The costs and benefits of managing some low-priority 999 ambulance calls by NHS Direct nurse advisers

Report for the National Co-ordinating Centre for NHS Service Delivery and Organisation R & D (NCCSDO)

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Executive Summary

Introduction

Rising demand for emergency ambulance services and a need to provide a more clinically appropriate service for callers with non-urgent conditions requires the development of alternative responses for this patient group. One alternative is to refer 999 calls prioritised as non-urgent for further telephone assessment and advice. It has been suggested that the NHS Direct Clinical Assessment System is one means of providing this service. The perceived advantages are better integration of emergency-call handling services, more effective use of ambulance resources, as callers are referred to more appropriate care pathways, and an enhanced service for patients. We have conducted an evaluation to assess the costs and benefits of transferring some low-priority 999 calls to NHS Direct nurse advisers for further assessment and advice.

Methods

We have conducted two studies. The first was a randomised controlled trial comparing outcomes of calls transferred for nurse advice with calls receiving a standard emergency ambulance response. Callers to three ambulance services whose call was prioritised with an agreed dispatch code and who met the inclusion criteria were randomised to receive an ambulance response (control group) or offered the option to have their call transferred to a nurse (intervention group). Those consenting to this option had their call transferred. Callers in both groups were also asked for consent to follow-up by postal questionnaire. The main process outcomes were the return rates of passed calls back to the ambulance service, transports to hospital and ambulance-service job cycle times. Patient outcomes were satisfaction with and acceptability of the new service.

A second observational study was also carried out. During this study all eligible calls were transferred to the new service and the impact on ambulance service workload estimated. During this phase we also carried out a qualitative study to identify the practical and operational issues that affect service development and implementation. We have also assessed the safety and reliability of call transfer and conducted an economic evaluation.

Results

Only 13% of potentially eligible calls were randomised during the controlled trial. The remaining calls were excluded because the call was not within agreed operational hours or because they did not meet the inclusion criteria. There were 1766 calls allocated to the intervention group and passed for further assessment and 2158 calls allocated to the control group. The return rate back to the ambulance service was 66.9% (range 36.1–75.5%). The return rate was much higher for Alpha-level dispatch codes than for Omega-level codes. Of returned calls 25% were returned for a 999 response and the remainder for transport or other non-clinical reasons. Passed calls had a shorter ambulance-service job cycle time and fewer transports to hospital. Both of these findings were statistically significant. A much lower number of cases than expected was assessed as requiring primary or self care.

Callers were generally satisfied with the service although this was lower for the intervention group than the control group. A high proportion of callers referred to the new service were particularly satisfied with the advice and reassurance provided by the nurse. Sources of dissatisfaction were being asked too many questions and having to wait for an ambulance. There remains an expectation among some callers that if they request an ambulance one should be sent immediately.

The observational study shows that the proportion of 999 calls that can be managed by nurse advice is low (13% for Alpha calls, 2.5% for Omega calls). This is less than previous estimates. The high return rate means that the number of cancelled ambulances is also low. However, the economic evaluation has shown that even a small reduction in ambulance journeys can produce significant cost savings. There is scope to increase the number of passed calls and reduce the return rate if appropriate operational processes and suitable referral pathways are put in place.

The small number of calls passed was disappointing for the services involved. However, the experience of joint working between the ambulance service and NHS Direct was seen by staff as a major step forward.

Examination of the return rates to the ambulance service for individual dispatch codes found no conditions where the return rate was less than 5%. Most were around 50%, with the code for falls reaching 80%. Comparison of sites using Alpha codes has shown that it is possible to reduce the return rate to 50% compared to the 70% we measured.

Serious adverse events were rare, with two in 3975 reported to one ambulance service. Our assessment found four out of 1552 cases where a delay in sending an ambulance may have been clinically important.

Conclusions

Transferring non-urgent 999 calls for further advice and assessment provides a safe and cost-effective service for some of these calls. The number of calls that can be managed by this process is a small proportion of the 999 workload. Previous estimates have made an assumption that referring calls for telephone advice would result in a cancelled ambulance. We have found this not to be the case and almost half of calls are returned to the ambulance service for an ambulance response indicating that, although non-urgent, many of these calls are for patients who need transport or some form of face-to-face assessment. In future it may be better to view this service as being one which can solve some cases but which also provides an enhanced triage system to aid the increasingly complex decisions around which emergency care resources to send and when.

