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Impact of the urgent care telephone service NHS 111 pilot sites: a controlled before and after study

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Abstract

Objectives: To measure the impact of the urgent care telephone service NHS 111 on the emergency and urgent care system.

Design: Controlled before and after study using routine data.

Setting: Four pilot sites and three control sites covering a total population of 3.6million in England, UK.

Participants and data: Routine data on 36 months of use of emergency ambulance service calls and incidents, emergency department attendances, urgent care contacts (GP out of hours, walk in and urgent care centres) and calls to the telephone triage service NHS Direct.

Intervention: NHS 111, a new 24 hour 7 day a week telephone service for non-emergency health problems, operated by trained non-clinical call handlers with clinical support from nurse advisors, using NHS Pathways software to triage calls to different services and home care.

Main outcomes: Changes in use of emergency and urgent care services.

Results: NHS 111 triaged 277,163 calls in the first year of operation for a population of 1.8 million. There was no change overall in emergency ambulance calls, emergency department attendances or urgent care use. There was a 19.3% reduction in calls to NHS Direct (95%CI -24.6% to14.0%) and a 2.9% increase in emergency ambulance incidents (95%CI 1.0% to 4.8%). There was an increase in activity overall in the emergency and urgent care system in each site ranging from 4.7 -12% per month and this remained when assuming that NHS 111 will eventually take all NHS Direct and GP Out of Hours calls.

Conclusions: In its first year of operation in four pilot sites NHS 111 did not deliver the expected system benefits of reducing calls to the 999 ambulance service or shifting patients to urgent rather than emergency care. There is potential that this type of service increases overall demand for urgent care.

Article Summary

Article Focus

- NHS 111 is a new telephone service for accessing urgent care where calls are assessed by non-clinical call handlers with clinician support.
- The aim of the service is to direct callers to the "right place, first time" and improve emergency and urgent care system efficiency.
- We have evaluated the first year of operation in four pilot sites to assess whether the new service achieves the objective of improving system efficiency.

Key messages

- In the first year of operation 72% of triaged calls to NHS 111 were managed by non-clinical call handlers and the service met quality standards.
- NHS 111 did not achieve the objective of increasing emergency and urgent care system efficiency. There was a significant increase in emergency ambulance incidents and an overall increase in use of emergency and urgent care services.

Strengths and limitations

- This is the first controlled evaluation of the impact of the NHS 111 service on the emergency and urgent care system in England. This is timely as the service is being rolled out nationally.
- There is limited evidence on the use of non-clinical call handlers to triage requests for urgent care and this study adds to the evidence base.
- Although we conducted a controlled study other system changes made it difficult to isolate the effects of NHS 111 and we were unable to assess the potential impact on in hours GP services.

Introduction

A consultation by policy makers in England identified that a key frustration in the general population was access to urgent care.[1] Problems faced by users of emergency and urgent care included a lack of awareness of services available, confusion about which service to access and multiple service contacts for the same episode.[2] In England in 2000 a national 24 hour telephone line for advice about health problems, NHS Direct, was established to address similar frustrations. Calls are answered by a non-clinical call handler and assessed by a nurse either immediately or with a later call back. Despite this service the national consultation found that access problems persisted.[1]

NHS 111 was developed as a solution to these problems by offering a telephone service to manage requests for urgent help[3] with some key differences from NHS Direct - access via a free to call, easily remembered three digit telephone number '111'; calls answered and assessed immediately by a trained non-clinical call handler without waiting or call backs; only some calls assessed by a nurse; and integration of the assessment system with services enabling direct referral to, or appointments to be made with, some services at the time of the call.

The expected benefits of NHS 111 were to improve access to urgent care, increase efficiency by directing people to the 'right place first time', increase satisfaction with urgent care and the national health service (NHS) generally, and in the longer term reduce unnecessary calls to the 999 emergency ambulance service and so begin to rectify concerns about inappropriate use of emergency services.[4]

NHS 111 was established in four pilot sites in England in 2010. It is rapidly becoming available nationally and there is international interest in telephone access to urgent care via non-clinical triage. A mixed methods evaluation focusing on processes, outcomes and costs was conducted in the four pilot sites. We report here on the specific outcome of NHS 111 improving efficiency of service use across the emergency and urgent care system by shifting care from emergency to urgent services. The objective was to assess the impact of NHS 111 on the emergency and urgent care system by examining demand for other urgent and emergency care services to detect if there was any change in how services were used.

Methods

Setting and service

Pilot services were established in four geographical areas defined by primary care trusts, the health care commissioning organisations operating in England in 2010. Durham & Darlington is an urban area with a population of around 606,000; Nottingham is a city of around 300,000 with a large minority ethnic population; Luton is a city of around 200,000 with a large minority ethnic population; and Lincolnshire is a largely rural area with a city, of

population 700,000. The four sites were chosen by the English Department of Health following a request for expressions of interest from commissioning organisations already planning or considering changing telephone access to urgent care. Call handling was provided by an ambulance service in one site and NHS Direct in three sites. In all sites NHS 111 could be accessed directly by dialling "111" or indirectly where GP out of hours call handling services were routed to NHS 111. Calls to NHS 111 are answered and assessed by trained non-clinical call handlers using the NHS Pathways assessment system.[5] If needed, calls can be transferred for additional assessment and advice from an onsite trained nurse. At the end of the assessment callers are matched to the most appropriate service available at the time of their call from a range of services within the callers' locality using an electronic Directory of Services linked to the assessment system. This can include emergency ambulance, emergency department, urgent care centre, walk in centre, minor injury unit, general practice (GP) out of hours service, in hours GP, community services, or home care. Referrals can be made to some services by NHS 111 at the time of the call, for example, direct dispatch of an emergency ambulance, appointment booking and transfer of the call to another telephone based service. A description of the NHS 111 service is provided as a supplemental file [S1].

Design

The design of this part of the evaluation was a controlled before and after study using a time series analysis of routine service activity data. Control sites were selected to match the pilot sites using a two stage process: 1) potential sites were identified by primary care trust area type (county or city), urban/rural mix and same Strategic Health Authority or nearest neighbour; 2) from 12 potential sites the final choice was made after matching for a range of 18 criteria based on population demographics, lifestyle, health profile and health service use. A table listing all criteria is provided as a supplemental file [S2]. It was important that control sites had no plans to introduce NHS 111 or make major changes to their emergency and urgent care system in the time frame of the evaluation. We identified three suitable control sites: North of Tyne, Leicester and Norfolk. Leicester was the best match for two pilot sites (Nottingham and Luton). The characteristics of the pilot and control sites are presented in Table 1. For the analyses reported here data from all pilot sites were combined and compared with data from all control sites. Randomisation of sites to be pilots or controls was not possible because the four pilot sites were pre-selected by the Department of Health.

The four pilot sites became fully operational at different times from July to December 2010. The study periods used were the first full year of operation of NHS 111 and the corresponding 2 years prior to the service starting.

Participants

Participants were users of the emergency and urgent care systems in the seven pilot and control sitesrecorded in routine service activity data as having accessed and used a range of emergency or urgent care services during the study periods.

Data collection

Use of NHS 111

A minimum data set (MDS) was created by the English Department of Health to provide information on NHS 111 service operation. All NHS 111 services submit monthly data and a MDS of activity for combined and individual services is published each month by the Department of Health.[6] The MDS records activity include numbers of: calls to the service; abandoned calls; triaged calls and transfer times for calls requiring clinical advice from a nurse. The dispositions of NHS 111 calls are recorded in five main categories: 1) ambulance dispatches; 2) recommended to attend Emergency Department; 3) recommended to attend primary and community care (including GP, urgent care, dental and pharmacy services); 4) recommended to attend another service (including community nursing, midwives, social services, opticians); 5) not recommended to attend a service (including home or self care and health information). We used the monthly routine minimum data set counts for each pilot site for the first year of operation to describe call volumes, numbers and proportions of triaged calls and calls passed for nurse assessment and the disposition arrived at following NHS Pathways assessment.

Routine data on use of key services

NHS 111 had the potential to produce an impact on activity across a range of emergency and urgent care services: calls to the emergency ambulance service; ambulance incidents, that is, an ambulance sent to the scene of the emergency; emergency department (ED) attendances; contacts with urgent care services such as GP out of hours, urgent care centres, walk in centres or minor injury units; the telephone triage service NHS Direct; same day general practice attendances; and a range of community services such as district nursing, dentists and pharmacies. Data are routinely available for the first five services only. We collected monthly counts of use of these services (ambulance calls and incidents, ED, urgent care and NHS Direct) by residents in the seven geographical areas – four pilot and three control sites - for 24 months prior to the start of NHS 111 (2008-10) and the same data plus calls to NHS 111 in the pilot areas for 12 months after (2010-11). Due to a lack of data availability for separate urgent care services, we had to combine data for out of hours primary care contacts, walk in centre attendances and urgent care centre attendances. The sources of this data were NHS data collections (Secondary Users Service and Weekly Situation reports) and local management information reports provided by the study sites.

This data was collected and collated by the Department of Health Commissioning Analysis and Intelligence Team.

We also needed to account for changes to services in the emergency and urgent care system other than NHS 111 occurring in the 36 months. NHS 111 leads and control site evaluation contacts were asked to provide details of changes to emergency and urgent care services occurring in study sites during the study time periods. We also searched primary care trust annual reports for 2009/10 and 2010/11 for each study site to identify any reported major changes to the emergency and urgent care system.

Analysis

For the service use analysis we fitted a time series regression model [7] to the combined pilot site counts to test for preliminary evidence that service use had changed over time. This model consisted of a month effect to help explain variation due to seasonal fluctuations, an overall trend, a before and after step term for other potentially significant changes introduced into the pilot site, and a term for before and after the time when NHS 111 was launched.

We then tested for changes in the pilot sites compared to the control sites using time series regression to test for the impact of NHS 111. We used a simple model with three main elements: 1) The basic model, consisting of a linear time trend in activity over the 36 months constrained to be the same in the pilot and control sites, plus a seasonal effect and a site effect. 2) Site specific before and after terms to allow for effects of potentially significant service changes other than NHS 111 introduced during the 36 months e.g. relocation of an emergency department. 3) A term for the regression of the monthly activity counts on the volume of NHS 111 calls that were triaged that month (the 'dose'). By definition the dose is zero for all months in the control sites and up until the launch of NHS 111 in the pilot sites. This regression allowed us to directly estimate the impact of different levels of NHS 111 activity.

We used the regression coefficient to estimate the impact on monthly service use per thousand NHS 111 calls for the pilot sites. The models were fitted and coefficients and standard errors estimated assuming normal errors with constant variance in the monthly activity counts. To check the assumption of constant variance, we also fitted models to the square root of the counts which helps stabilise the variance. This produced no important differences in fit so results using the raw count models are reported here. We used the Prais-Winsten procedure in STATA version 12 to fit the time series regression models.[8]

Results

Use of NHS 111

In the first year of operation over 400,000 calls were made to NHS 111 (Table 2). Two thirds were direct dial of the telephone number '111' by members of the general public and the other third were routed to the service from GP out of hours services. 22% of calls were unanswerable because the caller hung up within 30 seconds. These calls were predominately not intended for NHS 111 but were from people calling their general practice in the morning to make an appointment with their GP before the out of hours rerouting mechanism was switched off. 98% of answerable calls were answered and 277,163 (78%) of these were triaged by a call handler using the NHS Pathways assessment system. Reasons for not triaging calls were that the caller hung up, the call was transferred without triage (for example for a 999 ambulance), or health information only was given. The annual rate of triaged calls per 1000 population was 154. All pilot sites met national quality requirements for call abandonment rates of no more than 5%, and 95% of calls answered within 60 seconds. 28% of calls were transferred to a nurse for clinical advice although transfers were lower in the ambulance service provided site (21.3%) than in the NHS Direct provided sites (27.9 – 33.7%). For all sites combined, over half of triaged calls were assessed as requiring primary or urgent care, that is, GP practice, GP out of hours, walk in centres, urgent care centres, minor injury units, dental service or pharmacist (Figure 1).

Impact on emergency and urgent care services

Following the introduction of NHS 111, in individual pilot sites there was a statistically significant reduction in urgent care attendances in one site; reduction in calls to NHS Direct in three sites; reduction in ambulance emergency calls in one site and increase in one site, and an increase in ambulance incidents in one site.

For all sites combined, overall, there was no change in three of the five services measured that could be attributed to NHS 111 (Table 3). There was a large and statistically significant reduction in calls to NHS Direct of 102 fewer NHS Direct calls per triaged 1000 calls to NHS 111 equating to a 19.3% (95% CI -24.6% to14.0%) reduction in monthly NHS Direct activity. There was also a small and statistically significant increase in numbers of ambulance incidents of an extra 24 ambulance incidents per 1000 triaged calls to NHS 111 equating to an increase of 2.9% (95% CI 1.0% to 4.8%) in monthly ambulance activity.

For all sites and services combined, monthly use of the established services in the system varied depending on the site but when NHS 111 use was added in, there was an increase in activity overall in every site and this increase, ranging from 4.7 -12% per month, remained with the assumption that NHS 111 will eventually take all NHS Direct calls and GP Out of Hours calls (Table 4).

Discussion

Summary of findings

In its first year of operation in pilot sites there was no evidence that NHS 111 changed use of most of the emergency and urgent care services it was possible to measure. There was a large reduction in use of NHS Direct as calls transferred to NHS 111 but an increase in numbers of emergency ambulances sent to patients.

