viewed as best placed offer this support [21]. However, nurses at NHS Direct have also been well placed to use their clinical judgement in decision-making instantly reassuring parents to help them cope [22] where telephone based health services may be best suited to provide mainly parents with more knowledge and information.

As supported by internal audits T the highest outcome of calls –across all age groups was health information and/or self-care advice, with statistics suggesting around 40-50% of all calls made by or on behalf of children aged 0-15 were managed with no onward referral needed\_which supports previous audits [18]. High call rates were particularly high for symptoms relating to 'skin/hair/nails' and 'colds/flu/sickness' for all age groups, whereby, NHS Direct were able to support patients to selfmanage and provide health information these symptoms for 59.7% and 51.4% of all cases respectively. This suggests that NHS Direct are able to support more callers at home than previous reported[18], with only 7% of calls on behalf of children aged 1< advised to attend A&E and less children aged 1-3 and 4-15 advised to attend to see a GP.

The symptoms which contributed to the highest urgency were 'respiratory tract' and 'neurological disorder' with the highest outcomes being 999. Respiratory tract infections, are the most frequent acute problems contributing around 25% of patients who consult within primary care[23, 24] and around 40% of admissions to emergency services[8]. However, NHS Direct have shown to safely support 38.4% of all children with this symptom through the provision of telephone based self-care support and health information. Research has highlighted this to be an effective way of management [25-27] where medical information has proven successful in not only supporting children with respiratory tract infections, but ultimately leading to important reductions in antibiotic prescribing and reduced intention to consult without reducing satisfaction with care[28].

An interesting finding was that NHS Direct were able to successfully manage around 60% and 20% of calls relating to 'poisoning and overdose' characterised as low risk unintentional overdose with low toxic substances through the provision of self-care and health information respectively. With ingestion of harmful substances being the most common causes of injury, and subsequently a common reason for referral to A&E, this finding highlights that NHS Direct and essentially telephone based Comment [ejc22]: Reviewer 2 Co

> health care can safely support parents and caregivers to appropriately and safely manage the child's symptoms within their own home [29].

There were time differences noted, for example calls on behalf of children aged 1-3 were highest throughout the night 11pm -7pm. However, for children aged <1, calls peaked during the hours of 7am-3pm, this may suggest that NHS Direct is able to provide parents with instant reassurance of how to support a wide range of symptoms with the possibility of avoiding unnecessary GP visits. For children aged 4-15 call rates were found highest during the times of 3pm-11pm where they had higher reporting of symptoms relating to 'wounds and injuries'. This may be a reflection of when school finishes, whereby NHS Direct were able to support 50% of all children through the provision of selfcare support and health information. However, this finding could highlight a gap of knowledge to how parents of children can be best supported to look after children following school in relation to the provision of health information to help manage symptoms more effectively.

# LIMITATIONS

This research focused on patient (child subject of the call) data rather than caller caller (usually the parent/caregiver) data which does not provide useful information relating to the characteristics of the caller, whereby there is evidence that use of this service is dependent on the socio-demographic characteristics of the caller[10, 30-32]. Furthermore, whilst previous research has suggested that there is an upward trend of access associated with deprivation [30]. However, this finding is not consistent across age, whereby deprivation is shown to be related to lower usage for or on behalf of children (<15)[9, 12]. Therefore, it would be useful to explore the role of deprivation on the utilisation of this service in this cohort' which hopefully clarifies the point being made.

Although this study used a large sample of call data from 358,503 342,641 child-patients there were 100,390-a number of cases managed and closed by front-end advisors therefore (N=100,390) which

were removed from analysis for symptom classifications. Nonetheless, following pre-checking the remaining -and it is felt that the remaining calls used within the analysis meet the requirements of the research questionaim. This study focused on Whilst this study analysed four 'one month' periods across a year period, whilst it would have been more robust to have captured a full year sample, it was felt that the data would have been excessive with the four months felt to still remain representative of the population uptake in England. There are no national studies to compare this to, however, previous studies that have used a year sample have only had data on that population e.g. older people [16] or have focused on a specific geographic area [12, 31]. Over the four month periods there could have been seasonality differences, of which to capture seasonality this may have caused some bias towards some symptoms recorded and it would have been interesting to have explored seasonality differences for this cohort. Nonetheless, whilst telephone based healthcare systems such as NHS Direct has the potential for informing public health regarding the epidemiology of communicable diseases for common viruses such as influenza, norovirus [33-36] in the community this research provides an overview of how these symptoms are managed and the representiveness of this data.

explore differences

# [33-36]

## CONCLUSION

This is the first study to examine the symptoms and outcome of calls made to NHS Direct for and on behalf of young children. It has highlighted that NHS Direct has supported a wide range of symptoms through the provision of health information and self-care support and provides important data relating

to symptoms outcome and time of call. Moreover, it highlights the increasing role of telephone based healthcare in England and how the use of technology can provide instant support and reassurance to parents through the provision of clinical knowledge and information to empower them to support many symptoms. -As the new 111 telephone based service is rolled out nationally research should now focus on how this new service can further support the health of younger population groups and the impact this has on demand for other health services. which will provide useful to plan and develop services to meet the needs of parents and their young children

# Contributors

All authors contributed of the study conception/design. EC, AG, GR, SL contributed to the data collection. EC, AG, <u>AC</u>, DP, SL conducted the data analysis, critically revised the article and reviewed the draft of the article.