The Report

Section 1 Introduction

The 1996 review of ambulance-service performance standards (Chapman, 1996) recommended three categories of response for 999 emergency calls, namely:

- category A: immediately life-threatening;
- category B: serious;
- category C: not life-threatening or serious.

The report suggested that for non-serious (category C) calls Health Authorities and ambulance services should agree to provide responses appropriate to the patients' needs, either by ambulance or some other means. In the first instance, just two levels of response have been implemented in England and Wales with revised performance standards of an ambulance-service response to 75% of category A calls within 8 minutes and 95% of category B and C calls within 14 (urban) or 19 (rural) minutes. However, annual increases in demand for emergency ambulance services (Department of Health, 2002a), constrained financial resources and the need to meet a range of performance standards means that there remains a need to further improve the efficiency and effectiveness of ambulance service delivery. Ambulance services and independent sources such as the Audit Commission (Audit Commission, 1998) have suggested that one way this may be achieved would be to implement the category C response option. More recently, the NHS Plan (Department of Health, 2001a), and the Department of Health reviews *Reforming Emergency Care* (Department of Health, 2001b) and *Taking Healthcare to the* Patient (Department of Health, 2005) have stated explicitly the need to provide more patient-focused health services and specifically to optimise access to and delivery of emergency care. It has been estimated that up to 40% of 999 calls do not require an emergency response (Snooks *et al.*, 1998) and it would therefore seem reasonable to explore alternative methods of service provision for this patient group. A reduction in the number of patients who do not need emergency care being conveyed to hospital, leaving more ambulances available to respond quickly to life-threatening emergencies, has been identified as a key principle for the delivery of improved emergency care (Department of Health, 2000).

Computerised Emergency Medical Dispatch (EMD) systems have been introduced to ambulance-service control centres over recent years. The systems provide a structured set of questions which call-takers use to assess the urgency of the call. At the end of the call a dispatch code is assigned based on clinical condition and urgency. This is then

used to direct the type of response required. This means that services now identify calls classified as non-urgent, allowing exploration of alternative methods of management of these calls. The potential advantages, should an alternative model be successful, are:

- delivery of a service more clinically appropriate to the needs of patients with non-urgent conditions;
- the release of resources which are then available for responding to category A calls;
- improved management of demand for emergency ambulances;
- reduction of unnecessary journeys to hospital for patients and inappropriate demand on emergency departments.

Preliminary research has shown that for some non-urgent 999 calls patients are taken to hospital and then discharged with no or minimal treatment. In one study of 200 non-urgent calls 30% of patients were discharged from the emergency department without treatment, and a further 30% were discharged the same day. Of these half could have been managed by primary care or a minor injuries unit (Turner *et al*., 1999). A larger study of non-urgent 999 calls found 40% of patients taken to the emergency department were discharged the same day (Dale *et al*., 2003). Primary or self care may be more appropriate ways of managing these conditions and one way of determining the type of care required would be to transfer these calls for further telephone-based assessment. NHS Direct is a national telephone information and advice service. NHS Direct nurse advisers use decision-support software to assess a health-related problem and determine an appropriate course of action for the patient. The management options range from advice for self care, to contact a general practitioner (GP) or immediate attendance at an emergency department. Redirection of some ambulance service calls to this service could provide a more appropriate response and prevent unnecessary visits to emergency departments, as well as reducing the number of unnecessary responses made by ambulance services.

Not all non-urgent (category C) calls will be suitable for telephone assessment but it has been estimated that up to 12% of 999 calls could potentially be managed in this way (Woollard, 2001). In an ambulance service responding to 70 000 999 calls per year this could result in over 9000 fewer transports to hospital and increase the availability of emergency ambulances for faster response to more serious cases (Woollard, 2001). In England, if 10% of 999 calls were redirected and managed by NHS Direct around 380 000 potentially unnecessary transports to hospital could be avoided.