Context of other evidence

Policy makers in England established the first national telephone triage service in the world - NHS Direct - and there was considerable international interest in both this service and the evaluation of its pilot.[9] A Cochrane systematic review of the impact of telephone triage services identified that little research had been undertaken on the effect of these telephone services on emergency services.[10] The lack of impact of NHS 111 on emergency department attendances replicates the findings from the earlier evaluation of NHS Direct pilots.[11] The increase in ambulance incidents found in our study was not found for NHS Direct pilots. There is some evidence that telephone triage can reduce the use of general practice and general practice out of hours.[10, 11] A lack of routine data available for daytime general practice services in our study means we were unable to assess the impact of NHS 111 on use of general practice.

A key feature of NHS 111 is the use of non-clinical call handlers to assess calls. A systematic review of appropriateness of and compliance with telephone triage [12] found only two papers on non-clinical triageurs and these were of little relevance to NHS 111 as no assessment software was used.

Strengths and limitations

This evaluation has three strengths. First, there is little research evidence about telephone triage services operated by non-clinical call handlers, and the impact of telephone triage services on use of the emergency and urgent care system, making this evaluation of NHS 111 a valuable addition to the evidence base. Second, the evaluation is timely given that NHS 111 was established in pilot status in 2010 and is being rolled out nationally in England during 2012/13. Third, it is a large controlled study that has included data from a population of 3.6million people over 36 months on the use of five services as well as NHS111. The evaluation has three limitations. First, there was considerable 'noise' in the analysis of impact on services in terms of changes made to the range of services in the emergency and urgent care system other than NHS 111 in both the pilot and control sites. We recorded 13 different system changes across the pilot and control sites including relocation of an emergency department, reconfiguration of walk in and urgent care centres and emergency department diversion schemes. This made it challenging to detect the effect of NHS 111 but the time series analysis was a sophisticated approach to deal with these difficulties. Second,

there was no routine data available for a key service that may have been impacted by NHS 111: day time general practice, so the effects on this part of the system remain unknown. Finally, the timing of policy evaluations must be balanced to ensure early feedback to policy makers but also to allow for a service to become established. This evaluation is based on the first year of operation of a new service and so whilst early lessons are valuable the impact may change as the service matures and develops.

Implications

The findings of this study raise four key questions for the development of a national service. First, the four NHS 111 pilots did not produce some of the key expected benefits in their first year of operation. In fact they increased use of emergency ambulance incidents when the benefit expected was a reduction in use of this service in the longer term. In 2011/12 ambulance services in England attended 6.71 million incidents [13] and the 2.9% increase in ambulance incidents we have estimated could potentially result in an additional 195,000 annual attendances nationally or about 14,500 extra attendances for an ambulance service attending 500,000 incidents per year. It is important to further investigate and understand how the assessment system triages calls to the ambulance service in order to avoid unnecessary use of emergency ambulances.

Second, during our evaluation NHS Direct was still running as an alternative service. The policy plan is that NHS 111 will replace NHS Direct and there are significant implications to this strategy. NHS Direct was established to direct people to the right place but also in practice offers advice to people who do not need contact with a service. The emphasis of NHS 111 is on direction to right place rather than reassurance and self care advice. In our evaluation NHS 111 managed predominantly out of hours calls for urgent healthcare. If current callers to NHS Direct are shifted to NHS 111 the call volumes may increase substantially, the characteristics of the population using the service may change and consideration will need to be given to how the principles of NHS 111 in terms of immediate access without waiting, particularly for clinical advice, can be sustained.

Third, another important question to consider is whether the introduction of NHS 111 is creating supplier induced demand and therefore increasing overall demand for emergency and urgent care. There was some evidence from our system impact analysis that emergency and urgent care service use had increased overall but we cannot say if this is a real increase in demand or a shift from in hours GP services. It is possible that, once NHS 111 is a national service with a higher profile, demand for the service could change either by generating new demand or by people using it as an alternative to in hours primary care, or a combination of both.

Finally, it is useful to reflect on the expectations of the service. The provision of a telephone service which quickly guides people needing urgent care advice to the most appropriate service is sensible given repeatedly expressed concerns by the general public about

confusion around which service to access when needing urgent care. Key aspects of the service such as an easy-to-remember number, emphasis on fast triage and smooth transfer to the 'right service, first time' are desired by the general public. In our evaluation we found that alongside implementation of NHS 111 there were various re-organisations of servicesand implementation of demand management schemes in both the pilot and control sites. It is probably unrealistic to expect any one service, such as NHS 111, to do everything and real improvements may only be gained when a series of co-ordinated measures designed to increase efficiency across all services are implemented.

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Data Sharing:
A dataset of aggregated monthly contact counts for 5 emergency and urgent care services in 7 sites for 36 months is available on request from the corresponding author at j.turner@sheffield.ac.uk
The Department of Health publish monthly open access activity data for NHS 111 services available at http://transparency.dh.gov.uk/category/statistics/nhs-111-statistics/

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Contributors:
JT and AOC conceived the study and designed it with help from JN and EK. JN conducted the system impact analysis. JT wrote the first draft of the paper. All authors assisted in the interpretation of data and revising the paper and approved the final draft. JT is the guarantor.

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Ethics:
The study was approved by the Leeds (Central) Research Ethics Committee Reference number 10/H1313/57. NIHR CRN study ID: 9275

Competing interests:

All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare: the Department of Health Policy Research programme provided grant funding to the Medical Care Research Unit, University of Sheffield. AOC and JN are co-applicants on a research grant with NHS Direct studying tele-health for people with long term conditions. A family member of AOC won a contract to offer patient feedback for NHS 111 sites in London in June 2012.

Figure 1 – Percentage of triaged NHS 111 calls allocated to each emergency and urgent care service in four pilots sites in first year of operation

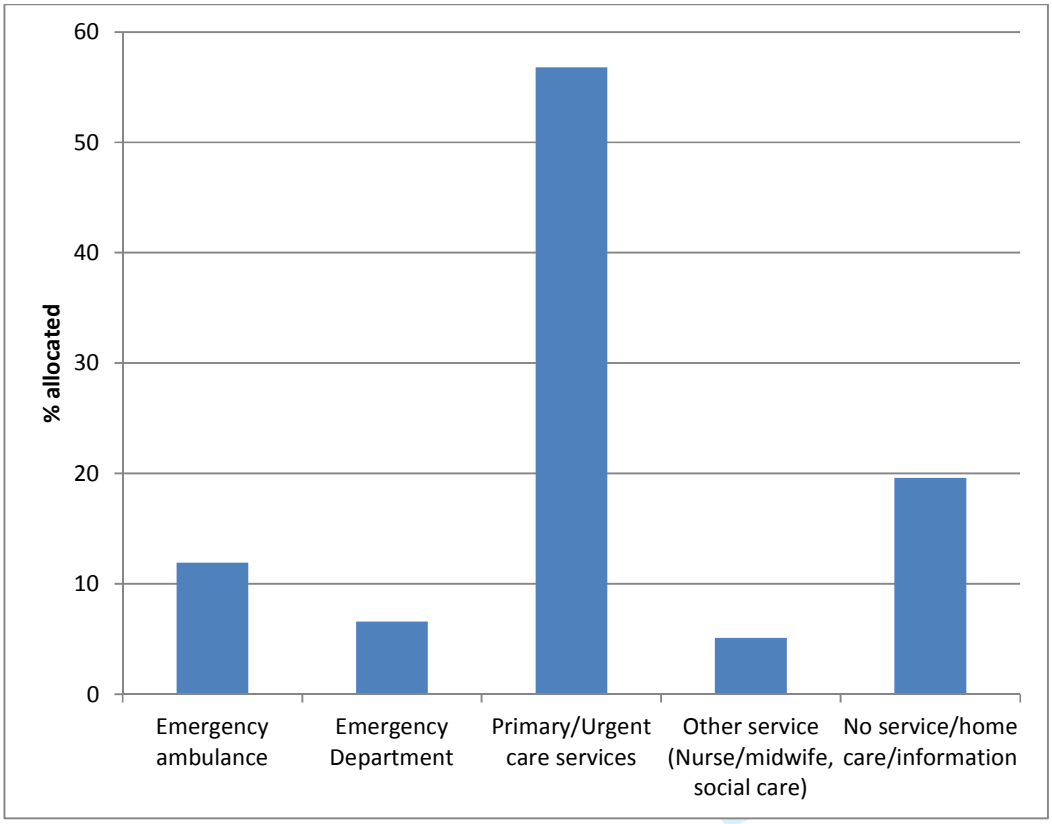


Table 1: Demographic characteristics of pilot and control sites

	Pilot Sites				Control Sites		
	Durham & Darlington	Nottingham	Lincolnshire	Luton	North of Tyne	Norfolk	Leicester City
Population (000's)	620	305	735	700 (Northamptonshire)	780	740	280
SHA	North East	East Midlands	East Midlands	East of England	North East	East of England	East Midlands
ONS Area Classification of Primary Care Organisations	Industrial Hinterlands	Centres with Industry	Prospering small towns	London Suburbs	Industrial Hinterlands Prospering small towns	Prospering small towns	Centres with Industry
ONS Rural/Urban Local Authority Classification	Predominantly Urban Predominantly Rural	Predominantly Urban	Predominantly Rural	Predominantly Urban	Predominantly Urban Predominantly Rural	Predominantly Rural	Predominantly Urban
NHS 111 service live	August 2010	November 2010	November 2010	December 2010			

Table 2: Total numbers of NHS 111 calls received, answered, triaged and transferred for nurse assessment in one year

	Durham & Darlington	Nottingham City	Lincolnshire	Luton	All NHS 111 sites
Population covered	606,800	300,800	700,300	194,300	1,802,200
Total number of calls connected to 111	209,633	58,397	102,611	38,210	408,851
Direct dial 111 n (%)	106,961 (51)	18,354 (31.4)	102,611 (100)	23,264 (60.8)	251,190 (61.4)
Switched from other sources n (%)	102,672 (49)	40,043 (68.6)	0	14,946 (39.2)	157,661 (38.6)
Answerable calls n (%)	165,355 (78.9)	56,539 (96.8)	100,144 (97.6)	37,497 (98.1)	359,535 (87.9)
Answered calls n (% of answerable calls)	161,082 (97.4)	55,564 (98.2)	99,381 (99.2)	37,073 (98.8)	353,100 (98.2)
Triaged calls n (% of answered calls)	114,686 (71.2)	44,937 (80.9)	85,509 (86.0)	32,031 (86.4)	277,163 (78.5)
Transferred to nurse n (% of triaged calls)	24,488 (21.3)	13,261 (29.5)	28,871 (33.7)	10,779 (33.6)	77,399 (27.9)
Triaged calls per year per 1,000 people	189	150	122	165	154

Table 3 Summary of estimated effects of NHS 111 on other emergency and urgent care services: % change in monthly activity counts

Service activity	Net change in raw activity* Number (%)	Estimated change in monthly activity per 1000 triaged NHS 111 calls	Pilot v Control model – estimated % change in monthly activity (95%CI)
ED attendances	-1128 (-11)	-1 (-66, +64) fewer attendances	-0.1% (-3.8%, +3.7%)
GPOOH, WiC, UCC. MIU attendances	-641 (-6)	+47 (-66, +159) extra attendances	+2.5% (-3.5%, +8.5%)
Calls to NHS Direct	-312 (-10)	-102 (-130, -74) fewer calls	-19.3% (-24.6%, -14.0%)
Calls to 999 ambulance service	-168 (-3)	+3 (-31, +37) more calls	+0.3% (-3.1%,+3.7)
Ambulance 999 incidents	+114 (+2.5)	+24 (+8, +39) more incidents	+2.9% (+1.0%,+4.8%)

*Net change is the change (before to after) in the pilot sites minus the change in the control sites.

Table 4: Average monthly contacts (000s) with services in the emergency and urgent care system before and after the launch of NHS 111 (based on routine data)

	Durham & Darlington		Change (%)	Nottingham		Change (%)	Luton		Change (%)	Lincolnshire		Change (%)
	Before	After		Before	After		Before	After		Before	After	
EDs	13675	13142	-3.9	7505	7945	+5.8	3474	3638	+4.7	14293	14117	-1.2
Urgent	13667	14729	+7.7	8561	9424	+11	7573	6135	-19	12374	13222	+6.8
NHS Direct	3978	2201	-44.7	3016	2186	-27.5	1547	1068	-31	3660	2655	-27.2
Ambulance calls	6479	6895	+6.4	4824	5319	+10.3	2626	2857	+8.8	7307	8480	+16.1
Ambulance incidents	5304	5734	+8.1	4276	4538	+6.1	2239	2488	+11.1	6989	7657	+9.6
All services	43103	42701	-1	28182	29412	+4.2	17459	16186	-7.3	44623	46131	+3.3
NHS 111	0	10000		0	3500		0	3000		0	10000	
Total with NHS 111	43103	52701	+18.2	28182	32914	+14.4	17459	19186	+9.1	44623	56131	+20.5
Total assuming all NHS Direct calls taken by NHS 111	43103	50924	+15.4	28182	32084	+12.2	17459	18707	+6.7	44623	55126	+19
Total assuming all NHS Direct calls taken by NHS 111 and estimated GP OOH calls taken by NHS 111	48003	50924	+5.7	30582	32084	+4.7	17459	18707	+6.7	48523	55126	+12

S1: NHS 111 service description

Core service principles

The underlying principle of NHS 111 is that patients who request urgent medical care should be assessed and directed to the "right service first time". The main features of the service are that:

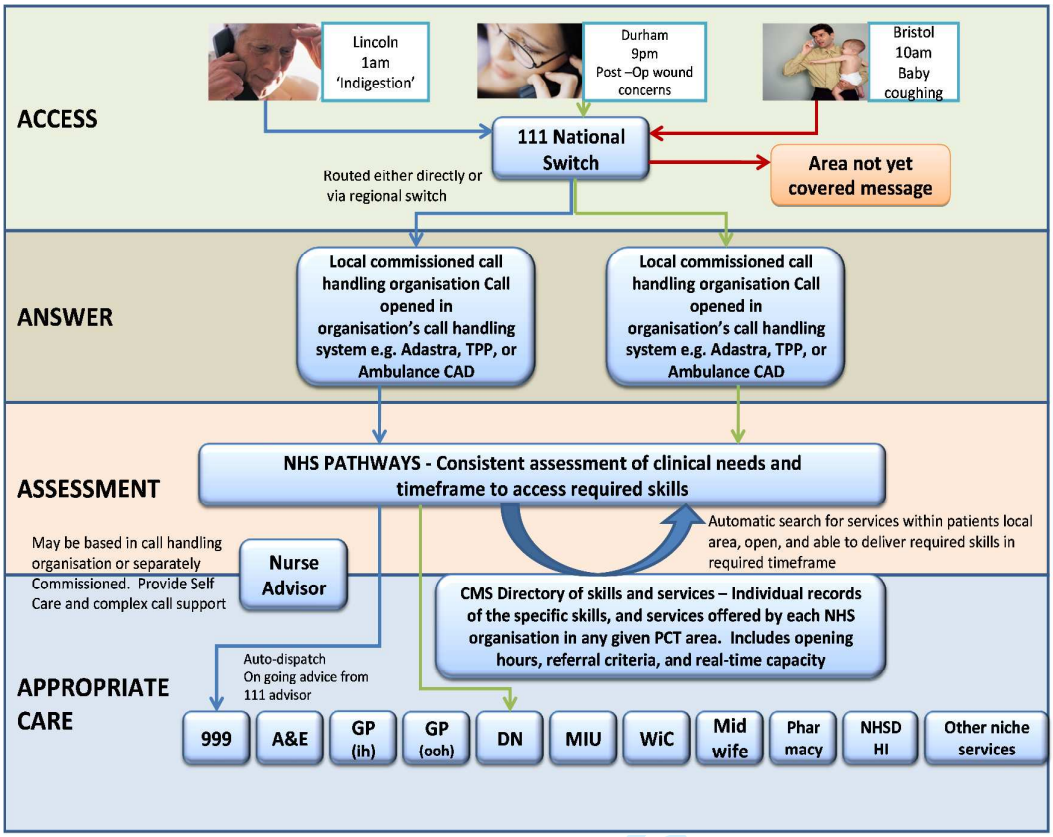
- The number is memorable and is free to use.
- Calls are assessed using an approved clinical assessment system to determine the most appropriate course of action for the patient at the first point of contact.
- Clinical assessment and provision of information, including clinician assessment, is completed on the first call without the need for a call back.
- Callers can be given health information, self care advice or directed to the most appropriate service available at the time of the call using an up to date skills based Directory of Services (DoS) for the patient's local area and without the need for re-triage.
- Where possible the NHS 111 service should develop real time links with urgent care providers so that information can be forwarded and appointments can be made for callers at the time of their call to NHS 111.
- Calls assessed as requiring an emergency ambulance response can be immediately directed to ambulance dispatch without the need for re-assessment.

NHS 111 therefore provides an integrated service that links clinical assessment with the services that are appropriate and available at the time of the call.

NHS 111 operational framework

Figure 4.1 illustrates the framework for the intended NHS 111 service during the initial pilot phase of the programme.

Figure 4.1 – Diagrammatic plan of the NHS 111 service



Source – NHS 111 Programme Board, 111 Service Specification version 1.2, May 2010

The operational framework consists of four linked steps:

1. *Access via the 111 telephone number* – Calls to NHS 111 can be routed in several ways and can be configured differently for different areas. The service can be accessed by callers only dialling 111, they may call another service such as a GP out of hours service and be asked to dial 111, or they may call another service and the call can be automatically switched to NHS 111 without the caller having to redial.
2. *Answer* – Calls are answered by a call handling service contracted to provide this service. The call handling service collects basic call details and then carries out the next step of clinical assessment.
3. *Clinical assessment* – In all four pilot sites a single clinical assessment system, NHS Pathways, is used as the clinical assessment system. NHS Pathways is a symptom based clinical assessment system used to triage calls from the public requesting emergency or

urgent healthcare and is used by ambulance services, GP out of hours services and other Single Point of Access telephone services for urgent care. The assessment is made by trained, non-clinical call advisors with clinician support available either on site. As call advisors ask symptom based questions, the answers to key indicator questions are flagged. The information from these answers is then used to match the clinical skills needed and the speed of response required for the clinical condition described to an appropriate service in step 4. In all sites most calls that may be suitable for self care advice or require referral to specialist services are transferred for clinical advice before a final disposition is reached.

4. *A web based Capacity Management System and Directory of Skills & Services (CMS/DoS)* is linked to the NHS Pathways clinical assessment system. This directory is populated locally and jointly by service commissioners and provider services. The available skills of each provider are specified, as are service operation guidance such as location, referral protocols and opening times. Services are matched to the clinical indicator flags in the clinical assessment system and appear to the call advisor in the order set by the service commissioner. The Capacity Management System operates in real time, taking account of what is available and current activity. This enables a call for urgent care to be automatically matched to a service with the right skills, location and within the required timeframe at the time of the call without having to manually search for an appropriate service. Where adequate technical links can be set up, appointments or other contacts can be made by the call adviser at the time of the call. Any provider service can be included in the CMS/DoS but, to ensure clinical safety, only some will be available for referral by an NHS Pathways call advisor. Other services, for example specialist nursing services, require additional clinician assessment before a referral can be made. The CMS/DoS system also provides activity and referral data for service monitoring and planning.

These four steps provide the overall framework for an NHS 111 service but within each step there are choices that can be made about how the service is delivered at a local level. Table 1 summarises the operating models used in the four pilot sites and illustrates the different approaches used.

Table 1: Description of four pilot site NHS 111 service models

	CDD	Nottingham	Lincolnshire	Luton
Call routing	Direct dial 111 Auto routed to 111 from Single Point of Access number	Direct dial 111 Auto routed to 111 from GP out of hours numbers	Direct dial 111 only (Nov 2010 – Mar 2011) All calls are 111 – no auto routed calls 1st April 2011 onwards all GP out of hours calls given message to call 111	Direct dial 111 Auto routed to 111 from some GP out of hours numbers Other GP out of hours numbers have a message telling caller to call 111
Call answering	Call handling provided by North East Ambulance Service Foundation Trust Service provided from ambulance emergency control centre in Newcastle on Tyne utilising emergency call control centre in hours and Patient Transport Service control centre at peak NHS 111 call times.	Call handling provided by NHS Direct national system Calls routed to NHS Direct using a separate number and identified within the system as Nottingham 111 or Nottingham OOH	Call handling provided by NHS Direct national system Calls routed to NHS Direct using a separate number and identified within the system as Lincolnshire 111	Call handling provided by NHS Direct national system Calls routed to NHS Direct using a separate number and identified within the system as Luton 111
Clinical Assessment	NHS Pathways using trained call advisors and on site nurse or paramedic clinical advice and supervision.	NHS Pathways using trained call advisors and NHS Direct nurse advisors for clinical advice and supervision.	NHS Pathways using trained call advisors and NHS Direct nurse advisors for clinical advice and supervision.	NHS Pathways using trained call advisors and NHS Direct nurse advisors for clinical advice and supervision.
CMS/DoS	Initial directory was existing directory and populated with services identified from commissioner led workshops and review meetings. Directory reflected urgent care reform and service remodelling that occurred prior to NHS 111. Current directory population built on this and led by PCT commissioner and a local	Two versions of directory have been populated. Initially populated by PCT leads who interacted with local providers. Second version using national clinical content templates was overseen by steering group with engagement with leads from provider organisations.	Two versions of directory have been populated. Initially populated by PCT leads who interacted with local providers. Second version using national clinical content templates was overseen by steering group with engagement with leads from provider organisations.	Population of directory has been a stepped process. Early phase contained primary care, urgent care and Out of Hours providers. Two additional re-populations and re-profiling edits in 2011 using national templates with additional services e.g. mental health, community services, social care added. Local engagement and

	provider capacity manager. Engagement events held with primary care providers to agree arrangements for in hours care. Over time additional services have been added allowing referrals to e.g. district nurses, nurse specialists. Transport can also be arranged for eligible patients to attend appointments made by 111.			involvement has increased with each review. Another re-population planned for 2012.
Technical links for warm transfer	Ambulance service emergency system for immediate ambulance dispatch Urgent Care Services so appointments can be made by the NHS 111 call advisor while the caller is still on the telephone	Ambulance service emergency system for immediate ambulance dispatch Calls can be warm transferred (i.e. no call back) to OOH provider for appointment booking	Ambulance service emergency system for immediate ambulance dispatch Calls can be warm transferred (i.e. no call back) to OOH provider for appointment booking	Manual dispatch of ambulances using agreed protocol Calls can be warm transferred (i.e. no call back) to booking agents within NHS Direct who book Out of Hours appointments with primary care services
Training	New staff recruited Standard NHS Pathways training. Additional training on safeguarding, negotiation skills, NHS 111 values, unscheduled care system. NHS 111 co-located with emergency ambulance control and both use NHS Pathways so call handlers can be used flexibly for either service when high demand.	Existing NHS Direct call handling staff re-trained Standard NHS Pathways training. Extension of role as now assessing patient on initial call. Additional training on transfer processes for OOH and ambulance dispatch. Safeguarding, record keeping and communication skills training already included in call handler training.	Existing NHS Direct call handling staff re-trained Standard NHS Pathways training. Extension of role as now assessing patient on initial call. Additional training on transfer processes for OOH and ambulance dispatch. Safeguarding, record keeping and communication skills training already included in call handler training.	Existing NHS Direct call handling staff re-trained Standard NHS Pathways training. Extension of role as now assessing patient on initial call.. Additional training on transfer processes for OOH and ambulance dispatch. Safeguarding, record keeping and communication skills training already included in call handler training.
Public Launch	August 2010	November 2010	November 2010	December 2010

S2: Criteria used to identify suitable control sites

Indicator	Description	Data source
Demographics		
Population size	Target population (thousands)	PCT publications
Persons 65+	Proportion of people 65 and over (%)	Office of National Statistics (2008 estimates)
Ethnicity	Proportion of BME population (%)	Office of National Statistics (2007 data)
Life expectancy	Life expectancy at birth for males/females (years)	The NHS Information Centre, Compendium of Clinical and Health Indicators (2006-2008 data)
Deprivation value	Proportion of people living in 20% most deprived areas of England (%)	The Association of Public Health Observatories (2007 data)
Lifestyle		
Alcohol	Proportion of binge drinking adults (%)	The NHS Information Centre, Health surveys for England 2003-2005
Smoking	Proportion of smoking adults (%)	
Obesity (adults)	Proportion of obese adults (%)	
Obesity (children)	Proportion of obese year 6 children (%)	The NHS Information Centre, National Child Measurement Programme: England, 2008/09 school year
Health profile		
Mortality rate, all causes	Directly age-standardised rate per 100000 population under 75	The NHS Information Centre, Compendium of Clinical and Health Indicators (2006-2008 data)
Mortality rate, all cancers	Directly age-standardised rate per 100000 population under 75	
Mortality rate, all circulatory diseases	Directly age-standardised rate per 100000 population under 75	
People with limiting long-term illness	Proportion of people with limiting long-term illness, 2001 Census	Office of National Statistics (2001 Census data)
People with long-term conditions	Proportion of respondents who reported a long-standing health problem in GP Patient Survey (%)	GP Patient Survey 2008/09
Use of health services		
A&E attendances	Attendance rate per 1000 population, includes A&E Departments, Walk in Centres and Minor Injury Units	Department of Health, QMAE data 2007/08
GP consultations	General Practices consultations combined rate per 1000 population (include GP and practice nurse consultations, estimates from national data)	The NHS Information Centre, QResearch report on trends in consultation rates in General Practices 1995-2008
GP out of hours contacts	Proportion of respondents of the GP Patient Survey who tried to contact OOH GP service in the last 6 months (%)	GP Patient Survey 2008/09
NHS Direct calls	Call rate per 1000 population	NHS Direct, 2008/09 data

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Impact of the urgent care telephone service NHS 111 pilot sites: a controlled before and after study

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Impact of the urgent care telephone service NHS 111 pilot sites: a controlled before and after study

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Abstract

Objectives: To measure the impact of the urgent care telephone service NHS 111 on the emergency and urgent care system.

Design: Controlled before and after study using routine data.

Setting: Four pilot sites and three control sites covering a total population of 3.6million in England, UK.

Participants and data: Routine data on 36 months of use of emergency ambulance service calls and incidents, emergency department attendances, urgent care contacts (GP out of hours, walk in and urgent care centres) and calls to the telephone triage service NHS Direct.

Intervention: NHS 111, a new 24 hour 7 day a week telephone service for non-emergency health problems, operated by trained non-clinical call handlers with clinical support from nurse advisors, using NHS Pathways software to triage calls to different services and home care.

Main outcomes: Changes in use of emergency and urgent care services.

Results: NHS 111 triaged 277,163 calls in the first year of operation for a population of 1.8 million. There was no change overall in emergency ambulance calls, emergency department attendances or urgent care use. There was a 19.3% reduction in calls to NHS Direct (95%CI -24.6% to14.0%) and a 2.9% increase in emergency ambulance incidents (95%CI 1.0% to 4.8%). There was an increase in activity overall in the emergency and urgent care system in each site ranging from 4.7 -12% per month and this remained when assuming that NHS 111 will eventually take all NHS Direct and GP Out of Hours calls.

