

BMJ Open Examining the role of Scotland's telephone advice service (NHS 24) for managing health in the community: analysis of routinely collected NHS 24 data

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ABSTRACT

Objectives: To examine the type, duration and outcome of the symptoms and health problems Scotland's nurse-led telephone advice service (NHS 24) is contacted about and explore whether these vary by time of contact and patient characteristics.

Design: Analysis of routinely collected NHS 24 data.

Setting: Scotland, UK.

Participants: Users of NHS 24 during 2011.

Main outcome measures: Proportion of the type, duration and outcome of the symptoms and health problems NHS 24 is contacted about.

Results: 82.6% of the calls were made out-of-hours and 17.4% in-hours. Abdominal problems accounted for the largest proportion of calls (12.2%) followed by dental (6.8%) and rash/skin problems (6.0%). There were differences in the type of problems presented in-hours and out-of-hours. Most problems (62.9%) had lasted <24 h before people contacted NHS 24. Out-of-hours calls tended to be for problems of shorter duration. Problems reported out-of-hours most commonly resulted in advice to visit an out-of-hours centre and in-hours advice to contact a general practitioner. Most of the service users were female and from more affluent areas. Use of the service declined with age in those over 35 years. The characteristics of users varied according to when NHS 24 was contacted. The number of calls made by an individual in the year ranged from 1 to 866, although most users (69.2%) made only one call. The type of problem presented varied by age and deprivation, but was broadly similar by gender, rural/urban status and geographic area. Call outcomes also varied by user characteristics.

Conclusions: This is the first study to examine how the public uses NHS 24. It has identified the patterns of problems which the service must be equipped to deal with. It has also provided important information about who uses the service and when. This information will help future planning and development of the service.

Strengths and limitations of this study

- The first study to explore how NHS 24 is used to manage symptoms or health problems.
- Most comprehensive study of NHS 24 to date with analysis of all NHS 24 activity data for the whole of Scotland for a full year.
- Validity checks undertaken to show the data were fit for answering the research questions.
- Sixteen per cent of data were excluded from analyses due to missing data, mainly due to calls that required simple advice and did not result in an algorithm being launched.

INTRODUCTION

Although many symptom episodes and health problems are managed in the community without seeking medical advice or care, symptoms such as cough, headache and fatigue remain common reasons for health-care utilisation.^{1 2} In the UK, general practitioners (GPs) have traditionally been the first point of contact for those seeking medical care or advice. However, in recent years, there have been a number of changes in the organisation of primary care, resulting in the introduction of new services including nurse-led telephone advice lines.

In Scotland, a new nurse-led telephone advice service, NHS 24, was announced in 2000 in the Scottish Executive White Paper, *Our National Health. A plan for action, a plan for change*.³ The service went live in 2002, with a national remit to 'provide an accessible, high-quality, consistent and sensitive healthcare service to the people of Scotland'.⁴ The service consists of a network of contact centres accessible through a single telephone number and is available 24 h a

day, 7 days a week. While NHS 24 has undergone several changes since its inception (due to its integration in different areas, changes in the General Medical Services contract, changes in the design of the service and a change in the phone number), it still provides the three core activities originally outlined in its blueprint.⁵ (A) telephone consultation aided and enhanced by evidence-based and professionally agreed clinical algorithms; (B) referral, where appropriate, to a range of integrated services (such as A&E, GPs, pharmacists, dentists and mental health practitioners) and advice about self-care to enable people to look after themselves and their families at home; and (C) health information.

There has been a steady increase in demand for NHS 24,⁶ with almost 1.5 million calls a year being received by 2012/2013.⁷ Telephone consultation services such as NHS 24 have great potential to help manage symptoms and health problems in the community (either through information and advice on appropriate self-care or through referral to appropriate clinical services), and to reduce demands on other NHS services if used optimally.⁸ While NHS 24 has undergone an independent evaluation examining its activity and performance,⁶ and a small number of studies have investigated specific components of the service,^{9–11} to date no research has examined how the public is using NHS 24 to manage their symptoms and health problems. Identifying the patterns of symptoms and health problems presented to NHS 24 will highlight the range of issues which the service must be equipped to deal with, and the associated experience and skills which NHS 24 staff need to have to successfully handle calls. It will also help to determine whether the service is being used as policymakers intended, that is, to deal with immediate and unexpected health problems and indicate whether the service could be optimised to better manage demands for healthcare, for example, through changes in staffing structures, service reconfiguration or examining ways to improve access.

The aim of this paper was to explore how the public is using NHS 24 to manage their symptoms and health problems. The paper describes findings from an analysis of routine NHS 24 call data. We examined the type, duration and outcome of symptoms and health problems NHS 24 is contacted about and explored whether these varied according to time of contact (in-hours or out-of-hours) and patient characteristics (sex, age, deprivation, etc). We also examined how often individuals used the service to determine whether there is a core group of frequent users.

METHODS

Data extraction from NHS 24

Under a data sharing agreement, NHS 24 activity data and associated patient characteristics from the NHS 24 Patient Relational Management system for January 2011 to December 2011 inclusive were supplied to the University of Aberdeen Data Management Team (DMT). Prior to full extraction, a 1-week sample of anonymised