# Funding

This research was jointly funded by NHS Direct and the University of Bedfordshire.

# **Competing interests**

None

# Data sharing statement

There is no additional data available

# Ethics

A favourable ethical opinion was obtained from the University of Bedfordshire and Essex 1 Research Ethics Committee (REF: 10/H0301/29). Research governance approval was granted by NHS Direct prior to the study commencing. Comment [ejc28]: Reviewer 2: Comment [sicuston and this paragraph now aims to reflect the discussion more

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## Table 1: Definitions of outcome

Self-careAdvice given on how to look after the problemGP urgentSeek urgent appointment with GPGP Same daySeek appointment with GP on the same dayGP routineSeek next available appointment with GP
GP urgentSeek urgent appointment with GPGP Same daySeek appointment with GP on the same dayGP routineSeek next available appointment with GP
GP Same daySeek appointment with GP on the same dayGP routineSeek next available appointment with GP
<b>GP routine</b> Seek next available appointment with GP
Health/medication Either information given over telephone or leaflets posted
A&E Advised to attend accident and emergency appointment
Call directed to 999
Community Referred to community service (includes pharmacy, mental health services, social services, and community nursing
Dental Referred to a dental service
Walk-in-centre Advised to attend a local walk-in-centre
Other Aborted calls, no action required and also where the agency referred to is not specified

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Table 2 Volum	ne and rat	e of calls	per <u>100</u>	p <u>opulati</u>	on <mark>erson</mark>	per ann	um <u>(CR)</u> a	accordin	ng to age g	roup an	d <u>sympto</u>	om classi	fication <del>a</del>	<del>gorithm</del>	group			<b>Comment [ejc29]:</b> Reviewer 2: Comment 54 Included per person per 100 population
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Symptom classification	<	-1	1	-3	4-	15	Total		<1		1-3		4-15		Total		Ù	Formatted: Font: Bold
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	Ν	CR	N	CR	N	CR	<u>N</u>	CR	N	CR	<u>N</u>	CR	N	CR	N	CR		Comment [ejc30]: Reviewer 1 Comment 11:
Pain	220	0.21	1034	0.34	5415	0.43	6669	0.40	180	0.18	777	0.27	5371	0.44	6328	0.40		This row has now been added to show N & CR to
Digestive problems	3976	3.75	2624	0.86	1352	0.11	7952	0.48	3637	3.58	2574	0.89	1195	0.10	7406	0.46		make it easier to read
Respiratory tract	2908	2.74	3501	1.15	2152	0.17	8561	0.51	2592	2.55	3143	1.09	2043	0.17	7778	0.49		
Wounds & Injuries	1996	1.88	4253	1.40	4472	0.35	10721	0.64	1894	1.87	3835	1.33	4238	0.35	9967	0.62		
Sensation disorders	478	0.45	1147	0.38	1233	0.10	2858	0.17	481	0.47	1123	0.39	1290	0.11	2894	0.18		
Urogenital disorders	165	0.16	430	0.14	722	0.06	1317	0.08	58	0.06	627	0.22	995	0.08	1680	0.11		
Medicine enquiries	401	0.38	446	0.15	634	0.05	14881	0.09	360	0.35	433	0.15	691	0.06	1484	0.09		
Dental problems	129	0.12	692	0.23	3098	0.25	3919	0.23	94	0.09	617	0.21	2892	0.24	3603	0.23		
Poisoning and overdose	686	0.65	2960	0.98	1245	0.10	4891	0.29	678	0.67	2883	1.00	1182	0.10	4743	0.30		
3Skin/Hair/Nail	3887	3.66	6853	2.26	4026	0.32	14766	0.88	3864	3.81	6531	2.26	3906	0.32	14301	0.90		
4Body temperature change	3238	3.04	6378	2.10	1276	0.10	10882	0.65	2923	2.88	6323	2.19	1243	0.10	10489	0.66		
5Lumps	170	0.16	221	0.07	238	0.02	629	0.04	178	0.18	231	0.08	228	0.02	637	0.04		
6Neurological disorders	40	0.04	98	0.03	150	0.01	288	0.02	35	0.03	86	0.03	200	0.02	321	0.02		
Colds/Flu/Sickness	3765	3.55	5045	1.66	3622	0.29	12432	0.74	3861	3.63	4972	1.72	3614	0.30	12267	0.77		
Crying	14440	13.61	2524	0.83	166	0.01	17130	1.02	13654	13.46	2346	0.81	158	0.01	16163	1.01		
Other	747	0.70	13448	4.43	12785	1.01	26980	1.61	740	0.73	12653	4.38	13139	1.09	26057	1.63		
Total	37236	35.09	51654	17.01	42612	3.37	131502	7.86	35054	34.55	49154	17.00	42385	3.52	126593	7.94		
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 Table 3: Percentage and number of cases of outcome by symptom