Conclusions: In its first year of operation in four pilot sites NHS 111 did not deliver the expected system benefits of reducing calls to the 999 ambulance service or shifting patients to urgent rather than emergency care. There is potential that this type of service increases overall demand for urgent care.

Article Summary

Article Focus

- NHS 111 is a new telephone service for accessing urgent care where calls are assessed by non-clinical call handlers with clinician support.
- The aim of the service is to direct callers to the "right place, first time" and improve emergency and urgent care system efficiency.
- We have evaluated the first year of operation in four pilot sites to assess whether the new service achieves the objective of improving system efficiency.

Key messages

- In the first year of operation 72% of triaged calls to NHS 111 were managed by non-clinical call handlers and the service met quality standards.
- NHS 111 did not achieve the objective of increasing emergency and urgent care system efficiency. There was a significant increase in emergency ambulance incidents and an overall increase in use of emergency and urgent care services.

Strengths and limitations

- This is the first controlled evaluation of the impact of the NHS 111 service on the emergency and urgent care system in England. This is timely as the service is being rolled out nationally.
- There is limited evidence on the use of non-clinical call handlers to triage requests for urgent care and this study adds to the evidence base.
- Although we conducted a controlled study other system changes made it difficult to isolate the effects of NHS 111 and we were unable to assess the potential impact on in hours GP services.

Introduction

A consultation by policy makers in England identified that a key frustration in the general population was access to urgent care..[1] Urgent care is defined as "the range of responses to people who require or perceive they need for urgent advice, care, treatment or diagnosis".[1] Problems faced by users of emergency and urgent care included a lack of awareness of services available, confusion about which service to access and multiple service contacts for the same episode.[2] In England in 2000 a national 24 hour telephone line for advice about health problems, NHS Direct, was established to address similar frustrations. Calls are answered by a non-clinical call handler and assessed by a nurse either immediately or with a later call back. Despite this service the national consultation found that access problems persisted.[1]

NHS 111 was developed as a solution to these problems by offering a telephone service to manage all requests for urgent help[3] including requests for out of hours primary care, urgent problems that may currently be directed to 999 ambulance services and health information and advice. The key differences from NHS Direct are - access via a free to call, easily remembered three digit telephone number '111'; calls answered and assessed immediately by a trained non-clinical call handler without waiting or call backs; only some calls assessed by a nurse; and integration of the assessment system with services enabling direct referral to, or appointments to be made with, some services at the time of the call.

The expected benefits of NHS 111 were to improve access to urgent care, increase efficiency by directing people to the 'right place first time' including self care advice, increase satisfaction with urgent care and the national health service (NHS) generally, and in the longer term reduce unnecessary calls to the 999 emergency ambulance service and so begin to rectify concerns about inappropriate use of emergency services.[4]

NHS 111 was established in four pilot sites in England in 2010. It is rapidly becoming available nationally and there is international interest in telephone access to urgent care via non-clinical triage. A mixed methods evaluation focusing on processes, outcomes and costs was conducted in the four pilot sites. We report here on the specific outcome of NHS 111 improving efficiency of service use across the emergency and urgent care system by shifting care from emergency to urgent services. The objective was to assess the impact of NHS 111 on the emergency and urgent care system by examining demand for other urgent and emergency care services to detect if there was any change in how services were used.

Methods

Setting and service

Pilot services were established in four geographical areas defined by primary care trusts, the health care commissioning organisations operating in England in 2010. Durham & Darlington

is an urban area with a population of around 606,000; Nottingham is a city of around 300,000 with a large minority ethnic population; Luton is a city of around 200,000 with a large minority ethnic population; and Lincolnshire is a largely rural area with a city, of population 700,000. The four sites were chosen by the English Department of Health following a request for expressions of interest from commissioning organisations already planning or considering changing telephone access to urgent care. Call handling was provided by an ambulance service in one site and NHS Direct in three sites. In all sites NHS 111 could be accessed directly by dialling "111" or indirectly where GP out of hours call handling services were routed to NHS 111. Calls to NHS 111 are answered and assessed by trained non-clinical call handlers using the NHS Pathways assessment system.[5] If needed, calls can be transferred for additional assessment and advice from an onsite trained nurse. At the end of the assessment callers are matched to the most appropriate service available at the time of their call from a range of services within the callers' locality using an electronic Directory of Services linked to the assessment system. This can include emergency ambulance, emergency department, urgent care centre, walk in centre, minor injury unit, general practice (GP) out of hours service, in hours GP, community services, or home care. Referrals can be made to some services by NHS 111 at the time of the call, for example, direct dispatch of an emergency ambulance, appointment booking and transfer of the call to another telephone based service. A description of the NHS 111 service is provided as a supplemental file [S1]. **Design**

The design of this part of the evaluation was a descriptive study of NHS 111 service use and a controlled before and after study using a time series analysis of routine service activity data. Control sites were selected to match equivalent geographical areas to the pilot sites using a two stage process: 1) potential sites were identified by primary care trust area type (county or city), urban/rural mix and same Strategic Health Authority (SHA) or nearest neighbour; 2) from 12 potential sites the final choice was made after matching for a range of 18 criteria based on population demographics, lifestyle, health profile and health service use. A table listing all criteria is provided as a supplemental file [S2]. It was important that control sites had no plans to introduce NHS 111 or make major changes to their emergency and urgent care system in the time frame of the evaluation. We identified three suitable control sites: North of Tyne, Leicester and Norfolk. Leicester was the best match for two pilot sites (Nottingham and Luton). The control site for Luton is not in the same SHA but was the best match for all other criteria and was the only suitable nearest neighbour SHA. For the main impact analysis sites have been combined to provide single pilot and control sites. The characteristics of the pilot and control sites are presented in Table 1. For the analyses reported here data from all pilot sites were combined and compared with data from all control sites. Randomisation of sites to be pilots or controls was not possible because the four pilot sites were pre-selected by the Department of Health.

The four pilot sites became fully operational at different times from July to December 2010. The study periods used were the first full year of operation of NHS 111 and the

corresponding 2 years prior to the service starting. During the course of the evaluation NHS Direct continued to operate as a national service within the pilot site areas.

Participants

Participants were users of the emergency and urgent care systems in the seven pilot and control sites recorded in routine service activity data as having accessed and used a range of emergency or urgent care services during the study periods.

Data collection

Use of NHS 111

A minimum data set (MDS) was created by the English Department of Health to provide information on NHS 111 service operation. All NHS 111 services submit monthly data and a MDS of activity for combined and individual services is published each month by the Department of Health.[6] The MDS records activity include numbers of: calls to the service; abandoned calls; triaged calls and transfer times for calls requiring clinical advice from a nurse. The dispositions of NHS 111 calls are recorded in five main categories: 1) ambulance dispatches; 2) recommended to attend Emergency Department; 3) recommended to attend primary and community care (including GP, urgent care, dental and pharmacy services); 4) recommended to attend another service (including community nursing, midwives, social services, opticians); 5) not recommended to attend a service (including home or self care and health information). We used the monthly routine minimum data set counts for each pilot site for the first year of operation to describe call volumes, numbers and proportions of triaged calls and calls passed for nurse assessment and the disposition arrived at following NHS Pathways assessment.

Routine data on use of key services

NHS 111 had the potential to produce an impact on activity across a range of emergency and urgent care services: calls to the emergency ambulance service; ambulance incidents, that is, an ambulance is sent and arrives at the scene of the emergency incident; emergency department (ED) attendances; contacts with urgent care services such as GP out of hours, urgent care centres, walk in centres or minor injury units; the telephone triage service NHS Direct; same day general practice attendances; and a range of community services such as district nursing, dentists and pharmacies. Data are routinely available for calls and incidents, ED, urgent care and NHS Direct) by residents in the seven geographical areas – four pilot and three control sites - for 24 months prior to the start of NHS 111 (2008-10) and the same data plus calls to NHS 111 in the pilot areas for 12 months after (2010-11). Due to a lack of data availability for separate urgent care services, we had to combine data for out of hours primary care contacts, walk in centre attendances and urgent care centre attendances. The sources of this data were NHS data collections (Secondary Users Service and Weekly Situation reports) and local management information reports provided by the study sites. .

For local management information reports a set of data items and definitions was used to standardise data collection across all sites. In one pilot area data on one urgent care contact data item was missing and therefore inputted from the previous and subsequent 3 months activity. All data was collected and collated by the Department of Health Commissioning Analysis and Intelligence Team

We also needed to account for changes to services in the emergency and urgent care system other than NHS 111 occurring in the 36 months. NHS 111 leads and control site evaluation contacts were asked to provide details of changes to emergency and urgent care services occurring in study sites during the study time periods. We also searched primary care trust annual reports for 2009/10 and 2010/11 for each study site to identify any reported major changes to the emergency and urgent care system.

Analysis

For the service use analysis we fitted a time series regression model [7] to the combined pilot site counts to test for preliminary evidence that service use had changed over time. This model consisted of a month effect to help explain variation due to seasonal fluctuations, an overall trend, a before and after step term for other potentially significant changes introduced into the pilot site, and a term for before and after the time when NHS 111 was launched. This was the pilot only model.

We then tested for changes in the pilot sites compared to the control sites using time series regression to test for the impact of NHS 111. We used a simple model with three main elements: 1) The basic model, consisting of a linear time trend in activity over the 36 months constrained to be the same in the pilot and control sites, plus a seasonal effect and a site effect. 2) Site specific before and after terms to allow for effects of potentially significant service changes other than NHS 111 introduced during the 36 months e.g. relocation of an emergency department. 3) A term for the regression of the monthly activity counts on the volume of NHS 111 calls that were triaged that month (the 'dose'). By definition the dose is zero for all months in the control sites and up until the launch of NHS 111 in the pilot sites. This regression allowed us to directly estimate the impact of different levels of NHS 111 activity.

We used the regression coefficient to estimate the impact on monthly service use per thousand NHS 111 calls for the pilot sites. The models were fitted and coefficients and standard errors estimated assuming normal errors with constant variance in the monthly activity counts. To check the assumption of constant variance, we also fitted models to the square root of the counts which helps stabilise the variance. This produced no important differences in fit so results using the raw count models are reported here as the pilot versus control model. We used the Prais-Winsten procedure in STATA version 12 to fit the time series regression models.[8]We considered the potential impact of NHS 111 on overall demand for the emergency and urgent care system as this adds an extra service and can potentially add an extra contact if it does not reduce use of other services in the system. We

used the routine data to measure monthly use of the different services in each pilot site before and after the introduction of NHS 111 and hence overall use of the emergency and urgent care system. We have then estimated the effect on the system taking two additional factors in to account 1) in the "after" period NHS Direct and NHS 111 were operating concurrently so we have estimated the effect if all NHS Direct calls are taken by NHS 111 and 2) in the "before" period GP out of hours calls (rather than contacts) were taken by a number of providers so we have estimated the number of these calls using the routine NHS 111 data on calls diverted from out of hours providers. The assumption of all NHS Direct and out of hours calls being managed by NHS 111 reflects the intended national service.

Results

Use of NHS 111

In the first year of operation over 400,000 calls were made to NHS 111 (Table 2). Two thirds were direct dial of the telephone number '111' by members of the general public and the other third were routed to the service from GP out of hours services. 22% of calls were unanswerable because the caller hung up within 30 seconds. These calls were predominately not intended for NHS 111 but were from people calling their general practice in the morning to make an appointment with their GP before the out of hours rerouting mechanism was switched off. 98% of answerable calls were answered and 277,163 (78%) of these were triaged by a call handler using the NHS Pathways assessment system. Reasons for not triaging calls were that the caller hung up, the call was transferred without triage (for example for a 999 ambulance), or health information only was given. The annual rate of triaged calls per 1000 population was 154. All pilot sites met national quality requirements for call abandonment rates of no more than 5%, and 95% of calls answered within 60 seconds. 28% of calls were transferred to a nurse for clinical advice although transfers were lower in the ambulance service provided site (21.3%) than in the NHS Direct provided sites (27.9 – 33.7%). For all sites combined, over half of triaged calls were assessed as requiring primary or urgent care, that is, GP practice, GP out of hours, walk in centres, urgent care centres, minor injury units, dental service or pharmacist (Figure 1).

Impact on emergency and urgent care services

Across all pilot and control sites there were 13 other system changes reported that were taken in to account in the analysis including the opening, closing and relocation of urgent

care and walk in centres, relocation of an emergency department, ED attendance reduction schemes, ambulance service conveyance direct to walk in centres and related publicity campaigns.

Following the introduction of NHS 111, in individual pilot sites there was a statistically significant reduction in urgent care attendances in one site; reduction in calls to NHS Direct in three sites; reduction in ambulance emergency calls in one site and increase in one site, and an increase in ambulance incidents in one site.

For all sites combined, overall, there was no change in three of the five services measured that could be attributed to NHS 111 (Table 3). There was a large and statistically significant reduction in calls to NHS Direct of 102 fewer NHS Direct calls per triaged 1000 calls to NHS 111 equating to a 19.3% (95% CI -24.6% to14.0%) reduction in monthly NHS Direct activity. There was also a small and statistically significant increase in numbers of ambulance incidents of an extra 24 ambulance incidents per 1000 triaged calls to NHS 111 equating to an increase of 2.9% (95% CI 1.0% to 4.8%) in monthly ambulance activity.

The counts of contacts with all services in the pilot sites shows that monthly use of the established services in the system slightly increased or slightly decreased, depending on the site but when NHS 111 use was added in, there was an increase in activity overall in every site. When taking in to account the assumption that in the future all NHS Direct and all GP out of hours calls will be directed to NHS 111 this increase, ranging from 4.7 -12% per month, remained. (Table 4).