data was extracted and examined to identify any issues with the extraction process. Discrepancies were resolved before the full data extraction was run. Data extracted from the NHS 24 system included: NHS 24 ID references (call ID and caller ID); date of the call; time of the call; in-hours or out-of-hours status; call reason (free-text field recording the health problem); primary algorithm launched (eg, abdominal pain algorithm, vomiting algorithm); call outcome (eg, referred to A&E, referred to GP, self-care advice); and patient demographics (eg, sex, age and geographical location). Since the purpose of the study was to examine the symptoms and health problems NHS 24 was contacted about, generic information calls to the service (eg, about surgery opening times) were not included in the data set. The DMT undertook data cleaning, matching of repeat callers (based on NHS 24 identifiers), assignment of new unique study identifiers to each user and anonymisation of the data. Postcodes were used to assign each patient a deprivation decile (based on the Scottish Index of Multiple Deprivation, SIMD 2009)¹² and an urban/rural status (based on the 6-fold Urban Rural Classification 2007–2008)¹³ before the postcode was removed from the data set during the anonymisation process. Two data sets were created. The ‘call data set’ consisted of rows representing each call to NHS 24. This data set allowed us to examine all of the calls made across the year in terms of type of symptom, duration of symptom and outcome of call for all in-hours and out-of-hours calls. An individual provided multiple rows for the ‘call data set’ if they had used NHS 24 on more than one occasion. This data set could not be used to examine demographics of the users of the service as some people appeared multiple times and the data were not mutually exclusive. The ‘user data set’ consisted of rows representing each unique user of NHS 24, that is, the person requiring advice from NHS 24, not necessarily the caller. This data set allowed us to examine the characteristics of NHS 24 users in terms of sex, age, deprivation, etc. The two anonymised data sets were then forwarded to the research team for analysis. The Grampian Research Ethics Committee confirmed that ethical approval was not required for the study since no new patient information was being collected, the data being analysed were fully anonymised and a data sharing agreement with NHS 24 had been established.

Ascertaining symptom and health problem information

The symptoms and problems NHS 24 is contacted about are not coded within its computer system. This information was therefore ascertained through the primary algorithm launched by call handlers at the time of first contact. As there were over 500 different algorithms launched, algorithms were grouped together for analyses. A number of approaches to grouping the algorithms were explored. Our final groupings were based on independent advice and then consensus from three clinicians which grouped the algorithms into 70

problem categories. For example, the algorithms 'abdominal', 'abdominal cramps', 'abdominal pain', 'heartburn' and 'indigestion' were grouped together as a single category labelled 'abdominal'. Since the duration of the symptom or problem being called about is also not routinely collected by NHS 24, we coded information recorded in the call reason free-text field to identify symptom duration whenever available. Outcomes accounting for at least 0.5% of in-hours calls or out-of-hours calls were analysed separately resulting in 14 call outcome groups (999 contacted for patient, patient sent to A&E via ambulance, patient advised to go to A&E, patient advised to visit out-of-hours centre, home visit to patient by doctor, patient advised to contact own GP practice, doctor to phone patient, patient advised to contact dentist, patient advised to contact pharmacist, patient advised to contact other health professional, service clinician to phone patient, nurse to phone patient, patient given self-care advice, information provided). Outcomes accounting for less than 0.5% of calls were grouped together under 'other'.

Validity checks

To determine if the information recorded on the NHS 24 database was an accurate representation of the symptoms or health problems people called about, two data validity checks were undertaken. In the first validity check (call listening), a random sample of 50 anonymised calls were listened to at the Aberdeen NHS 24 call centre by two members of the research team (AME and AM) who were blind to the information recorded in the NHS 24 database. Each researcher independently recorded details of the symptom information provided in the call and then identified what they believed to be the primary reason for the call and any secondary reason for the call. These data were then directly compared with the information recorded on the NHS 24 database and the proportion of mismatched data quantified. In the second validity check (free-text analysis), a random sample of free-text fields from 500 calls were directly compared with the initial algorithm launched by the call handlers to explore how well the algorithms launched reflected the actual problems reported by the user.

Analysis

Descriptive analyses were used to explore the type and duration of symptoms and health problems that NHS 24 was contacted about, as well as the range of call outcomes and how these varied by problem. We also investigated whether symptom patterns and outcomes varied between (1) in-hours (8:00 to 18:00 Monday to Friday) and out-of-hours (evenings, nights, weekends and all public, bank and local holidays) and (2) different patient groups. When looking at the data by patient group, data were aggregated so that an individual could contribute only once to each specific problem category, although they may contribute to a number of different problem categories. The denominator in each case was the

number of unique individuals who contacted NHS 24 for that problem during the study year. A priori we defined a frequent user as someone who used the service more than 24 times during the year. The χ^2 tests were used to determine if there were statistical differences between groups. Statistical analyses were carried out using SPSS and CI analysis. Owing to the large size of the data set, all proportions were found to be surrounded by very tight 95% CIs, and differences between proportions were all highly significant ($p < 0.001$), even when the proportions were very similar. For clarity of presentation, therefore, findings are reported as number and proportion only.

RESULTS

Validity checks

Call listening

The problem assigned to the call on the NHS 24 data set matched both of the independent reviewer's primary or secondary assessments of the problem in 80% of cases. Fourteen per cent of calls matched one of the reviewer's primary or secondary assessments and 6% did not directly match either reviewer's assessment of the call reason.

Free-text analysis

The primary algorithm launched reflected the problems reported by the callers in the free-text field in 100% of cases.

Call data set

During 2011, 1 342 010 calls were made to NHS 24 about a symptom or health problem. Of these, 1 285 038 had an NHS 24 identifier (which allowed matching of repeat users) and were included in the analyses. A total of 1 061 347 (82.6%) calls were made out-of-hours and 223 691 (17.4%) calls were made in-hours.

Problems presented to NHS 24

Problem categories could be assigned to 1 074 240 (83.6%) calls. The commonest 50 problems (table 1) accounted for 97.7% of all calls. Overall, abdominal problems accounted for the largest proportion of calls (12.2%), followed by dental (6.8%) and rash/skin (6.0%) problems. There were significant differences in the type of problems presented in-hours and out-of-hours. Out-of-hours, abdominal (13.2%), rash/skin (6.4%) and breathing (6.3%) problems were the most frequent reasons for contact, while in-hours, dental (37.2%), abdominal (6.9%) and medication (4.5%) problems were the most frequent reasons for contact.