The use of nurse-led telephone consultation services is becoming an increasingly widespread feature of the UK health service. A study evaluating the use of nurse telephone consultation in a primary care out-of-hours setting found reductions in GP telephone advice, GP home visits and attendance at primary care centres with no increase in adverse events, indicating that this is a safe and effective approach to

emergency call management (Lattimer *et al*., 1998). More specifically, a recent UK study has demonstrated that nurses and paramedics in ambulance-control centres can successfully provide telephone advice to 999 callers categorised by EMD systems as non-urgent (Dale *et al*., 2000). The study assessed the advice service in shadow form – that is, an ambulance was still sent – and compared outcomes of patients given telephone advice with a control group receiving no advice. Both nurses and paramedics were used to provide further clinical assessment and advice. Of calls receiving telephone assessment 52% were triaged as not requiring an ambulance and of these 36% did not travel to hospital, compared to 18% who were triaged as requiring an ambulance. Patients triaged as not requiring an ambulance were less likely to be admitted to hospital although just under 10% did require inpatient treatment. As the study was carried out in shadow form an ambulance was only cancelled after the telephone assessment and with the agreement of the caller. As a consequence only 10% of calls receiving the intervention resulted in a cancelled ambulance. Case review by an expert panel of 239 cases triaged as not requiring an ambulance showed a high level of agreement with the triage decision with only two cases considered to have required an immediate ambulance, and for these cases no life risk was identified. The authors suggested that the use of telephone assessment and advice is potentially safe but required further investigation, both in terms of the potential for adverse events and to assess the acceptability of the service to users. Similarly, an evaluation of a pilot study of a comparable service in the USA showed that the number of ambulance journeys could be reduced without compromising patient safety (Smith *et al*., 2001). However, only a small number of cases was studied: 38 calls in an initial, shadow study where an ambulance was still dispatched and 133 calls in a subsequent study where nurse consultation was provided instead of an ambulance response. Only a third of potentially eligible calls were passed to the nurse. Telephone follow-up of 85 of the calls reported that 95% were satisfied with the medical outcome. However, although comments from respondents about their experience of talking to a nurse were positive, this is not the same as satisfaction with the service. The study reported that no adverse incidents were recorded but, given that these are calls triaged as low priority or non-urgent, such events would be expected to be rare and such a small sample would be unlikely to detect them.

These early studies indicate that use of telephone assessment for some 999 calls shows promise as an alternative to sending an immediate emergency ambulance response. At present no empirical evidence has been published about the safety and service impact of passing category C calls to NHS Direct (Snooks *et al*., 2002) and there remains a need to conduct larger pragmatic trials in 'live' settings. The Clinical Assessment System used by NHS Direct has been successfully integrated into primary care to provide a seamless out-of-hours access service and is also being introduced into Walk-In Centres and emergency departments (Department of Health, 2001c). Extension

into the management of ambulance-service 999 calls appears to be a logical next step and would contribute to the *Reforming Emergency Care* strategy (Department of Health, 2001b) of developing an integrated, whole-systems approach to emergency care, using a standardised assessment system. This strategy has also been advocated as a key component of delivering the ambulance service contribution to the NHS Plan (Department of Health, 2002b) and, very recently, to improving public services through E-Government (House of Commons Committee of Public Accounts, 2002).

This study has been designed to investigate the feasibility, safety, acceptability, costs and service impact of redirecting some non-urgent 999 calls for an emergency ambulance to NHS Direct nurse advisers.

The aims of this study were to:

- assess whether the transfer of low-priority ambulance-service 999 calls to NHS Direct nurse advisers provides a clinically safe and acceptable alternative to sending a paramedic ambulance;
- to measure the impact of this service change on ambulance-service and NHS Direct operations; and
- to assess the cost consequences and cost-effectiveness of the service change.

Within these overall aims, the objectives of the study were to:

- identify the EMD codes of non-urgent conditions which could be managed appropriately by NHS Direct nurse advisers;
- empirically test this list of codes with respect to processes and outcomes of care: care cycle times; call outcome (self care/ambulance attendance/conveyance to hospital/other health care contact); compliance with advice given; patient satisfaction and acceptability; clinical risk;
- measure the operational impact on ambulance-service response times for life-threatening category A calls;
- measure the operational impact on NHS Direct call volumes and the capacity to cope with this change;
- assess the impact of the service change on Ambulance Service and NHS Direct staff who manage and provide the service;
- assess the ambulance and NHS Direct service costs associated with transfer of calls between systems and the cost-effectiveness of this alternative method of call management.