Discussion

Summary of findings

In the first year of operation NHS 111pilot sites triaged almost 300,000 calls, 72% of these calls were managed by non-clincial callhandlers and just over half of calls were directed to primary care. However, there was no evidence that NHS 111 changed use of most of the emergency and urgent care services it was possible to measure. There was a large reduction in use of NHS Direct as calls transferred to NHS 111 but an increase in numbers of emergency ambulances sent to patients and there is potential that overall demand for services across the emergency and urgent care system could increase.

Context of other evidence

Policy makers in England established the first national telephone triage service in the world - NHS Direct - and there was considerable international interest in both this service and the evaluation of its pilot.[9] A Cochrane systematic review of the impact of telephone triage services identified that little research had been undertaken on the effect of these telephone services on emergency services.[10] The lack of impact of NHS 111 on emergency department attendances replicates the findings from the earlier evaluation of NHS Direct pilots.[11] The increase in ambulance incidents found in our study was not found for NHS

Direct pilots. There is some evidence that telephone triage can reduce the use of general practice and general practice out of hours.[10, 11] A lack of routine data available for daytime general practice services in our study means we were unable to assess the impact of NHS 111 on use of general practice.

A key feature of NHS 111 is the use of non-clinical call handlers to assess calls. A systematic review of appropriateness of and compliance with telephone triage [12] found only two papers on non-clinical triageurs and these were of little relevance to NHS 111 as no assessment software was used.

Strengths and limitations

This evaluation has three strengths. First, there is little research evidence about telephone triage services operated by non-clinical call handlers, and the impact of telephone triage services on use of the emergency and urgent care system, making this evaluation of NHS 111 a valuable addition to the evidence base. Second, the evaluation is timely given that NHS 111 was established in pilot status in 2010 and is being rolled out nationally in England during 2012/13. Third, it is a large controlled study that has included data from a population of 3.6million people over 36 months on the use of five services as well as NHS111. The evaluation has three limitations. First, there was considerable 'noise' in the analysis of impact on services in terms of changes made to the range of services in the emergency and urgent care system other than NHS 111 in both the pilot and control sites. We recorded 13 different system changes across the pilot and control sites. This made it challenging to detect the effect of NHS 111 but the time series analysis was a sophisticated approach to deal with these difficulties. Second, there was no routine data available for a key service that may have been impacted by NHS 111: day time general practice, so the effects on this part of the system remain unknown. Finally, the timing of policy evaluations must be balanced to ensure early feedback to policy makers but also to allow for a service to become established. This evaluation is based on the first year of operation of a new service and so whilst early lessons are valuable the impact may change as the service matures and develops.

Implications

The findings of this study raise five key questions for the development of a national service. First, the four NHS 111 pilots did not produce some of the key expected benefits in their first year of operation. In all four pilot sites there was an increase in emergency ambulance incidents compared to controls and this was statistically significant in one service and for all services combined. The benefit expected was a reduction in use of this service in the longer term. In 2011/12 ambulance services in England attended 6.71 million incidents [13] and the 2.9% increase in ambulance incidents we have estimated could potentially result in an additional 195,000 annual attendances nationally or about 14,500 extra attendances for an

ambulance service attending 500,000 incidents per year. It is important to further investigate and understand how the assessment system triages calls to the ambulance service in order to avoid unnecessary use of emergency ambulances.

Second, all four pilot sites used the same call assessment system – NHS Pathways – to manage calls to NHS 111. This means the findings reflect the inherent characteristics of the NHS Pathways system such as the levels of caution and risk built in to the assessment algorithms, particularly as it is designed to be used by non-clinical call handlers. There may be less flexibility to change decisions compared to assessments made by nurses [14] and it is possible than a different call assessment system could produce different results.

Third, during our evaluation NHS Direct was still running as an alternative service. The policy plan is that NHS 111 will replace NHS Direct and there are significant implications to this strategy. NHS Direct was established to direct people to the right place but also in practice offers advice to people who do not need contact with a service. The emphasis of NHS 111 is on direction to right place rather than reassurance and self care advice. In our evaluation NHS 111 managed predominantly out of hours calls for urgent healthcare. If current callers to NHS Direct are shifted to NHS 111 the call volumes may increase substantially, the characteristics of the population using the service may change and consideration will need to be given to how the principles of NHS 111 in terms of immediate access without waiting, particularly for clinical advice, can be sustained.

Fourth, another important question to consider is whether the introduction of NHS 111 is creating supplier induced demand and therefore increasing overall demand for emergency and urgent care. There was some evidence from our system impact analysis that emergency and urgent care service use had increased overall but we cannot say if this is a real increase in demand or a shift from in hours GP services. It is possible that, once NHS 111 is a national service with a higher profile, demand for the service could change either by generating new demand or by people using it as an alternative to in hours primary care, or a combination of both.

Finally, it is useful to reflect on the expectations of the service. The provision of a telephone service which quickly guides people needing urgent care advice to the most appropriate service is sensible given repeatedly expressed concerns by the general public about confusion around which service to access when needing urgent care. Key aspects of the service such as an easy-to-remember number, emphasis on fast triage and smooth transfer to the 'right service, first time' are desired by the general public. In our evaluation we found that alongside implementation of NHS 111 there were various re-organisations of servicesand implementation of demand management schemes in both the pilot and control sites. It is probably unrealistic to expect any one service, such as NHS 111, to do everything and real improvements may only be gained when a series of co-ordinated measures designed to increase efficiency across all services are implemented.

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Data Sharing:
A dataset of aggregated monthly contact counts for 5 emergency and urgent care services in 7 sites for 36 months is available on request from the corresponding author at j.turner@sheffield.ac.uk
The Department of Health publish monthly open access activity data for NHS 111 services available at http://transparency.dh.gov.uk/category/statistics/nhs-111-statistics/

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Table 1: Demographic characteristics of pilot and control sites

	Pilot Sites				Control Sites		
	Durham & Darlington	Nottingham	Lincolnshire	Luton	North of Tyne	Norfolk	Leicester City
Population (000's)	620	305	735	700 (Northamptonshire)	780	740	280
SHA	North East	East Midlands	East Midlands	East of England	North East	East of England	East Midlands
ONS Area Classification of Primary Care Organisations	Industrial Hinterlands	Centres with Industry	Prospering small towns	London Suburbs	Industrial Hinterlands Prospering small towns	Prospering small towns	Centres with Industry
ONS Rural/Urban Local Authority Classification	Predominantly Urban Predominantly Rural	Predominantly Urban	Predominantly Rural	Predominantly Urban	Predominantly Urban Predominantly Rural	Predominantly Rural	Predominantly Urban
NHS 111 service live	August 2010	November 2010	November 2010	December 2010			

Table 2: Total numbers of NHS 111 calls received, answered, triaged and transferred for nurse assessment in one year

	Durham & Darlington	Nottingham City	Lincolnshire	Luton	All NHS 111 sites
Population covered	606,800	300,800	700,300	194,300	1,802,200
Total number of calls connected to 111	209,633	58,397	102,611	38,210	408,851
Direct dial 111 n (%)	106,961 (51)	18,354 (31.4)	102,611 (100)	23,264 (60.8)	251,190 (61.4)
Switched from other sources n (%)	102,672 (49)	40,043 (68.6)	0	14,946 (39.2)	157,661 (38.6)
Answerable calls n (%)	165,355 (78.9)	56,539 (96.8)	100,144 (97.6)	37,497 (98.1)	359,535 (87.9)
Answered calls n (% of answerable calls)	161,082 (97.4)	55,564 (98.2)	99,381 (99.2)	37,073 (98.8)	353,100 (98.2)
Triaged calls n (% of answered calls)	114,686 (71.2)	44,937 (80.9)	85,509 (86.0)	32,031 (86.4)	277,163 (78.5)
Transferred to nurse n (% of triaged calls)	24,488 (21.3)	13,261 (29.5)	28,871 (33.7)	10,779 (33.6)	77,399 (27.9)
Triaged calls per year per 1,000 people	189	150	122	165	154

Table 3 Summary of estimated effects of NHS 111 on other emergency and urgent care services: % change in monthly activity counts

Service activity	Pilot only model - Estimated change in monthly service activity per 1000 triaged NHS 111 calls after the introduction of NHS 111	Pilot v Control model – estimated % change in monthly activity (95%CI)in pilot sites compared to control sites after the introduction of NHS 111
ED attendances	-1 (-66, +64) fewer attendances	-0.1% (-3.8%, +3.7%)
GPOOH, WiC, UCC. MIU attendances	+47 (-66, +159) extra attendances	+2.5% (-3.5%, +8.5%)
Calls to NHS Direct	-102 (-130, -74) fewer calls	-19.3% (-24.6%, -14.0%)
Calls to 999 ambulance service	+3 (-31, +37) more calls	+0.3% (-3.1%,+3.7)
Ambulance 999 incidents where an ambulance arrives at the incident scene	+24 (+8, +39) more incidents	+2.9% (+1.0%,+4.8%)

Table 4: Average monthly contacts (000s) with services in the emergency and urgent care system before and after the launch of NHS 111 (based on routine data)

	Durham & Darlington		Change (%)	Nottingham		Change (%)	Luton		Change (%)	Lincolnshire		Change (%)
	Before	After		Before	After		Before	After		Before	After	
EDs	13675	13142	-3.9	7505	7945	+5.8	3474	3638	+4.7	14293	14117	-1.2
Urgent	13667	14729	+7.7	8561	9424	+11	7573	6135	-19	12374	13222	+6.8
NHS Direct	3978	2201	-44.7	3016	2186	-27.5	1547	1068	-31	3660	2655	-27.2
Ambulance calls	6479	6895	+6.4	4824	5319	+10.3	2626	2857	+8.8	7307	8480	+16.1
Ambulance incidents	5304	5734	+8.1	4276	4538	+6.1	2239	2488	+11.1	6989	7657	+9.6
All services	43103	42701	-1	28182	29412	+4.2	17459	16186	-7.3	44623	46131	+3.3
Estimated NHS 111	0	10000		0	3500		0	3000		0	10000	
Total with NHS 111	43103	52701	+18.2	28182	32914	+14.4	17459	19186	+9.1	44623	56131	+20.5
Total contacts assuming all NHS Direct calls taken by NHS 111	43103	50924	+15.4	28182	32084	+12.2	17459	18707	+6.7	44623	55126	+19
Total contacts assuming all NHS Direct calls and all estimated GP OOH calls taken by NHS 111	48003	50924	+5.7	30582	32084	+4.7	17459	18707	+6.7	48523	55126	+12

Impact of the urgent care telephone service NHS 111 pilot sites: a controlled before and after study

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Abstract

Objectives: To measure the impact of the urgent care telephone service NHS 111 on the emergency and urgent care system.

Design: Controlled before and after study using routine data.

Setting: Four pilot sites and three control sites covering a total population of 3.6million in England, UK.

Participants and data: Routine data on 36 months of use of emergency ambulance service calls and incidents, emergency department attendances, urgent care contacts (GP out of hours, walk in and urgent care centres) and calls to the telephone triage service NHS Direct.

Intervention: NHS 111, a new 24 hour 7 day a week telephone service for non-emergency health problems, operated by trained non-clinical call handlers with clinical support from nurse advisors, using NHS Pathways software to triage calls to different services and home care.

Main outcomes: Changes in use of emergency and urgent care services.

Results: NHS 111 triaged 277,163 calls in the first year of operation for a population of 1.8 million. There was no change overall in emergency ambulance calls, emergency department attendances or urgent care use. There was a 19.3% reduction in calls to NHS Direct (95%CI -24.6% to14.0%) and a 2.9% increase in emergency ambulance incidents (95%CI 1.0% to 4.8%). There was an increase in activity overall in the emergency and urgent care system in each site ranging from 4.7 -12% per month and this remained when assuming that NHS 111 will eventually take all NHS Direct and GP Out of Hours calls.

Conclusions: In its first year of operation in four pilot sites NHS 111 did not deliver the expected system benefits of reducing calls to the 999 ambulance service or shifting patients to urgent rather than emergency care. There is potential that this type of service increases overall demand for urgent care.

Article Summary

Article Focus

- NHS 111 is a new telephone service for accessing urgent care where calls are assessed by non-clinical call handlers with clinician support.
- The aim of the service is to direct callers to the "right place, first time" and improve emergency and urgent care system efficiency.
- We have evaluated the first year of operation in four pilot sites to assess whether the new service achieves the objective of improving system efficiency.

Key messages

- In the first year of operation 72% of triaged calls to NHS 111 were managed by non-clinical call handlers and the service met quality standards.
- NHS 111 did not achieve the objective of increasing emergency and urgent care system efficiency. There was a significant increase in emergency ambulance incidents and an overall increase in use of emergency and urgent care services.

Strengths and limitations

- This is the first controlled evaluation of the impact of the NHS 111 service on the emergency and urgent care system in England. This is timely as the service is being rolled out nationally.
- There is limited evidence on the use of non-clinical call handlers to triage requests for urgent care and this study adds to the evidence base.
- Although we conducted a controlled study other system changes made it difficult to isolate the effects of NHS 111 and we were unable to assess the potential impact on in hours GP services.

Introduction

A consultation by policy makers in England identified that a key frustration in the general population was access to urgent ~~urgent~~ care~~. for urgent health problems that are not emergencies, that is, are not life-threatening or life changing~~.[1] Urgent care is defined as "the range of responses to people who require or perceive they need for urgent advice, care, treatment or diagnosis".[1] Problems faced by users of emergency and urgent care included a lack of awareness of services available, confusion about which service to access and multiple service contacts for the same episode.[2] In England in 2000 a national 24 hour telephone line for advice about health problems, NHS Direct, was established to address similar frustrations. Calls are answered by a non-clinical call handler and assessed by a nurse either immediately or with a later call back. Despite this service the national consultation found that access problems persisted.[1]

NHS 111 was developed as a solution to these problems by offering a telephone service to manage all requests for urgent help[3] including requests for out of hours primary care, urgent problems that may currently be directed to 999 ambulance services and health information and advice. The ~~with some~~ key differences from NHS Direct are - access via a free to call, easily remembered three digit telephone number '111'; calls answered and assessed immediately by a trained non-clinical call handler without waiting or call backs; only some calls assessed by a nurse; and integration of the assessment system with services enabling direct referral to, or appointments to be made with, some services at the time of the call.