Problem duration

We were able to assign a problem duration to 897 903 (69.9%) calls. Most problems (62.9%) had lasted <24 h before people contacted NHS 24 (table 2) with symptoms of a few hours (1–6 h) or a day (12–24 h) most common. Problems of short duration (≤ 1 h) were frequently related to medication issues, injuries/wounds and head-related problems, while those of long duration

Table 1 The commonest 50 problems presented to NHS 24 (out-of-hours, in-hours and total calls)

Problem category	Out-of-hours calls		In-hours calls		Total calls	
	n	Per cent	n	Per cent	n	Per cent
Abdominal	115 975	13.2	12 057	6.9	128 032	12.2
Dental	6276	0.7	64 642	37.2	70 918	6.8
Rash/skin	56 458	6.4	6191	3.6	62 649	6.0
Breathing	55 484	6.3	3828	2.2	59 312	5.7
Genitourinary	54 012	6.2	3117	1.8	57 129	5.4
Chest pain	42 886	4.9	5375	3.1	48 261	4.6
Medication	36 392	4.2	7804	4.5	44 196	4.2
Vomiting/nausea	31 636	3.6	3039	1.7	34 675	3.3
Ear	29 662	3.4	2368	1.4	32 030	3.1
Throat	28 724	3.3	2328	1.3	31 052	3.0
Headache	26 947	3.1	3250	1.9	30 197	2.9
Back	25 182	2.9	3423	2.0	28 605	2.7
Mental health	24 504	2.8	3753	2.2	28 257	2.7
Cough	25 743	2.9	2060	1.2	27 803	2.6
Eye	20 355	2.3	2786	1.6	23 141	2.2
Pregnancy related	18 977	2.2	3041	1.7	22 018	2.1
Legs	19 496	2.2	2465	1.4	21 961	2.1
Fever	19 754	2.3	1671	1.0	21 425	2.0
Injury/wound	18 355	2.1	2298	1.3	20 653	2.0
Head related	14 892	1.7	2610	1.5	17 502	1.7
Feet	13 605	1.6	2489	1.4	16 094	1.5
Hand	11 471	1.3	2275	1.3	13 746	1.3
Baby/infant	12 007	1.4	1228	0.7	13 235	1.3
Vaginal	11 069	1.3	2040	1.2	13 109	1.2
Dizziness	11 275	1.3	1531	0.9	12 806	1.2
Face	7684	0.9	3054	1.8	10 738	1.0
Diarrhoea	9515	1.1	1175	0.7	10 690	1.0
Constipation	8107	0.9	1080	0.6	9187	0.9
Neck	7121	0.8	1056	0.6	8177	0.8
Knee	6847	0.8	1301	0.7	8148	0.8
Lumps	6897	0.8	1131	0.7	8028	0.8
Male genitalia	6838	0.8	1004	0.6	7842	0.7
Rectal/anal	7033	0.8	794	0.5	7827	0.7
Hip	6955	0.8	843	0.5	7798	0.7
Arms	6734	0.8	946	0.5	7680	0.7
Shoulder	6804	0.8	963	0.6	7767	0.7
Weakness	6843	0.8	775	0.4	7618	0.7
Confusion	7098	0.8	477	0.3	7575	0.7
Bites/stings	6370	0.7	1032	0.6	7402	0.7
Nose	6360	0.7	983	0.6	7343	0.7
Ankle	5448	0.6	1180	0.7	6628	0.6
Ingestion/inhalation	4309	0.5	1581	0.9	5890	0.6
Mouth	3080	0.4	2393	1.4	5473	0.5
Fainting	4699	0.5	708	0.4	5407	0.5
Diabetes	4609	0.5	321	0.2	4930	0.5
Burns	3812	0.4	621	0.4	4433	0.4
Death	3957	0.5	67	0.1	4024	0.4
Falls	3124	0.4	546	0.3	3670	0.3
Palpitations	2904	0.3	320	0.2	3224	0.3
Bleeding	1310	0.1	1827	1.1	3137	0.3
Total	875 595	100	173 847	100	1 049 442	100

(>4 weeks) were commonly pregnancy-related problems. There was a significant difference in the problem duration between in-hours and out-of-hours calls with out-of-hours calls tending to be for problems of a shorter duration than in-hours calls.

Call outcome

Out-of-hours calls most commonly resulted in: advice to visit an out-of-hours centre (in 34.1% of cases), a home visit by a doctor (12.2%) or provision of self-care advice (10.2%; table 3). In comparison, in-hours calls most

Table 2 Frequency of problem duration (out-of-hours, in-hours and total calls)

Problem duration	Out-of-hours calls		In-hours calls		Total calls	
	n	Per cent	n	Per cent	n	Per cent
≤15 min	62 137	8.2	10 413	7.4	72 550	8.1
>15–30 min	50 967	6.7	7515	5.4	58 482	6.5
>30–60 min	56 688	7.5	7628	5.4	64 316	7.2
>1–6 h	131 223	17.3	16 541	11.8	147 764	16.5
>6–12 h	53 304	7.0	7814	5.6	61 118	6.8
>12–24 h	133 458	17.6	26 152	18.7	159 610	17.8
>1–2 days	93 283	12.3	21 267	15.2	114 550	12.8
>2–4 days	86 807	11.5	20 301	14.5	107 108	11.9
>4–7 days	54 509	7.2	12 884	9.2	67 393	7.5
>1–2 weeks	19 723	2.6	5163	3.7	24 886	2.8
>2–4 weeks	7192	0.9	1981	1.4	9173	1.0
>4 weeks	8500	1.1	2453	1.8	10 953	1.2
Total	757 791	100	140 112	100	897 903	100

commonly resulted in: advice to contact a dentist (in 27.6% of cases), a NHS 24 service clinician phoning the patient (21.1%) or advice to contact the patient's GP (19.2%). Outcomes were broadly similar for most of the symptoms and health problems examined. Exceptions to this were for dental problems, which resulted in advice to contact a dentist in 87.0% of in-hours calls and 43.1% of out-of-hours calls; problems with hands, which resulted in advice to go to A&E in 29.6% of in-hours calls and 29.5% of out-of-hours calls; head-related problems, which resulted in advice to go to A&E in 46.2% of in-hours calls and 38.8% of out-of-hours calls; and medication problems, which resulted in self-care advice or information in 28.6% of in-hours calls and 29.0% of out-of-hours calls.