Section 2 Plan of investigation and study sites

2.1 Overview

This study aimed to evaluate a number of components of the planned service change, including clinical, service and cost effects. Although the randomised controlled trial remains the gold standard of health services research it is recognised that a number of different methods may be required to evaluate this type of complex intervention (Medical Research Council, 2000). In particular, the organisation and delivery of the new services will be dependent on the complex relationships between different health care providers. So, while measuring the impact on individual patients is a key objective, decisions about the feasibility of further development and implementation of the service will depend on a more detailed assessment of the implications for service workload and the processes that contribute to successful service change.

We therefore took a mixed-methods approach to the study. A randomised controlled trial formed the main study, supplemented by a number of complementary sub-studies. We also utilised data collected from a number of other pilot sites initiating the same service change in order to try and enhance the generalisability of the study. Table 1 summarises the different studies conducted.

The randomised controlled trial is described in Sections 3, 4 and 5. The observational study is described in Section 6, risk assessment in Section 7 and economic evaluation in Section 8.

2.2 Study sites

Three ambulance-service areas were included in the main study.

- Site 1: Greater Manchester Ambulance Service (GMAS), which provides an emergency ambulance service to the metropolitan area of Greater Manchester. It receives 318 000 emergency calls a year from an urban area.
- Site 2: Two Shires Ambulance Service, which provides an emergency ambulance service to Buckinghamshire and Northamptonshire. This area receives 117 000 emergency calls a year and is representative of many English 'shire' ambulance services.
- Site 3: Welsh Ambulance Service, which provides a national emergency ambulance service to the whole of Wales. Operationally the service is divided into three areas each with their own control centres. For this study the south-west area was initially used. This area receives 72 000 emergency calls a year

from a mixture of urban, mixed urban and rural and very rural areas. Subsequently the northern area covering Gwynedd and Clwyd was also included.

Two models of service delivery have been evaluated.

In Greater Manchester emergency nurse advisers were located in the ambulance-service control room and the whole process was managed in a single centre.

In the other services calls were transferred from the ambulance-service control centre to a separate NHS Direct call centre. In the Two Shires this was Thames Valley and Northamptonshire NHS Direct and in Wales it was NHS Direct Wales.

For a short period Oxfordshire Ambulance Service also transferred calls to Thames Valley and Northamptonshire NHS Direct. However only 14 calls were passed and as the processes were identical these have been included with the Two Shires data.

The EMD system for call prioritisation used in all the study ambulance services is the Advanced Medical Priority Dispatch System (AMPDS). All of the nurse assessments were carried out using the standard NHS Direct Clinical Assessment System. So, the call identification and assessment processes were the same in all sites. The difference is in the model used to operationalise the service. The advantage this provides is that two alternative models can be evaluated in the same study and any differences in costs and the practical issues involved with service change can be identified.

2.3 Approval for the study and project oversight

Ethical approval for the study was obtained from Trent Multi-centre Research Ethics Committee. In addition research governance approval was given by each of the study ambulance-service and NHS Direct sites. A project steering group to oversee the study was formed and met regularly throughout the project. This comprised

- the Sheffield and Swansea research teams,
- senior managers from each ambulance-service site,
- senior managers from each NHS Direct site,
- managers from each ambulance-service control room,
- the Medical Director of Thames Valley and Northamptonshire NHS Direct.

This ensured co-operation from each site and full involvement of the service providers in the management and implementation of the study, and the subsequent retrieval of data.