The expected benefits of NHS 111 were to improve access to urgent care, increase efficiency by directing people to the 'right place first time' including self care advice, increase satisfaction with urgent care and the national health service (NHS) generally, and in the longer term reduce unnecessary calls to the 999 emergency ambulance service and so begin to rectify concerns about inappropriate use of emergency services.[4]

NHS 111 was established in four pilot sites in England in 2010. It is rapidly becoming available nationally and there is international interest in telephone access to urgent care via non-clinical triage. A mixed methods evaluation focusing on processes, outcomes and costs was conducted in the four pilot sites. We report here on the specific outcome of NHS 111 improving efficiency of service use across the emergency and urgent care system by shifting care from emergency to urgent services. The objective was to assess the impact of NHS 111 on the emergency and urgent care system by examining demand for other urgent and emergency care services to detect if there was any change in how services were used.

Methods

Setting and service

Pilot services were established in four geographical areas defined by primary care trusts, the health care commissioning organisations operating in England in 2010. Durham & Darlington is an urban area with a population of around 606,000; Nottingham is a city of around 300,000 with a large minority ethnic population; Luton is a city of around 200,000 with a large minority ethnic population; and Lincolnshire is a largely rural area with a city, of population 700,000. The four sites were chosen by the English Department of Health following a request for expressions of interest from commissioning organisations already planning or considering changing telephone access to urgent care. Call handling was provided by an ambulance service in one site and NHS Direct in three sites. In all sites NHS 111 could be accessed directly by dialling "111" or indirectly where GP out of hours call handling services were routed to NHS 111. Calls to NHS 111 are answered and assessed by trained non-clinical call handlers using the NHS Pathways assessment system.[5] If needed, calls can be transferred for additional assessment and advice from an onsite trained nurse. At the end of the assessment callers are matched to the most appropriate service available at the time of their call from a range of services within the callers' locality using an electronic Directory of Services linked to the assessment system. This can include emergency ambulance, emergency department, urgent care centre, walk in centre, minor injury unit, general practice (GP) out of hours service, in hours GP, community services, or home care. Referrals can be made to some services by NHS 111 at the time of the call, for example, direct dispatch of an emergency ambulance, appointment booking and transfer of the call to another telephone based service. A description of the NHS 111 service is provided as a supplemental file [S1].

Design

The design of this part of the evaluation was a descriptive study of NHS 111 service use and a controlled before and after study using a time series analysis of routine service activity data. Control sites were selected to match equivalent geographical areas to the pilot sites using a two stage process: 1) potential sites were identified by primary care trust area type (county or city), urban/rural mix and same Strategic Health Authority (SHA) or nearest neighbour; 2) from 12 potential sites the final choice was made after matching for a range of 18 criteria based on population demographics, lifestyle, health profile and health service use. A table listing all criteria is provided as a supplemental file [S2]. It was important that control sites had no plans to introduce NHS 111 or make major changes to their emergency and urgent care system in the time frame of the evaluation. We identified three suitable control sites: North of Tyne, Leicester and Norfolk. Leicester was the best match for two pilot sites (Nottingham and Luton). The control site for Luton is not in the same SHA but was the best match for all other criteria and was the only suitable nearest neighbour SHA. For the main impact analysis sites have been combined to provide single pilot and control sites. The characteristics of the pilot and control sites are presented in Table 1. For the analyses reported here data from all pilot sites were combined and compared with data from all

control sites. Randomisation of sites to be pilots or controls was not possible because the four pilot sites were pre-selected by the Department of Health.

The four pilot sites became fully operational at different times from July to December 2010. The study periods used were the first full year of operation of NHS 111 and the corresponding 2 years prior to the service starting. During the course of the evaluation NHS Direct continued to operate as a national service within the pilot site areas.

Participants

Participants were users of the emergency and urgent care systems in the seven pilot and control sites recorded in routine service activity data as having accessed and used a range of emergency or urgent care services during the study periods.

Data collection

Use of NHS 111

A minimum data set (MDS) was created by the English Department of Health to provide information on NHS 111 service operation. All NHS 111 services submit monthly data and a MDS of activity for combined and individual services is published each month by the Department of Health.[6] The MDS records activity include numbers of: calls to the service; abandoned calls; triaged calls and transfer times for calls requiring clinical advice from a nurse. The dispositions of NHS 111 calls are recorded in five main categories: 1) ambulance dispatches; 2) recommended to attend Emergency Department; 3) recommended to attend primary and community care (including GP, urgent care, dental and pharmacy services); 4) recommended to attend another service (including community nursing, midwives, social services, opticians); 5) not recommended to attend a service (including home or self care and health information). We used the monthly routine minimum data set counts for each pilot site for the first year of operation to describe call volumes, numbers and proportions of triaged calls and calls passed for nurse assessment and the disposition arrived at following NHS Pathways assessment.

Routine data on use of key services

NHS 111 had the potential to produce an impact on activity across a range of emergency and urgent care services: calls to the emergency ambulance service; ambulance incidents, that is, an ambulance is sent and arrives at~~sent to~~ the scene of the emergency incident; emergency department (ED) attendances; contacts with urgent care services such as GP out of hours, urgent care centres, walk in centres or minor injury units; the telephone triage

service NHS Direct; same day general practice attendances; and a range of community services such as district nursing, dentists and pharmacies. Data are routinely available for ~~the first five services only. We collected monthly counts of use of these services (ambulance~~ calls and incidents, ED, urgent care and NHS Direct) by residents in the seven geographical areas – four pilot and three control sites - for 24 months prior to the start of NHS 111 (2008-10) and the same data plus calls to NHS 111 in the pilot areas for 12 months after (2010-11). Due to a lack of data availability for separate urgent care services, we had to combine data for out of hours primary care contacts, walk in centre attendances and urgent care centre attendances. The sources of this data were NHS data collections (Secondary Users Service and Weekly Situation reports) and local management information reports provided by the study sites. . For local management information reports a set of data items and definitions was used to standardise data collection across all sites. In one pilot area data on one urgent care contact data item was missing and therefore inputted from the previous and subsequent 3 months activity. All~~This~~ data was collected and collated by the Department of Health Commissioning Analysis and Intelligence Team~~.~~

We also needed to account for changes to services in the emergency and urgent care system other than NHS 111 occurring in the 36 months. NHS 111 leads and control site evaluation contacts were asked to provide details of changes to emergency and urgent care services occurring in study sites during the study time periods. We also searched primary care trust annual reports for 2009/10 and 2010/11 for each study site to identify any reported major changes to the emergency and urgent care system.

Analysis

For the service use analysis we fitted a time series regression model [7] to the combined pilot site counts to test for preliminary evidence that service use had changed over time. This model consisted of a month effect to help explain variation due to seasonal fluctuations, an overall trend, a before and after step term for other potentially significant changes introduced into the pilot site, and a term for before and after the time when NHS 111 was launched. This was the pilot only model.

We then tested for changes in the pilot sites compared to the control sites using time series regression to test for the impact of NHS 111. We used a simple model with three main elements: 1) The basic model, consisting of a linear time trend in activity over the 36 months constrained to be the same in the pilot and control sites, plus a seasonal effect and a site effect. 2) Site specific before and after terms to allow for effects of potentially significant service changes other than NHS 111 introduced during the 36 months e.g. relocation of an emergency department. 3) A term for the regression of the monthly activity counts on the volume of NHS 111 calls that were triaged that month (the 'dose'). By definition the dose is zero for all months in the control sites and up until the launch of NHS 111 in the pilot sites. This regression allowed us to directly estimate the impact of different levels of NHS 111 activity.

We used the regression coefficient to estimate the impact on monthly service use per thousand NHS 111 calls for the pilot sites. The models were fitted and coefficients and standard errors estimated assuming normal errors with constant variance in the monthly activity counts. To check the assumption of constant variance, we also fitted models to the square root of the counts which helps stabilise the variance. This produced no important differences in fit so results using the raw count models are reported here as the pilot versus control model. We used the Prais-Winsten procedure in STATA version 12 to fit the time series regression models.[8]

We considered the potential impact of NHS 111 on overall demand for the emergency and urgent care system as this adds an extra service and can potentially add an extra contact if it does not reduce use of other services in the system. We used the routine data to measure monthly use of the different services in each pilot site before and after the introduction of NHS 111 and hence overall use of the emergency and urgent care system. We have then estimated the effect on the system taking two additional factors in to account 1) in the "after" period NHS Direct and NHS 111 were operating concurrently so we have estimated the effect if all NHS Direct calls are taken by NHS 111 and 2) in the "before" period GP out of hours calls (rather than contacts) were taken by a number of providers so we have estimated the number of these calls using the routine NHS 111 data on calls diverted from out of hours providers. The assumption of all NHS Direct and out of hours calls being managed by NHS 111 reflects the intended national service.

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Results

Use of NHS 111

In the first year of operation over 400,000 calls were made to NHS 111 (Table 2). Two thirds were direct dial of the telephone number '111' by members of the general public and the other third were routed to the service from GP out of hours services. 22% of calls were unanswerable because the caller hung up within 30 seconds. These calls were predominately not intended for NHS 111 but were from people calling their general practice in the morning to make an appointment with their GP before the out of hours rerouting mechanism was switched off. 98% of answerable calls were answered and 277,163 (78%) of these were triaged by a call handler using the NHS Pathways assessment system. Reasons for not triaging calls were that the caller hung up, the call was transferred without triage (for example for a 999 ambulance), or health information only was given. The annual rate of triaged calls per 1000 population was 154. All pilot sites met national quality requirements for call abandonment rates of no more than 5%, and 95% of calls answered within 60

seconds. 28% of calls were transferred to a nurse for clinical advice although transfers were lower in the ambulance service provided site (21.3%) than in the NHS Direct provided sites (27.9 – 33.7%). For all sites combined, over half of triaged calls were assessed as requiring primary or urgent care, that is, GP practice, GP out of hours, walk in centres, urgent care centres, minor injury units, dental service or pharmacist (Figure 1).

Impact on emergency and urgent care services

Across all pilot and control sites there were 13 other system changes reported that were taken in to account in the analysis including the opening, closing and relocation of urgent care and walk in centres, relocation of an emergency department, ED attendance reduction schemes, ambulance service conveyance direct to walk in centres and related publicity campaigns.

Following the introduction of NHS 111, in individual pilot sites there was a statistically significant reduction in urgent care attendances in one site; reduction in calls to NHS Direct in three sites; reduction in ambulance emergency calls in one site and increase in one site, and an increase in ambulance incidents in one site.

For all sites combined, overall, there was no change in three of the five services measured that could be attributed to NHS 111 (Table 3). There was a large and statistically significant reduction in calls to NHS Direct of 102 fewer NHS Direct calls per triaged 1000 calls to NHS 111 equating to a 19.3% (95% CI -24.6% to14.0%) reduction in monthly NHS Direct activity. There was also a small and statistically significant increase in numbers of ambulance incidents of an extra 24 ambulance incidents per 1000 triaged calls to NHS 111 equating to an increase of 2.9% (95% CI 1.0% to 4.8%) in monthly ambulance activity.

~~For all sites and services combined,~~ The counts of contacts with all services in the pilot sites shows that monthly use of the established services in the system slightly increased or slightly decreased, depending on the site but ~~monthly use of the established services in the system varied depending on the site but~~ when NHS 111 use was added in, there was an increase in activity overall in every site. When taking in to account the assumption that in the future all NHS Direct and all GP out of hours calls will be directed to NHS 111 ~~and~~ this increase, ranging from 4.7 -12% per month, remained. ~~with the assumption that NHS 111 will eventually take all NHS Direct calls and GP Out of Hours calls~~ (Table 4).

Discussion

Summary of findings

In ~~its~~ the first year of operation NHS 111 ~~in~~ pilot sites triaged almost 300,000 calls, 72% of these calls were managed by non-clincial callhandlers and just over half of calls were directed to primary care. However, there was no evidence that NHS 111 changed use of most of the emergency and urgent care services it was possible to measure. There was a

large reduction in use of NHS Direct as calls transferred to NHS 111 but an increase in numbers of emergency ambulances sent to patients and there is potential that overall demand for services across the emergency and urgent care system could increase.

Context of other evidence

Policy makers in England established the first national telephone triage service in the world - NHS Direct - and there was considerable international interest in both this service and the evaluation of its pilot.[9] A Cochrane systematic review of the impact of telephone triage services identified that little research had been undertaken on the effect of these telephone services on emergency services.[10] The lack of impact of NHS 111 on emergency department attendances replicates the findings from the earlier evaluation of NHS Direct pilots.[11] The increase in ambulance incidents found in our study was not found for NHS Direct pilots. There is some evidence that telephone triage can reduce the use of general practice and general practice out of hours.[10, 11] A lack of routine data available for daytime general practice services in our study means we were unable to assess the impact of NHS 111 on use of general practice.

A key feature of NHS 111 is the use of non-clinical call handlers to assess calls. A systematic review of appropriateness of and compliance with telephone triage [12] found only two papers on non-clinical triageurs and these were of little relevance to NHS 111 as no assessment software was used.