User data set

There were 791 178 users of NHS 24 during 2011 (table 4). Most users were female (57.8%). Over half of the users were under 35 years of age, with use of the service declining in those aged 35 years and older. There was a higher proportion of users from more affluent areas than less affluent areas. Most callers lived in urban areas, and in central belt locations.

In-hours and out-of-hours use

The service was used out-of-hours by 682 622 people (86.3% of all users) and in-hours by 184 617 people (23.3% of all users; table 4), with 9.6% using the service during both periods. Compared with in-hours users, a significantly higher proportion of out-of-hours users

Table 3 Call outcomes (out-of-hours and in-hours)

Outcomes	Out-of-hours		In-hours	
	Number of calls	Per cent of calls	Number of calls	Per cent of calls
999 contacted for patient	73 117	6.9	5743	2.6
Patient sent to A&E via ambulance	7759	0.7	–	–
Patient advised to go to A&E	54 046	5.1	11 825	5.3
Patient advised to visit out-of-hours centre	361 918	34.1	–	–
Home visit to patient by doctor	129 306	12.2	–	–
Patient advised to contact own GP practice	88 850	8.4	42 876	19.2
Doctor to phone patient	74 809	7.0	–	–
Patient advised to contact dentist	–	–	61 803	27.6
Patient advised to contact pharmacist	23 988	2.3	4052	1.8
Patient advised to contact other HP*	7230	0.7	1648	0.7
Service clinician to phone patient	74 356	7.0	47 268	21.1
Nurse to phone patient	34 534	3.3	–	–
Patient given self-care advice	108 152	10.2	16 084	7.2
Information provided	–	–	20 418	9.1
Other†	23 282	2.2	11 974	5.4
Total	1 061 347	100	223 691	100

*Other HP (eg, midwife, dentist, optician, etc).

†Outcomes occurring in less than 0.5% of out-of-hours calls or less than 0.5% of in-hours calls were grouped together as 'other'. GP, general practitioner; HP, health professional; N, number.

Table 4 Total, out-of-hours and in-hours users by sociodemographic group

Sociodemographic group	Total users n=791 178		Out-of-hours users n=682 622		In-hours users n=184 617	
	n	Per cent	n	Per cent	n	Per cent
Gender						
Female	457 051	57.8	400 839	58.7	101 801	55.1
Male	334 127	42.2	281 783	41.3	82 816	44.9
Age category (years)						
0–1 (baby/infant)	37 299	4.7	35 302	5.2	6706	3.6
1–4 (toddler)	79 088	10.0	72 799	10.7	13 904	7.5
5–15 (child)	81 839	10.3	72 165	10.6	14 562	7.9
16–24 (young adult)	103 165	13.0	82 318	12.1	34 280	18.6
25–34	109 891	13.9	86 074	12.6	36 154	19.6
35–44	89 714	11.3	73 397	10.8	24 273	13.1
45–54	79 752	10.1	67 117	9.8	18 993	10.3
55–64	63 426	8.0	55 905	8.2	12 167	6.6
65–74	55 367	7.0	50 907	7.5	8904	4.8
75–84	56 732	7.2	53 352	7.8	9040	4.9
85–94	31 486	4.0	29 988	4.4	5179	2.8
95+	3412	0.4	3294	0.5	452	0.2
Deprivation decile*						
1 (most affluent)	95 754	12.3	82 398	12.1	24 066	13.0
2	90 891	11.7	78 288	11.5	22 450	12.2
3	87 296	11.2	75 037	11.0	21 479	11.6
4	83 574	10.7	72 016	10.5	19 882	10.8
5	77 443	9.9	66 878	9.8	17 929	9.7
6	72 015	9.2	62 417	9.1	16 115	8.7
7	71 186	9.1	61 837	9.1	15 421	8.4
8	73 268	9.4	63 814	9.3	15 558	8.4
9	66 704	8.6	57 900	8.5	14 200	7.7
10 (least affluent)	60 857	7.8	53 009	7.8	12 917	7.0
Urban/rural classification†						
Large urban areas (most urban)	319 321	41.0	271 895	39.8	80 520	43.6
Other urban areas	252 797	32.5	219 479	32.2	57 993	31.4
Accessible small towns	66 568	8.5	58 568	8.8	13 915	7.5
Remote small towns	23 214	3.0	20 785	3.0	4330	2.3
Accessible rural	81 885	10.5	71 559	10.5	16 932	9.2
Remote rural (most rural)	35 203	3.0	31 308	4.6	6327	3.4
Geographic location‡						
Ayrshire and Arran	61 120	7.7	53 438	7.8	13 208	7.2
Borders	13 377	1.7	11 335	1.7	3179	1.7
Dumfries and Galloway	20 453	2.6	17 931	2.6	4055	2.2
Fife	58 867	7.5	50 494	7.4	14 378	7.8
Forth Valley	47 760	6.0	40 943	6.0	11 770	6.4
Greater Glasgow and Clyde	196 123	24.8	166 864	24.4	48 024	26.0
Grampian	78 111	9.9	66 420	9.7	18 710	10.1
Highland	35 650	4.5	32 147	4.7	6375	3.5
Lanarkshire	89 582	11.3	77 353	11.3	21 001	11.4
Lothian	125 456	15.9	109 693	16.1	29 428	15.9
Orkney	2065	0.3	1868	0.3	335	0.2
Shetland	1997	0.3	1722	0.3	452	0.2
Tayside	56 611	7.2	49 434	7.2	12 310	6.7
Western Isles	2870	0.4	2615	0.4	443	0.2

Numbers do not always add up to 100% due to missing data in subgroups.

*Deprivation is based on the Scottish Index of Multiple Deprivation 2009.