Table 1 Design of the evaluation of assessment of low-priority 999 ambulance calls by NHS Direct nurse advisers

Study	Purpose of study	Type of subject	Source of subjects	Outcomes being assessed	Method of assessment	Source of data
1	Empirical evaluation of calls passed for nurse assessment	Low-priority 999 ambulance calls	RCT	Final disposition of nurse assessment	Descriptive	Ambulance-service control records; NHS Direct record of call assessment
2	Comparison of care processes	Low-priority 999 ambulance calls	RCT	Transports to hospital; care cycle times	Comparison of intervention and control groups	Ambulance-service control records; NHS Direct record of call assessment
3	Satisfaction and acceptability	Low-priority 999 ambulance calls	RCT	Caller and patient views of service received	Comparison of intervention and control groups	Postal questionnaire
4	Impact of service change on call volumes and response times	Ambulance and NHS Direct calls	Observational study	Proportion of service call volumes passed for advice; impact on ambulance category A performance	Before and after; descriptive	Ambulance-service control room and NHS Direct routine data
5	Impact of service change on staff	Ambulance service and NHS Direct staff	Ambulance service and NHS Direct staff	Views and attitudes on service change	Qualitative study	Semi-structured interviews
6	Clinical risk and suitability of priority dispatch codes for nurse assessment	Calls passes for further nurse assessment	RCT; pilot study; NHS Direct pilot sites	Return rate to ambulance service; transports to hospital; adverse events	Descriptive; appropriateness	NHS Direct records; complaints; ambulance patient-report forms; NHS Direct call audit
7	Economic evaluation	Low-priority 999 ambulance calls	RCT sites	Costs and consequences of service change	Cost-consequence analysis	Service-use data and financial data

RCT, randomised controlled trial.

Section 3 Methods for the randomised controlled trial

3.1 Overview

Callers to the 999 emergency service in three ambulance control centres whose call was assessed by the emergency priority dispatch as low priority were randomly allocated to receive either an emergency ambulance or to have their call transferred for further assessment by an NHS Direct nurse adviser over a 1-year period.

All callers who consented to take part in the study were included. Details of the timings of calls, outcome of nurse assessment and transports to hospital were recorded for all cases. Where callers consented to follow-up a postal questionnaire was sent to determine outcome after 2 days, health service contacts and satisfaction with the service.

Processes and outcomes have been described and compared for each group using an intention-to-treat analysis. The methods are outlined below in more detail.

3.2 Study population

The target population is people who call the 999 emergency ambulance service and request an ambulance for clinical conditions that may not require an emergency, lights-and-sirens response but could instead be either self-managed or referred to a more appropriate health care provider. Typically this includes minor injury or illness that is not time-critical and could be managed, for example, by a primary care service.

In order to distinguish these calls from the more urgent 999 calls some form of triage or sorting needs to occur at the time of the call. All ambulance-service control centres have implemented call-prioritisation systems. Initially this was to enable them to quickly identify life-threatening calls which require the fastest response and consequently deploy finite resources on the basis of clinical need.

The predominant call-prioritisation system in the UK is the AMPDS (see Table 2). The system was developed in the USA and uses a protocol-driven assessment process that categorises emergency calls to different levels of urgency. Calls are handled by trained Emergency Medical Dispatchers (EMDs) and the key processes are as follows.

- An initial assessment that gathers information on patient details (name, age, location), key questions on clinical condition (to establish whether the patient is conscious and/or breathing) and the presenting problem (chief complaint).

- Further interrogation about the presenting problem using assessment protocols for 32 different clinical conditions or incident types. The EMD may move between protocols depending on the answers given to questions. At the end of the process a dispatch code is assigned which reflects condition and urgency. Condition (or incident type) is indicated by the final category number and, in the standard system, urgency is graded at four levels: Delta (most urgent), Charlie, Bravo and Alpha (least urgent) reflecting the type of response required. The most recent version has an additional low-level category (Omega).
- The EMD may provide post-dispatch instructions. This may be simple first aid and general advice (e.g. to send someone to look for the ambulance), or specific instructions on what to do in an emergency (e.g. CPR, imminent childbirth, choking).

Table 2 Example of dispatch codes for AMPDS

Category 2 Allergies/rash/medical reactions/stings		
Level	***Description***	***Dispatch code***
Omega	1 No difficulty breathing or swallowing with symptoms present for ≥1 hour	2O01
Alpha	1 No difficulty breathing or swallowing	2A01
Bravo	1 Unknown symptoms (third-party situation)	2B01
Charlie	1 Difficulty breathing or swallowing	2C01
Delta	1 Severe respiratory distress 2 Not alert 3 Condition worsening	2D01 2D02 2D03

The levels of urgency were developed in the USA and were designed to reflect the type (Advanced Life Support or Basic Life Support) and speed (with or without lights and sirens) of response required. However, in the UK these have been used as the basis of categorising calls as A, B or C in line with response-time performance standards (Chapman, 1996).