Strengths and limitations

This evaluation has three strengths. First, there is little research evidence about telephone triage services operated by non-clinical call handlers, and the impact of telephone triage services on use of the emergency and urgent care system, making this evaluation of NHS 111 a valuable addition to the evidence base. Second, the evaluation is timely given that NHS 111 was established in pilot status in 2010 and is being rolled out nationally in England during 2012/13. Third, it is a large controlled study that has included data from a population of 3.6million people over 36 months on the use of five services as well as NHS111. The evaluation has three limitations. First, there was considerable 'noise' in the analysis of impact on services in terms of changes made to the range of services in the emergency and urgent care system other than NHS 111 in both the pilot and control sites. We recorded 13 different system changes across the pilot and control sites. ~~including relocation of an emergency department, reconfiguration of walk in and urgent care centres and emergency department diversion schemes.~~ This made it challenging to detect the effect of NHS 111 but the time series analysis was a sophisticated approach to deal with these difficulties. Second, there was no routine data available for a key service that may have been impacted by NHS 111: day time general practice, so the effects on this part of the system remain unknown. Finally, the timing of policy evaluations must be balanced to ensure early feedback to policy makers but also to allow for a service to become established. This evaluation is based on the

first year of operation of a new service and so whilst early lessons are valuable the impact may change as the service matures and develops.

Implications

The findings of this study raise ~~four~~ five key questions for the development of a national service. First, the four NHS 111 pilots did not produce some of the key expected benefits in their first year of operation. In all four pilot sites there was an increase in~~fact they increased use of~~ emergency ambulance incidents compared to controls and this was statistically significant in one service and for all services combined. T~~when t~~he benefit expected was a reduction in use of this service in the longer term. In 2011/12 ambulance services in England attended 6.71 million incidents [13] and the 2.9% increase in ambulance incidents we have estimated could potentially result in an additional 195,000 annual attendances nationally or about 14,500 extra attendances for an ambulance service attending 500,000 incidents per year. It is important to further investigate and understand how the assessment system triages calls to the ambulance service in order to avoid unnecessary use of emergency ambulances.

Second, all four pilot sites used the same call assessment system – NHS Pathways – to manage calls to NHS 111. ~~From an evaluation point of view this provided an advantage as the assessment system was consistent. Different systems would have added another confounder particularly to the impact analysis. However, it does~~ This means the findings reflect the inherent characteristics of the NHS Pathways system such as the levels of caution and risk built in to the assessment algorithms, particularly as it is designed to be used by non-clinical call handlers. There may be less flexibility to change decisions compared to assessments made by nurses [14] and i~~t~~t is possible than a different call assessment system could produce different results.~~.~~

Third~~Second~~, during our evaluation NHS Direct was still running as an alternative service. The policy plan is that NHS 111 will replace NHS Direct and there are significant implications to this strategy. NHS Direct was established to direct people to the right place but also in practice offers advice to people who do not need contact with a service. The emphasis of NHS 111 is on direction to right place rather than reassurance and self care advice. In our evaluation NHS 111 managed predominantly out of hours calls for urgent healthcare. If current callers to NHS Direct are shifted to NHS 111 the call volumes may increase substantially, the characteristics of the population using the service may change and consideration will need to be given to how the principles of NHS 111 in terms of immediate access without waiting, particularly for clinical advice, can be sustained.

Fourth~~Third~~, another important question to consider is whether the introduction of NHS 111 is creating supplier induced demand and therefore increasing overall demand for emergency and urgent care. There was some evidence from our system impact analysis that emergency and urgent care service use had increased overall but we cannot say if this is a real increase in demand or a shift from in hours GP services. It is possible that, once NHS 111 is a national service with a higher profile, demand for the service could change either by generating new demand or by people using it as an alternative to in hours primary care, or a combination of both.

Finally, it is useful to reflect on the expectations of the service. The provision of a telephone service which quickly guides people needing urgent care advice to the most appropriate service is sensible given repeatedly expressed concerns by the general public about confusion around which service to access when needing urgent care. Key aspects of the service such as an easy-to-remember number, emphasis on fast triage and smooth transfer to the 'right service, first time' are desired by the general public. In our evaluation we found that alongside implementation of NHS 111 there were various re-organisations of servicesand implementation of demand management schemes in both the pilot and control sites. It is probably unrealistic to expect any one service, such as NHS 111, to do everything and real improvements may only be gained when a series of co-ordinated measures designed to increase efficiency across all services are implemented.

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Data Sharing:
A dataset of aggregated monthly contact counts for 5 emergency and urgent care services in 7 sites for 36 months is available on request from the corresponding author at j.turner@sheffield.ac.uk
The Department of Health publish monthly open access activity data for NHS 111 services available at http://transparency.dh.gov.uk/category/statistics/nhs-111-statistics/

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Contributors:
JT and AOC conceived the study and designed it with help from JN and EK. JN conducted the system impact analysis. JT wrote the first draft of the paper. All authors assisted in the

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Ethics:
The study was approved by the Leeds (Central) Research Ethics Committee Reference number 10/H1313/57. NIHR CRN study ID: 9275

Competing interests:

All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare: the Department of Health Policy Research programme provided grant funding to the Medical Care Research Unit, University of Sheffield. AOC and JN are co-applicants on a research grant with NHS Direct studying tele-health for people with long term conditions. A family member of AOC won a contract to offer patient feedback for NHS 111 sites in London in June 2012.

~~Figure 1 – Percentage of triaged NHS 111 calls allocated to each emergency and urgent care service in four pilots sites in first year of operation~~

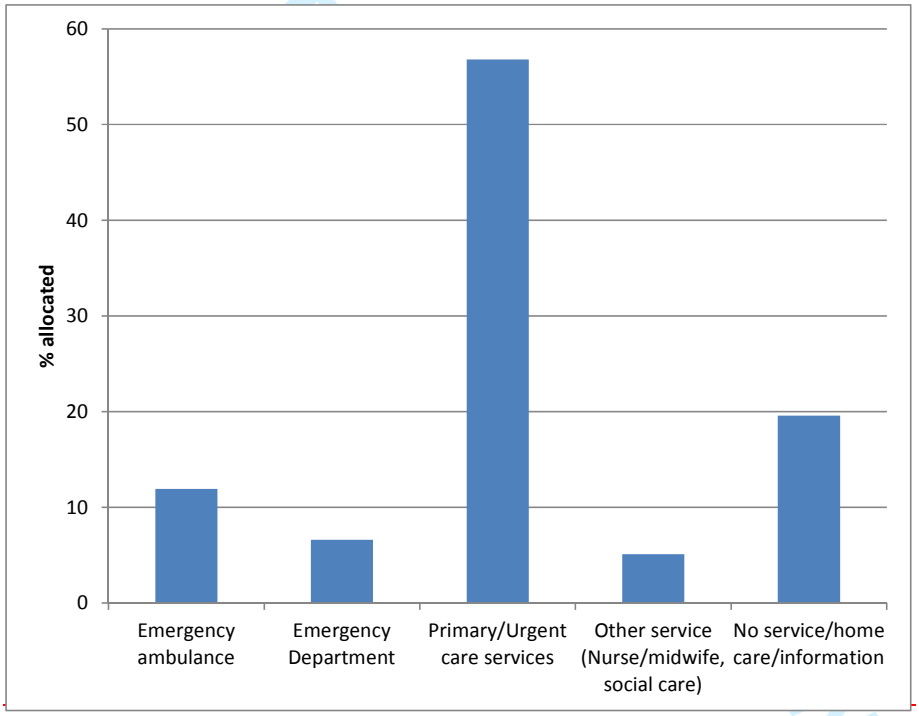

Table 1: Demographic characteristics of pilot and control sites

	Pilot Sites				Control Sites		
	Durham & Darlington	Nottingham	Lincolnshire	Luton	North of Tyne	Norfolk	Leicester City
Population (000's)	620	305	735	700 (Northamptonshire)	780	740	280
SHA	North East	East Midlands	East Midlands	East of England	North East	East of England	East Midlands
ONS Area Classification of Primary Care Organisations	Industrial Hinterlands	Centres with Industry	Prospering small towns	London Suburbs	Industrial Hinterlands Prospering small towns	Prospering small towns	Centres with Industry
ONS Rural/Urban Local Authority Classification	Predominantly Urban Predominantly Rural	Predominantly Urban	Predominantly Rural	Predominantly Urban	Predominantly Urban Predominantly Rural	Predominantly Rural	Predominantly Urban
NHS 111 service live	August 2010	November 2010	November 2010	December 2010			

Table 2: Total numbers of NHS 111 calls received, answered, triaged and transferred for nurse assessment in one year

	Durham & Darlington	Nottingham City	Lincolnshire	Luton	All NHS 111 sites
Population covered	606,800	300,800	700,300	194,300	1,802,200
Total number of calls connected to 111	209,633	58,397	102,611	38,210	408,851
Direct dial 111 n (%)	106,961 (51)	18,354 (31.4)	102,611 (100)	23,264 (60.8)	251,190 (61.4)
Switched from other sources n (%)	102,672 (49)	40,043 (68.6)	0	14,946 (39.2)	157,661 (38.6)
Answerable calls n (%)	165,355 (78.9)	56,539 (96.8)	100,144 (97.6)	37,497 (98.1)	359,535 (87.9)
Answered calls n (% of answerable calls)	161,082 (97.4)	55,564 (98.2)	99,381 (99.2)	37,073 (98.8)	353,100 (98.2)
Triaged calls n (% of answered calls)	114,686 (71.2)	44,937 (80.9)	85,509 (86.0)	32,031 (86.4)	277,163 (78.5)
Transferred to nurse n (% of triaged calls)	24,488 (21.3)	13,261 (29.5)	28,871 (33.7)	10,779 (33.6)	77,399 (27.9)
Triaged calls per year per 1,000 people	189	150	122	165	154

Table 3 Summary of estimated effects of NHS 111 on other emergency and urgent care services: % change in monthly activity counts

Service activity	Pilot only model - Estimated change in monthly service activity per 1000 triaged NHS 111 calls after the introduction of NHS 111	Pilot v Control model – estimated % change in monthly activity (95%CI)in pilot sites compared to control sites after the introduction of NHS 111
ED attendances	-1 (-66, +64) fewer attendances	-0.1% (-3.8%, +3.7%)
GPOOH, WiC, UCC. MIU attendances	+47 (-66, +159) extra attendances	+2.5% (-3.5%, +8.5%)
Calls to NHS Direct	-102 (-130, -74) fewer calls	-19.3% (-24.6%, -14.0%)
Calls to 999 ambulance service	+3 (-31, +37) more calls	+0.3% (-3.1%,+3.7)
Ambulance 999 incidents where an ambulance arrives at the incident scene	+24 (+8, +39) more incidents	+2.9% (+1.0%,+4.8%)

~~*Net change is the change (before to after) in the pilot sites minus the change in the control sites.~~

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Table 4: Average monthly contacts (000s) with services in the emergency and urgent care system before and after the launch of NHS 111 (based on routine data)

	Durham & Darlington		Change (%)	Nottingham		Change (%)	Luton		Change (%)	Lincolnshire		Change (%)
	Before	After		Before	After		Before	After		Before	After	
EDs	13675	13142	-3.9	7505	7945	+5.8	3474	3638	+4.7	14293	14117	-1.2
Urgent	13667	14729	+7.7	8561	9424	+11	7573	6135	-19	12374	13222	+6.8
NHS Direct	3978	2201	-44.7	3016	2186	-27.5	1547	1068	-31	3660	2655	-27.2
Ambulance calls	6479	6895	+6.4	4824	5319	+10.3	2626	2857	+8.8	7307	8480	+16.1
Ambulance incidents	5304	5734	+8.1	4276	4538	+6.1	2239	2488	+11.1	6989	7657	+9.6
All services	43103	42701	-1	28182	29412	+4.2	17459	16186	-7.3	44623	46131	+3.3
Estimated NHS 111	0	10000		0	3500		0	3000		0	10000	
Total with NHS 111	43103	52701	+18.2	28182	32914	+14.4	17459	19186	+9.1	44623	56131	+20.5
Total contacts assuming all NHS Direct calls taken by NHS 111	43103	50924	+15.4	28182	32084	+12.2	17459	18707	+6.7	44623	55126	+19
Total contacts assuming all NHS Direct calls ~~taken by NHS 111~~ and all estimated GP OOH calls taken by NHS 111	48003	50924	+5.7	30582	32084	+4.7	17459	18707	+6.7	48523	55126	+12

S1: NHS 111 service description

Core service principles

The underlying principle of NHS 111 is that patients who request urgent medical care should be assessed and directed to the "right service first time". The main features of the service are that:

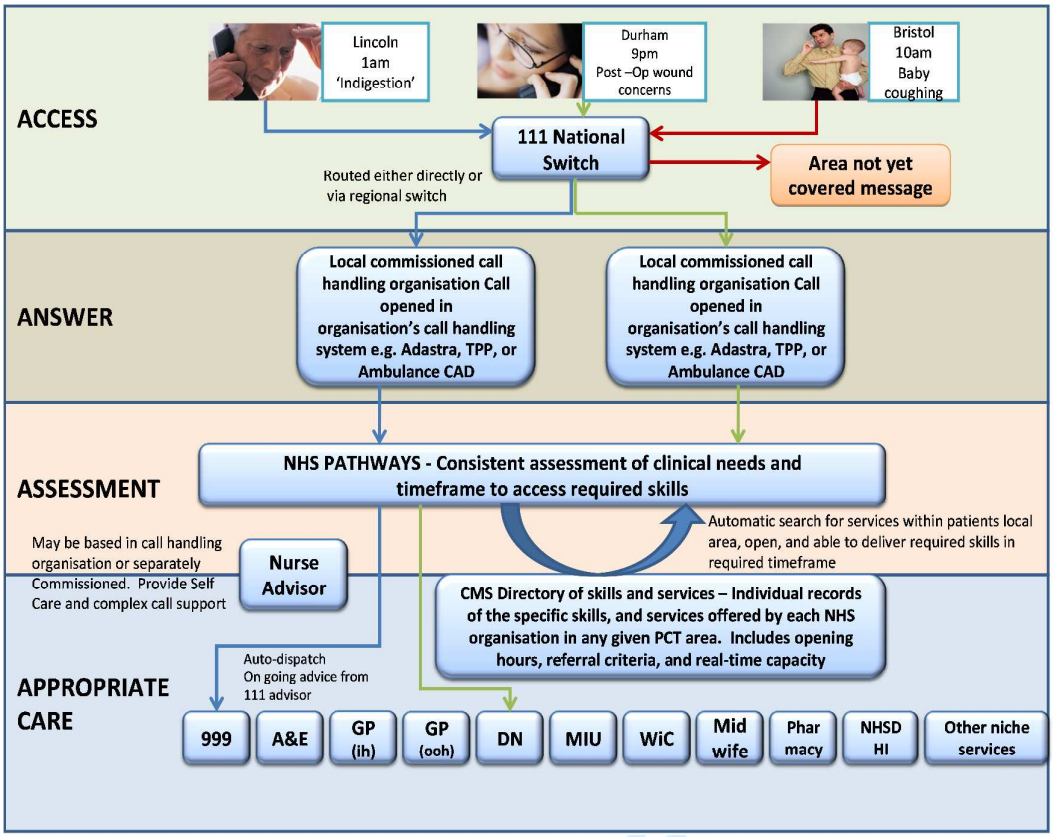
- The number is memorable and is free to use.
- Calls are assessed using an approved clinical assessment system to determine the most appropriate course of action for the patient at the first point of contact.
- Clinical assessment and provision of information, including clinician assessment, is completed on the first call without the need for a call back.
- Callers can be given health information, self care advice or directed to the most appropriate service available at the time of the call using an up to date skills based Directory of Services (DoS) for the patient's local area and without the need for re-triage.
- Where possible the NHS 111 service should develop real time links with urgent care providers so that information can be forwarded and appointments can be made for callers at the time of their call to NHS 111.
- Calls assessed as requiring an emergency ambulance response can be immediately directed to ambulance dispatch without the need for re-assessment.

NHS 111 therefore provides an integrated service that links clinical assessment with the services that are appropriate and available at the time of the call.

NHS 111 operational framework

Figure 4.1 illustrates the framework for the intended NHS 111 service during the initial pilot phase of the programme.

Figure 4.1 – Diagrammatic plan of the NHS 111 service



Source – NHS 111 Programme Board, 111 Service Specification version 1.2, May 2010

The operational framework consists of four linked steps:

1. *Access via the 111 telephone number* – Calls to NHS 111 can be routed in several ways and can be configured differently for different areas. The service can be accessed by callers only dialling 111, they may call another service such as a GP out of hours service and be asked to dial 111, or they may call another service and the call can be automatically switched to NHS 111 without the caller having to redial.
2. *Answer* – Calls are answered by a call handling service contracted to provide this service. The call handling service collects basic call details and then carries out the next step of clinical assessment.
3. *Clinical assessment* – In all four pilot sites a single clinical assessment system, NHS Pathways, is used as the clinical assessment system. NHS Pathways is a symptom based clinical assessment system used to triage calls from the public requesting emergency or

urgent healthcare and is used by ambulance services, GP out of hours services and other Single Point of Access telephone services for urgent care. The assessment is made by trained, non-clinical call advisors with clinician support available either on site. As call advisors ask symptom based questions, the answers to key indicator questions are flagged. The information from these answers is then used to match the clinical skills needed and the speed of response required for the clinical condition described to an appropriate service in step 4. In all sites most calls that may be suitable for self care advice or require referral to specialist services are transferred for clinical advice before a final disposition is reached.

4. *A web based Capacity Management System and Directory of Skills & Services (CMS/DoS)* is linked to the NHS Pathways clinical assessment system. This directory is populated locally and jointly by service commissioners and provider services. The available skills of each provider are specified, as are service operation guidance such as location, referral protocols and opening times. Services are matched to the clinical indicator flags in the clinical assessment system and appear to the call advisor in the order set by the service commissioner. The Capacity Management System operates in real time, taking account of what is available and current activity. This enables a call for urgent care to be automatically matched to a service with the right skills, location and within the required timeframe at the time of the call without having to manually search for an appropriate service. Where adequate technical links can be set up, appointments or other contacts can be made by the call adviser at the time of the call. Any provider service can be included in the CMS/DoS but, to ensure clinical safety, only some will be available for referral by an NHS Pathways call advisor. Other services, for example specialist nursing services, require additional clinician assessment before a referral can be made. The CMS/DoS system also provides activity and referral data for service monitoring and planning.

These four steps provide the overall framework for an NHS 111 service but within each step there are choices that can be made about how the service is delivered at a local level. Table 1 summarises the operating models used in the four pilot sites and illustrates the different approaches used.

Table 1: Description of four pilot site NHS 111 service models

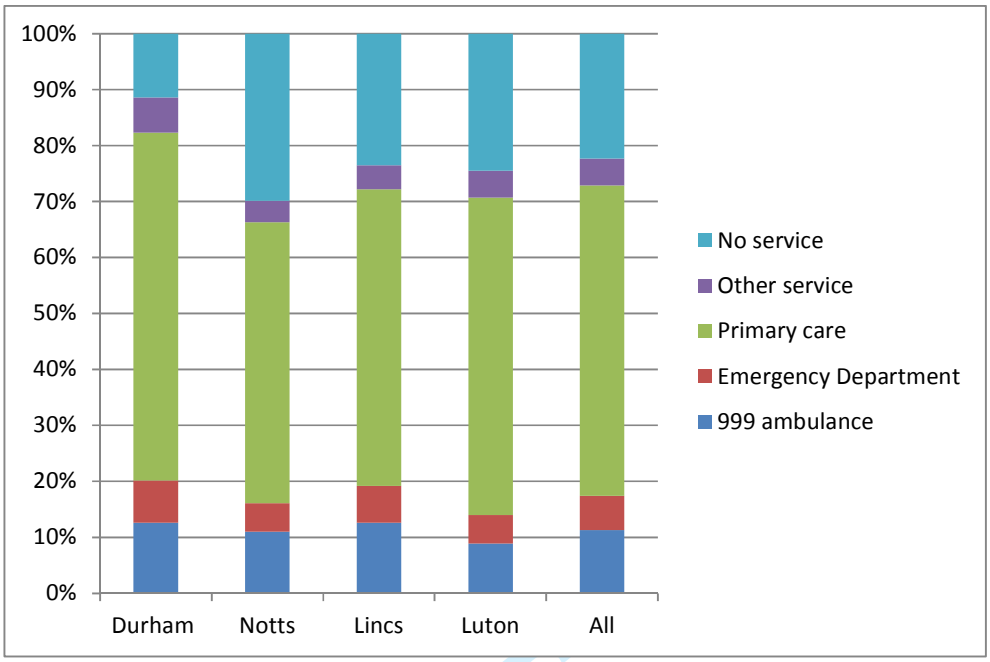
	CDD	Nottingham	Lincolnshire	Luton
Call routing	Direct dial 111 Auto routed to 111 from Single Point of Access number	Direct dial 111 Auto routed to 111 from GP out of hours numbers	Direct dial 111 only (Nov 2010 – Mar 2011) All calls are 111 – no auto routed calls 1st April 2011 onwards all GP out of hours calls given message to call 111	Direct dial 111 Auto routed to 111 from some GP out of hours numbers Other GP out of hours numbers have a message telling caller to call 111
Call answering	Call handling provided by North East Ambulance Service Foundation Trust Service provided from ambulance emergency control centre in Newcastle on Tyne utilising emergency call control centre in hours and Patient Transport Service control centre at peak NHS 111 call times.	Call handling provided by NHS Direct national system Calls routed to NHS Direct using a separate number and identified within the system as Nottingham 111 or Nottingham OOH	Call handling provided by NHS Direct national system Calls routed to NHS Direct using a separate number and identified within the system as Lincolnshire 111	Call handling provided by NHS Direct national system Calls routed to NHS Direct using a separate number and identified within the system as Luton 111
Clinical Assessment	NHS Pathways using trained call advisors and on site nurse or paramedic clinical advice and supervision.	NHS Pathways using trained call advisors and NHS Direct nurse advisors for clinical advice and supervision.	NHS Pathways using trained call advisors and NHS Direct nurse advisors for clinical advice and supervision.	NHS Pathways using trained call advisors and NHS Direct nurse advisors for clinical advice and supervision.
CMS/DoS	Initial directory was existing directory and populated with services identified from commissioner led workshops and review meetings. Directory reflected urgent care reform and service remodelling that occurred prior to NHS 111. Current directory population built on this and led by PCT commissioner and a local	Two versions of directory have been populated. Initially populated by PCT leads who interacted with local providers. Second version using national clinical content templates was overseen by steering group with engagement with leads from provider organisations.	Two versions of directory have been populated. Initially populated by PCT leads who interacted with local providers. Second version using national clinical content templates was overseen by steering group with engagement with leads from provider organisations.	Population of directory has been a stepped process. Early phase contained primary care, urgent care and Out of Hours providers. Two additional re-populations and re-profiling edits in 2011 using national templates with additional services e.g. mental health, community services, social care added. Local engagement and

	provider capacity manager. Engagement events held with primary care providers to agree arrangements for in hours care. Over time additional services have been added allowing referrals to e.g. district nurses, nurse specialists. Transport can also be arranged for eligible patients to attend appointments made by 111.			involvement has increased with each review. Another re-population planned for 2012.
Technical links for warm transfer	Ambulance service emergency system for immediate ambulance dispatch Urgent Care Services so appointments can be made by the NHS 111 call advisor while the caller is still on the telephone	Ambulance service emergency system for immediate ambulance dispatch Calls can be warm transferred (i.e. no call back) to OOH provider for appointment booking	Ambulance service emergency system for immediate ambulance dispatch Calls can be warm transferred (i.e. no call back) to OOH provider for appointment booking	Manual dispatch of ambulances using agreed protocol Calls can be warm transferred (i.e. no call back) to booking agents within NHS Direct who book Out of Hours appointments with primary care services
Training	New staff recruited Standard NHS Pathways training. Additional training on safeguarding, negotiation skills, NHS 111 values, unscheduled care system. NHS 111 co-located with emergency ambulance control and both use NHS Pathways so call handlers can be used flexibly for either service when high demand.	Existing NHS Direct call handling staff re-trained Standard NHS Pathways training. Extension of role as now assessing patient on initial call. Additional training on transfer processes for OOH and ambulance dispatch. Safeguarding, record keeping and communication skills training already included in call handler training.	Existing NHS Direct call handling staff re-trained Standard NHS Pathways training. Extension of role as now assessing patient on initial call. Additional training on transfer processes for OOH and ambulance dispatch. Safeguarding, record keeping and communication skills training already included in call handler training.	Existing NHS Direct call handling staff re-trained Standard NHS Pathways training. Extension of role as now assessing patient on initial call.. Additional training on transfer processes for OOH and ambulance dispatch. Safeguarding, record keeping and communication skills training already included in call handler training.
Public Launch	August 2010	November 2010	November 2010	December 2010

S2: Criteria used to identify suitable control sites

Indicator	Description	Data source
Demographics		
Population size	Target population (thousands)	PCT publications
Persons 65+	Proportion of people 65 and over (%)	Office of National Statistics (2008 estimates)
Ethnicity	Proportion of BME population (%)	Office of National Statistics (2007 data)
Life expectancy	Life expectancy at birth for males/females (years)	The NHS Information Centre, Compendium of Clinical and Health Indicators (2006-2008 data)
Deprivation value	Proportion of people living in 20% most deprived areas of England (%)	The Association of Public Health Observatories (2007 data)
Lifestyle		
Alcohol	Proportion of binge drinking adults (%)	The NHS Information Centre, Health surveys for England 2003-2005
Smoking	Proportion of smoking adults (%)	
Obesity (adults)	Proportion of obese adults (%)	
Obesity (children)	Proportion of obese year 6 children (%)	The NHS Information Centre, National Child Measurement Programme: England, 2008/09 school year
Health profile		
Mortality rate, all causes	Directly age-standardised rate per 100000 population under 75	The NHS Information Centre, Compendium of Clinical and Health Indicators (2006-2008 data)
Mortality rate, all cancers	Directly age-standardised rate per 100000 population under 75	
Mortality rate, all circulatory diseases	Directly age-standardised rate per 100000 population under 75	
People with limiting long-term illness	Proportion of people with limiting long-term illness, 2001 Census	Office of National Statistics (2001 Census data)
People with long-term conditions	Proportion of respondents who reported a long-standing health problem in GP Patient Survey (%)	GP Patient Survey 2008/09
Use of health services		
A&E attendances	Attendance rate per 1000 population, includes A&E Departments, Walk in Centres and Minor Injury Units	Department of Health, QMAE data 2007/08
GP consultations	General Practices consultations combined rate per 1000 population (include GP and practice nurse consultations, estimates from national data)	The NHS Information Centre, QResearch report on trends in consultation rates in General Practices 1995-2008
GP out of hours contacts	Proportion of respondents of the GP Patient Survey who tried to contact OOH GP service in the last 6 months (%)	GP Patient Survey 2008/09
NHS Direct calls	Call rate per 1000 population	NHS Direct, 2008/09 data

Figure 1 – Percentage of triaged NHS 111 calls allocated to each emergency and urgent care service in four pilots sites in first year of operation



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