†Urban/rural classification is based on the sixfold Urban Rural Classification 2007–2008.

‡Geographic location is based on the 14 Scottish health boards.

were female, younger or older, living in less affluent areas and living in remote and rural areas. Conversely, a significantly higher proportion of in-hours users were

males, those aged 16–44, those living in more affluent areas and those living in large urban areas than out-of-hours users.

Number of calls and frequent users

The total number of calls for each user ranged between 1 and 866, with most reporting 1 (69.2%) or 2 (18.5%) calls and only 2.0% having more than five calls in the year. Females, younger and older users, more affluent individuals, and those living in urban areas were significantly more likely to make more than one call. Some 568 (0.1%) users met our definition of a frequent user, and there was no clear pattern in the characteristics of these users.

Problems presented by user characteristics

There were few clear differences in the problems presented by females and males (although many of the differences in proportions were significant due to the large size of the data set). Abdominal problems, dental problems and rash/skin problems were the top three problems in both men and women. There were clear differences in the problems presented by each of the 12 different age groups, with rash/skin problems commonest in the under 5s, abdominal problems commonest in those aged 5–74 and breathing problems commonest in those aged 75 and over (table 5). The proportion of people using NHS 24 for injuries/wounds, leg and breathing problems significantly increased with age. Less affluent users tended to contact NHS 24 less often for most problems than more affluent users; exceptions were for genitourinary, throat problems, eye problems and fever (table 6). There were no clear differences in the problems presented by different urban/rural groups or people living in different geographical areas.

Out-of-hours outcomes by user characteristics

Advice to visit an out-of-hours centre was the commonest out-of-hours outcome for females and males, under 65s and all deprivation, urban/rural and geographic area groups. Males were significantly more likely than females to be sent to or advised to go to A&E (20.0% vs 16.9%), while females were significantly more likely than males to have a doctor visit or call them (23.3% vs 20.8%). Children (<16 years) were significantly more likely to receive self-care advice than adults (21.7% vs 11.6%). The proportion of patients advised to visit an out-of-hours centre decreased across each of the 12 age groups examined from 71.0% for 0–1 years to 1.9% for 95+ years. The proportion of patients being sent to A&E, having a home visit or having a nurse phone them all significantly increased across the 12 different age groups (from 5.6% to 20.8%, 1.5% to 69.0% and 0.1% to 10.3%, respectively). The proportion of patients being sent to or advised to go to A&E significantly increased with affluence (from 15.6% for deprivation decile 10 to 19.8% for deprivation decile 1).

In-hours outcomes by user characteristics

Advice to contact a dentist was the commonest in-hours outcome for both males and females. Those calling about infants (0–1 years) were most often advised to

contact the GP, those aged between 5 and 64 to contact a dentist, and all other age groups (1–4, 65–74, 75–84, 85–94 and 95+ years) to await a service clinician call. Children (<16 years) were significantly more likely to receive advice to go to A&E and receive self-care advice than adults (9.1% vs 5.6% and 14.6% vs 7.0%, respectively). Similarly, those aged 65+ were significantly more likely to have 999 contacted for them and significantly more likely to receive provision of information than other age groups (7.1% vs 2.4% and 20.1% vs 9.0%, respectively). The pattern of in-hours outcomes was similar across deprivation and urban/rural groups. Advice to contact a dentist was commonest in each of the geographic areas except Lothian, Highlands and Islands, where advice to contact own GP or await a service clinician call was most common.

DISCUSSION

Summary of main findings

People used NHS 24 for a wide range of problems, with abdominal problems most common, followed by dental and rash/skin problems. Problems presented differed according to whether the calls were made in-hours or out-of-hours. This was particularly true for dental problems which accounted for <1% of out-of-hours calls, but over a third of in-hours calls. Duration of problem varied depending on whether the call was made in-hours or out-of-hours. Problems reported out-of-hours most commonly resulted in advice to visit an out-of-hours centre and in-hours resulted in advice to contact a GP. Females, those aged 16–34 and those from more affluent areas were more likely to use the service than others. The sociodemographic characteristics of users varied according to when NHS 24 was contacted. Most users made only one call during the year. Types of problems presented varied by age and deprivation, but were broadly similar by gender, rural/urban status and geographic area. Call outcomes varied according to the characteristics of users.

Strengths and limitations of the study

No previous studies have examined the symptoms and outcomes presented to NHS 24. Previous studies exploring UK telephone advice services have either been based on specific age groups,^{14 15} examined specific geographical areas^{16 17} or have not had access to a full year of data.¹⁴ We had access to all NHS 24 activity data for the whole of Scotland for a full year. This is therefore the most comprehensive study of a UK telephone advice service to date and the first study to explore how NHS 24 is used by the general population to manage symptoms or health problems. As with all studies using secondary data, there are limitations in what we were able to examine due to the nature of the data collected and the fact that it was not collected for this purpose. We undertook two validity checks to assess whether the data were fit for answering our research questions. We found