Alpha-level calls have generally been associated with category C (non-urgent or low-priority calls). It is these calls that are not time-dependent emergencies requiring an immediate ambulance response, which may be potentially appropriate for a range of alternative responses. Further assessment and advice at the time of the 999 telephone call is one alternative response and may not be suitable for all Alpha calls. The prioritisation code is the means of identifying calls and does not represent all potential category C calls but a subgroup of these calls that may be suitable for the alternative response being tested in this study.

At the outset of the study it was intended to use a carefully selected and agreed list of AMPDS Alpha dispatch codes as the initial means of identifying the study population. Two of the study sites, together with a small number of other ambulance services, were already using this

method to pilot telephone assessment and advice of some 999 calls. However, Medical Priority, the US company that had developed AMPDS and provided the system to UK ambulance services, expressed some concerns about the system being used to identify calls where no ambulance response would be sent in the first instance, as this was not an intended application. By doing so, study services would be in breach of the licensing agreements governing the system's use.

A version of the system is available that has been developed for a similar scheme in Canada and has been in use for 10 years. This provides additional questions in the protocols that allowed the assignment of an additional low-level categorisation – Omega – and has been used successfully to identify calls for telephone assessment. The potential advantage of using this system was that it had been previously tested, albeit in a different health care system, and that the additional questions provide a more accurate means of identifying suitable calls, thereby reducing the risk of inappropriate referral. The study could therefore provide a means for testing the application in the UK setting. The disadvantages were that this would reduce the number of calls offered further assessment, and the system was only available with the latest version of AMPDS, which not all services had purchased and which also incurred an extra cost. In addition, using only Omega codes would allow no investigation of whether other, Alpha-level calls, could also be equally suitable.

Following negotiation with Medical Priority and the study services it was agreed that, as this was a research project in which processes and outcomes would be monitored closely, both Omega and Alpha codes would be tested. Wales already operated the, at that time, most recent version of AMPDS (version 11.0). The Two Shires site planned to install a new command and control system which included upgrading of the AMPDS system to the same version and this process was brought forward. Medical Priority provided the additional software required to run Omega protocols at no cost and so both of these sites used Omega codes as the means of identifying the study population. The Greater Manchester site did not plan to upgrade their AMPDS system for at least a year and therefore continued to use AMPDS version 10.2 and Alpha codes.

In each site the list of codes to be used was agreed by the ambulance service and NHS Direct, and approved by NHS Direct's Medical Directors. The complete list of codes used are given in Tables 3 and 4.

Table 3 AMPDS Alpha study codes

MPDS code	Chief complaint	Characteristics
1A1	Abdominal pain	Males >34 years, females >44 years
2A1	Allergies/rash/medicine reactions/stings	No difficulty breathing or swallowing
3A1	Animal bites/attacks	Superficial or minor bites
3A2		Spider or insect bites
4A1	Assault/rape	NOT DANGEROUS injuries
4A2		NON-RECENT injuries
5A1	Back pain (non-traumatic)	Non-traumatic back pain
5A2		NON-RECENT traumatic back pain
7A1	Burns/explosion	Small burns (<18%)
7A2		Sunburn or minor burns (less than or equal to hand size)
11A1	Choking	Not choking now. Breathing normally
13A1	Diabetic problems	Conscious and alert
16A1	Eye problems/injuries	Moderate eye injuries/problems
16A2		MINOR eye injuries
17A1	Falls/back injuries (traumatic)	NOT DANGEROUS injuries
17A2		NON-RECENT injuries
18A1	Headache	Normal breathing
20A1	Heat/cold exposure	Alert (without priority symptoms)
21A1	Haemorrhage/lacerations	NOT DANGEROUS bleeding
24A1	Pregnancy/childbirth/miscarriage	First-TRIMESTER bleeding or MISCARRIAGE
24A2		Illness during pregnancy
25A1	Psychiatric/suicide attempt	Non-violent and non-suicidal
26A1	Sick person (specific diagnosis)	No priority symptoms
26A2		Boils
26A3		Bumps (non traumatic)
26A4		Can't sleep
26A5		Can’t urinate (without abdominal pain)
26A6		Catheter (in/out without bleeding)
26A7		Constipation
26A8		Cramps/spasms (in extremities)