Comment [ejc31]: Reviewer 2 Comment 26: Total line added and also Y axis labels provided for Figures 1&2

**Comment [ejc32]:** Reviewer1 Comment 11: An extra row has been added to provide headings for N and % and all % signs within the table have been removed

I																								25	Figures 1&2
																	<b>Comment [ejc3</b> extra row has been and % and all % si removed								
Symptom	999		A&E		Dental		Health Information		Self-care		Other		GP routine		GP same		GP urgent		Community		Walk in centre		Total		
	Ν	%	Ν	%	N	%	N	%	N	%	Ν	%	N	%	N	%	N	%	N	%	N	%	N	%	
Pain	295	2.3	926	7.1	9	.1	1257	9.7	3356	25.9	484	3.7	1901	14.6	2722	21.0	1563	12.0	160	1.2	305	2.4	12978	100	-
Digestive Problems	36	.2	381	2.5	1	.0	2419	15.8	4800	31.5	810	5.3	2539	16.6	2938	19.3	1081	7.1	106	.7	151	1.0	15262	100	-
Respiratory Tract Problems	840	5.1	1146	7.0	0	.0	1961	12.0	4305	26.4	462	2.8	1961	12.0	3286	20.1	1903	11.7	199	1.2	260	1.6	16323	100	
Wounds and Injuries	381	1.9	5477	26.7	39	.2	2322	11.3	7928	38.7	787	3.8	1066	5.2	1053	5.1	246	1.2	308	1.5	881	4.3	20488	100	-
Sensation Disorders	17	3	208	3.6	6	.1	709	12.4	1465	25.6	448	7.8	1339	23.4	912	15.9	128	2.2	217	3.8	282	4.9	5731	100	-
Urogenital Disorders	4	.1	69	2.3	0	.0	92	3.1	261	8.7	238	8.0	770	25.8	935	31.3	367	12.3	84	2.8	167	5.6	2987	100	-
Medicine Enquiries	0	.0	10	.3	11	.4	629	21.3	1852	62.6	61	2.1	62	2.1	108	3.6	82	2.8	144	4.9	1	.0	2960	100	
Poisoning and Overdose	152	1.6	1694	17.6	2	.0	1930	20.0	5458	56.6	189	2.0	53	.6	88	.9	46	.5	11	.1	12	.1	9635	100	-
Skin/Hair/Nail	376	1.3	1053	3.6	28	.1	4859	16.7	12526	5 43.2	499	1.7	2610	9.0	4073	14.0	1010	3.5	1222	4.2	768	2.6	29024	100	-
Body temp change	553	2.6	1006	4.7	6	.0	2667	12.5	6847	32.1	321	1.5	2756	12.9	4913	23.0	1848	8.7	138	.6	306	1.4	21361	100	-
Lumps	0	.0	48	3.8	0	.0	95	7.5	264	20.9	170	13.5	424	33.6	129	10.2	17	1.3	36	2.9	80	6.3	1263	100	-
Neurological disorders	51	8.4	94	15.4	0	.0	26	4.3	65	10.7	22	3.6	96	15.8	168	27.6	79	13.0	0	.0	8	1.3	609	100	
Colds and Flu/ Sickness	223	.9	1651	6.7	5	.0	4156	16.9	8497	34.5	504	2.0	3335	13.5	4827	19.6	974	4.0	173	.7	309	1.3	24654	100	
Crying	1159	3.5	2810	8.5	7	.0	2164	6.5	6671	20.2	1344	4.1	3722	11.2	8489	25.7	5473	16.5	676	2.0	578	1.7	33093	100	
Total (N)	4087		16573		<u>114</u>		25286		64295	5	<u>6339</u>		22634	l	34641		<u>14817</u>		3474		<u>4108</u>		<u>196368</u>	+	Formatted: Left

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Figure 1: Outcome of triage for each age group (<1, 1-3, 4-15)



Figure 2: Distribution of calls by age groups across three time periods

142x90mm (300 x 300 DPI) 

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