Table 5 Commonest problems presented to NHS 24 by age group

Problem category	n	0–1 years n=36 962	1–4 years n=78 022	5–15 years n=80 398	16–24 years n=101 156	25–34 years n=107 550	35–44 years n=87 925	45–54 years n=78 203	55–64 years n=62 081	65–74 years n=54 217	75–84 years n=55 629	85–94 years n=30 890	95+ years n=3348
Abdominal	n	84	9690	13 911	16 586	15 355	11 746	10 640	8523	7387	6825	3232	265
	Per cent	0.2	12.4	17.3	16.4	14.3	13.4	13.6	13.7	13.6	12.3	10.5	7.9
Dental	n	150	1135	5116	13 094	14 807	10 160	7969	3858	1509	641	163	6
	Per cent	0.4	1.5	6.4	12.9	13.8	11.6	10.2	6.2	2.8	1.2	0.5	0.2
Rash/skin	n	8888	16 448	9062	5379	4655	3250	2750	1996	1388	1226	590	52
	Per cent	24.0	21.1	11.3	5.3	4.3	3.7	3.5	3.2	2.6	2.2	1.9	1.6
Breathing	n	1333	3827	3538	4823	4930	4950	5311	5255	5980	7022	3959	438
	Per cent	3.6	4.9	4.4	4.8	4.6	5.6	6.8	8.5	11.0	12.6	12.8	13.1
Genito-urinary	n	314	3285	2682	5528	4883	4089	4279	4241	4413	5268	3061	278
	Per cent	0.8	4.2	3.3	5.5	4.5	4.7	5.5	6.8	8.1	9.5	9.9	8.3
Chest pain	n	0	68	2105	13 154	12 719	2912	2849	2261	2040	2266	1159	91
	Per cent	0.0	0.1	2.6	13.0	11.8	3.3	3.6	3.6	3.8	4.1	3.8	2.7
Medication	n	895	2202	1873	3655	4510	4775	4459	3951	3919	4381	2456	221
	Per cent	2.4	2.8	2.3	3.6	4.2	5.4	5.7	6.4	7.2	7.9	8.0	6.6
Vomiting/nausea	n	5465	8264	2421	2497	2191	1466	1434	1519	1783	2329	1574	182
	Per cent	14.8	10.6	3.0	2.5	2.0	1.7	1.8	2.4	3.3	4.2	5.1	5.4
Ear	n	939	6863	6902	3617	3467	2702	2034	1103	531	321	147	9
	Per cent	2.5	8.8	8.6	3.6	3.2	3.1	2.6	1.8	1.0	0.6	0.5	0.3
Throat	n	217	2396	5548	6675	5494	3626	1965	1164	673	485	224	34
	Per cent	0.6	3.1	6.9	6.6	5.1	4.1	2.5	1.9	1.2	0.9	0.7	1.0
Headache	n	3	1165	4191	5012	5249	3944	3047	1770	1131	958	371	27
	Per cent	0.0	1.5	5.2	5.0	4.9	4.5	3.9	2.9	2.1	1.7	1.2	0.8
Back	n	1	76	574	3291	4475	4431	3948	2628	1938	2109	1253	112
	Per cent	0.0	0.1	0.7	3.3	4.2	5.0	5.0	4.2	3.6	3.8	4.1	3.3
Mental health	n	7	199	521	2493	2884	3089	2663	1608	1269	1646	1084	127
	Per cent	0.0	0.3	0.6	2.5	2.7	3.5	3.4	2.6	2.3	3.0	3.5	3.8
Cough	n	5879	7372	2752	1242	1569	1359	1313	1263	976	1010	638	111
	Per cent	15.9	9.4	3.4	1.2	1.5	1.5	1.7	2.0	1.8	1.8	2.1	3.3
Eye	n	1830	2739	2141	2688	3164	2586	2315	1798	1123	794	420	41
	Per cent	5.0	3.5	2.7	2.7	2.9	2.9	3.0	2.9	2.1	1.4	1.4	1.2
Pregnancy related	n	0	0	97	6850	7989	2208	72	1	0	0	0	0
	Per cent	0.0	0.0	0.1	6.8	7.4	2.5	0.1	0.0	0.0	0.0	0.0	0.0
Legs	n	52	525	754	1350	2075	2497	2636	2366	2302	2760	1953	249
	Per cent	0.1	0.7	0.9	1.3	1.9	2.8	3.4	3.8	4.2	5.0	6.3	7.4
Fever	n	3440	7349	2620	1073	1267	838	706	649	666	886	503	54
	Per cent	9.3	9.4	3.3	1.1	1.2	1.0	0.9	1.0	1.2	1.6	1.6	1.6
Injury/wound	n	294	853	1583	2476	2629	2228	1854	1652	1573	1823	1300	188
	Per cent	0.8	1.1	2.0	2.4	2.4	2.5	2.4	2.7	2.9	3.3	4.2	5.6
Head related	n	1369	3787	2727	1510	1195	855	783	623	731	1373	1426	207
	Per cent	3.7	4.9	3.4	1.5	1.1	1.0	1.0	1.0	1.3	2.5	4.6	6.2
Feet	n	145	747	1828	2016	2235	1861	1736	1519	1055	997	500	58
	Per cent	0.4	1.0	2.3	2.0	2.1	2.1	2.2	2.4	1.9	1.8	1.6	1.7
Hand	n	184	716	1660	2096	2027	1719	1425	1094	752	722	455	62
	Per cent	0.5	0.9	2.1	2.1	1.9	2.0	1.8	1.8	1.4	1.3	1.5	1.9
Baby/infant	n	8922	2108	0	42	243	142	0	0	1	0	0	0
	Per cent	24.1	2.7	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Vaginal	n	97	626	580	3427	2836	1692	1053	435	343	426	236	30
	Per cent	0.3	0.8	0.7	3.4	2.6	1.9	1.3	0.7	0.6	0.8	0.8	0.9
Dizziness	n	1	44	420	1349	1661	1424	1385	1442	1356	1764	916	65
	Per cent	0.0	0.1	0.5	1.3	1.5	1.6	1.8	2.3	2.5	3.2	3.0	1.9

Table 6 Commonest problems presented to NHS 24 by deprivation decile

Problem category		Most affluent n=94 060	2 n=89 309	3 n=85 817	4 n=82 083	5 n=76 073	6 n=70 632	7 n=69 845	8 n=71 868	9 n=65 430	Least affluent n=59 667
Abdominal	n	12 965	12 275	11 760	11 196	10 494	9330	9216	9373	8639	7637
	Per cent	13.8	13.7	13.7	13.6	13.8	13.2	13.2	13.0	13.2	12.8
Dental	n	7784	7705	7063	6474	5778	5215	4980	4760	4208	3225
	Per cent	8.3	8.6	8.2	7.9	7.6	7.4	7.1	6.6	6.4	5.4
Rash/skin	n	7361	6775	6052	5911	5277	4863	4630	5124	4648	4102
	Per cent	7.8	7.6	7.1	7.2	6.9	6.9	6.6	7.1	7.1	6.9
Breathing	n	6984	6471	6200	5820	4976	4500	4440	4300	3748	3356
	Per cent	7.4	7.2	7.2	7.1	6.5	6.4	6.4	6.0	5.7	5.6
Genitourinary	n	4396	4374	4485	4341	4205	3909	3983	4313	3917	3885
	Per cent	4.7	4.9	5.2	5.3	5.5	5.5	5.7	6.0	6.0	6.5
Chest pain	n	6277	5600	5149	4608	4010	3520	3331	3246	2809	2388
	Per cent	6.7	6.3	6.0	5.6	5.3	5.0	4.8	4.5	4.3	4.0
Medication	n	4846	4413	4387	3978	3723	3318	3178	3190	2882	2778
	Per cent	5.2	4.9	5.1	4.8	4.9	4.7	4.6	4.4	4.4	4.7
Vomiting/nausea	n	4159	3726	3453	3337	3075	2779	2582	2730	2555	2313
	Per cent	4.4	4.2	4.0	4.1	4.0	3.9	3.7	3.8	3.9	3.9
Ear	n	3526	3295	3078	2964	2616	2486	2581	2653	2612	2366
	Per cent	3.7	3.7	3.6	3.6	3.4	3.5	3.7	3.7	4.0	4.0
Throat	n	3291	3178	3168	2972	2674	2477	2411	2852	2583	2436
	Per cent	3.5	3.6	3.7	3.6	3.5	3.5	3.5	4.0	3.9	4.1
Headache	n	3570	3201	3062	2859	2606	2390	2379	2364	2141	1878
	Per cent	3.8	3.6	3.6	3.5	3.4	3.4	3.4	3.3	3.3	3.1
Back	n	3202	2963	2921	2730	2504	2202	2226	2175	1926	1674
	Per cent	3.4	3.3	3.4	3.3	3.3	3.1	3.2	3.0	2.9	2.8
Mental health	n	2726	2452	2181	1971	1714	1487	1360	1332	1077	972
	Per cent	2.9	2.7	2.5	2.4	2.3	2.1	1.9	1.9	1.6	1.6
Cough	n	3225	3030	2746	2655	2392	2246	2193	2384	2285	1965
	Per cent	3.4	3.4	3.2	3.2	3.1	3.2	3.1	3.3	3.5	3.3
Eye	n	2304	2265	2153	2140	2125	1992	2016	2164	2067	2062
	Per cent	2.4	2.5	2.5	2.6	2.8	2.8	2.9	3.0	3.2	3.5
Pregnancy related	n	2785	2255	2102	1857	1614	1364	1399	1375	1126	972
	Per cent	3.0	2.5	2.4	2.3	2.1	1.9	2.0	1.9	1.7	1.6
Legs	n	2434	2255	2150	2218	1942	1745	1776	1718	1612	1450
	Per cent	2.6	2.5	2.5	2.7	2.6	2.5	2.5	2.4	2.5	2.4
Fever	n	2333	2224	2105	2036	1934	1776	1807	1962	1816	1765
	Per cent	2.5	2.5	2.5	2.5	2.5	2.5	2.6	2.7	2.8	3.0
Injury/wound	n	1978	2021	1978	2037	1845	1792	1739	1676	1573	1556
	Per cent	2.1	2.3	2.3	2.5	2.4	2.5	2.5	2.3	2.4	2.6
Head related	n	1999	1846	1810	1703	1656	1515	1450	1594	1415	1326
	Per cent	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2	2.2	2.2

Continued



Table 6 Continued

Problem category	Most affluent		2		3		4		5		6		7		8		9		Least affluent	
	n	Per cent	n	Per cent	n	Per cent	n	Per cent	n	Per cent	n	Per cent	n	Per cent	n	Per cent	n	Per cent	n	Per cent
Feet	1709	1.8	1648	1.9	1598	1.9	1591	1.9	1544	2.0	1344	1.9	1296	1.9	1353	1.9	1223	1.9	1164	2.0
Hand	1440	1.5	1468	1.6	1364	1.6	1352	1.6	1328	1.7	1221	1.7	1157	1.7	1195	1.7	1121	1.7	1058	1.8
Baby/infant	1530	1.6	1389	1.6	1234	1.4	1182	1.4	1097	1.4	952	1.3	971	1.4	1102	1.5	944	1.4	839	1.4
Vaginal	1704	1.8	1438	1.6	1359	1.6	1248	1.5	1107	1.5	1038	1.5	984	1.4	992	1.4	854	1.3	871	1.5
Dizziness	1374	1.5	1303	1.5	1319	1.5	1305	1.6	1236	1.6	1021	1.4	1090	1.6	1059	1.5	996	1.5	961	1.6

100% match in the free-text analysis and 94% match in the call listening analysis. This indicated that we could use, with a high degree of certainty, the primary algorithms launched by the call handlers to examine the symptoms and health problems people present to NHS 24. The algorithms could have been categorised in a number of different ways. Our approach grouped the algorithms together in the way that was most meaningful for the data we had and was based on independent advice and then consensus from three clinicians. Our approach means that symptoms are not categorised in the same way as some other studies have used, making direct comparison between studies difficult. It has however enabled us to explore a wider range of symptoms and health problems than previous studies have been able to examine. We did not double count individuals in the user data set analyses. Individuals who had phoned on more than one occasion could contribute to different problem categories, but only once to each specific problem category. We were unable to code 210 798 calls (16.4%) into a problem category, resulting in these calls being excluded from the analyses. This was mainly because the call did not have any record of an algorithm being launched (99.5% of uncoded calls). These missing data are likely to reflect calls that are closed quickly by the call handler as they required simple, quick health advice that did not warrant an algorithm being launched. The remaining 0.5% of uncoded calls had an algorithm launched, but the algorithm was uncommon and did not fit with one of the 70 defined problem categories used in this study. It is difficult to estimate how these missing data may have affected our results. In order to explore this, the free-text field of a random sample of 500 of these missing calls was undertaken. Analysis of this subsample of calls showed that there did not appear to be a consistent pattern in the types of symptoms called about suggesting no systematic bias had occurred, although clearly the symptoms in these calls are likely to have been less severe, reflecting health problems that could be given simple management advice. Deprivation deciles and urban/rural classifications of users were based on the postcodes logged on the NHS 24 system. The NHS 24 system automatically logs an address and postcode based on the location of the caller, not necessarily the user. Since calls are usually either made for the caller themselves or on behalf of the caller's partner or child, the caller and patient's postcode would be the same in the majority of cases. In some cases, however, (eg, calls made for a visiting relative) the caller's postcode will not match that of the patient and users will have been incorrectly allocated the postcode of the caller.

Comparison with existing literature

No previous studies have examined the symptoms and outcomes presented to NHS 24. Studies of NHS Direct data^{14 15} have examined age-specific samples and classified symptoms and outcomes in a different way to this

study, making direct comparison difficult. Broadly speaking, we found similar symptoms among children in our study as Cook *et al*,¹⁴ with infant-specific symptoms (such as crying) and skin problems commonest in those under 1 and skin problems commonest in those aged 1–4. For older children, we found abdominal problems to be most common while Cook *et al* found pain most common. Differences between the studies in coding abdominal pain may account for this apparent difference. In the over 65s, we found abdominal problems and breathing problems to be the commonest call reasons. These findings are broadly in line with Hsu *et al*,¹⁵ who reported pain, digestive problems and respiratory problems as the top three problems in this age group.

Several of the symptoms and health problems frequently reported in the community^{18–20} were not commonly found in the NHS 24 data set (eg, cold/flu, feeling tired/run down, joint pain and difficulty sleeping). In contrast, some infrequently reported symptoms in community surveys were relatively common in the NHS 24 data set (eg, chest pain and breathing problems). This suggests that people are selective about the types of problems they present to NHS 24; presenting symptoms that are more severe or more acute, particularly out-of hours. For most problems, onward referral to another healthcare professional or service was relatively common. Overall, only 10% of out-of-hours calls and 16% of in-hours calls resulted in self-care advice or information provision. This suggests that either, for the most part, people are using the service to deal with problems which require clinical care or that triage within the service remains relatively cautious.

We found that use of NHS 24 varied among different population groups and by time of call. Most calls (82.6%) were made out-of-hours and we found significant differences in the type, duration and outcome of symptoms presented in-hours compared with out-of-hours. Our findings suggest that people use NHS 24 very differently over these two periods with out-of-hours calls more frequently made for more urgent health problems, while in-hours calls tend to be for less urgent issues, requiring more general advice. This finding highlights that people appear to be using the service as policymakers intended, that is, predominantly out-of-hours to deal with immediate and unexpected health problems. However, differences in the use of the service at different times has important implications for the future planning and development of the service and our findings provide important information for health service planners on issues such as staffing structures and the skill-sets staff require at different times. The fact that people have limited alternative healthcare options out-of-hours (visiting an out-of-hours centre or A&E and calling an ambulance) will also influence what people do in this time period. A smaller proportion of males used the service than females, consistent with the use of primary care services in general² and use of telephone advice lines in

particular.^{15 21–23} However, when males did use NHS 24, a larger proportion of them used it in-hours rather than out-of-hours. We found that a smaller proportion of older users than younger users used the service. This contrasts with the use of many other healthcare services (in which older people are high users²), but is consistent with findings from studies examining use of NHS Direct, England's discontinued telephone advice line,^{23–25} replaced in 2014 with NHS 111.²⁶ This may reflect an unfamiliarity among older people with this type of service or an unwillingness to use telephone advice lines. Over time, this apparent age disparity is likely to reduce as younger adults, who seem more comfortable with using the service, age. This in turn should lead to a change in the characteristics of individuals using NHS 24 and will require the service to adapt, since older users are likely to have more complex health needs and use the service for different symptoms than younger age groups. Our data showed that less affluent individuals were less likely to use NHS 24. This is contrary to the use of other healthcare services in which deprivation is frequently associated with higher use.^{27 28} Studies of NHS Direct have also reported an association between high deprivation and low use of the telephone advice service,^{16 17 24 29} although there is some evidence that the relationship may not be linear. When those living in less affluent areas did use NHS 24, a higher proportion of them used the service out-of-hours than in-hours. As both older adults and less affluent individuals are likely to have poorer health than their counterparts, our finding of lower NHS 24 use in these potentially more vulnerable groups is interesting. Similar findings have been reported in relation to NHS Direct use.¹⁹ Improved education about NHS 24 and the range of services it offers may be of particular benefit to these groups to improve access to the service and should be explored by policymakers.

The outcome of both in-hours and out-of-hours calls varied among different population groups. While in many cases this may be a reflection of the nature of the problems being experienced or the general health of the user (eg, older people requiring more home visits and more ambulances), there were also some less obviously explicable trends. For example, those who were more affluent were more likely to be sent to or referred to A&E than those in the more deprived areas. Given the link between increasing deprivation and poorer health, this pattern seems counter-intuitive. Reasons for this finding are unclear; the more affluent may be better able to articulate their symptoms over the telephone or may be more specific in their demands for healthcare than less affluent individuals.

CONCLUSION

This is the first study to examine how the public uses NHS 24. It has identified the patterns of health problems and outcomes of calls presented to NHS 24 and

explored how these vary by time of call (in-hours and out-of-hours) and characteristics of the user (age, sex deprivation, etc). As such, it provides important new insights into how NHS 24 is currently being used, identifies the number and range of problems the service has to deal with and highlights the importance of NHS 24's role for managing symptoms and health problems in the community. This information will help with the future planning and development of the service (both in-hours and out-of-hours) to support healthcare across Scotland.

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