MPDS code	Chief complaint	Characteristics
26A9		Cut off ring request
26A10		Deafness
26A11		Defecation
26A12		Earache
26A13		Enema
26A14		Gout
26A15		Haemorrhoids/piles
26A16		Hepatitis
26A17		Hiccups
26A18		Hungry
26A19		Nervous
26A22		Penis problem pain
26A23		Rash/skin disorder
26A24		Sore throat
26A25		Toothache
26A26		Transportation only
26A27		Venereal disease
26A28		Wound infection (focal or surface)
27A1	Stab/gunshot wound	NON-RECENT single PERIPHERAL wound
28A1	Stroke (CVA)	Normal breathing (age 35 or less)
30A1	Traumatic injuries specific	NOT DANGEROUS injuries
30A2		NON-RECENT injuries
31A1	Unconscious/passing out (non-traumatic)	Single fainting episode and alert (age <35)
31A2		Near fainting episode and alert (age <35)
31C1		Single or near fainting episode and alert (age ≥35)

Table 4 AMPDS Omega study codes

MPDS code	Chief complaint	Characteristics
1O1	Abdominal pain	Males <15 years
1O2		Females <12 years
2O1	Allergies/rash/medicine reactions/stings	No difficulty breathing or swallowing with symptoms present for >1 hour
3O1	Animal bites/attacks	Superficial or minor peripheral bites
3O2		Spider or insect bites
4A1	Assault/rape	NOT DANGEROUS distal injuries
4A2		NON-RECENT injuries (>6 hours)
7O1	Burns/explosion	Sunburn or minor burns (less than or equal to hand size)
10O1	Chest pain	Normal breathing (age <12 years)
11O1	Choking	Not choking now. Breathing normally
13O1	Diabetic problems	Conscious and alert with 1st party verification
14A1	Drowning (near)	Alert and breathing normally (no injuries and out of water)
16O1	Eye problems/injuries	MINOR eye injuries
17O1	Falls/back injuries (traumatic)	NOT DANGEROUS distal injuries
17O2		NON-RECENT injuries (>6 hours)
18O1	Headache	Normal breathing with first-party verificaton
20O1	Heat/cold exposure	Alert with first-party verification
21O1	Haemorrhage/lacerations	Minor haemorrhage
21O2		Nosebleed (age <35)
21O3		Non-bleeding laceration
23O1	Overdose/ingestion/poisoning	Conscious and alert without priority sysmptoms
24O1	Pregnancy/childbirth/miscarriage	First-trimester bleeding or miscarriage with first-party verification
24O2		Illness during pregnancy
25O1	Psychiatric/suicide attempt	Non-suicidal with first-party verification
25O2		Suicidal (not threatening) with first-party verification
26O2	Sick person (specific diagnosis)	Boils

MPDS code	Chief complaint	Characteristics
26O3		Bumps (non-traumatic)
26O4		Can't sleep
26O6		Catheter (in/out without bleeding)
26O7		Constipation
26O8		Cramps/spasms (in extremities)
26O9		Cut off ring request
26O10		Deafness
26O11		Defecation
26O12		Earache
26O13		Enema
26O14		Gout
26O15		Haemorrhoids/piles
26O16		Hepatitis
26O17		Hiccups
26O18		Hungry
26O19		Nervous
26O22		Penis problem pain
26O23		Rash/skin disorder
26O24		Sore throat
26O25		Toothache
26O26		Transportation only
26O27		Venereal disease
26O28		Wound infection (focal or surface)
30O1	Traumatic injuries specific	NOT DANGEROUS distal injuries
30O2		Splinters (≤1 in/2.5 cm)

3.3 Inclusion and exclusion criteria

The agreed dispatch codes provided the initial means of identifying calls for inclusion. However, there were a number of circumstances in which further assessment by a nurse would be either impractical or inappropriate. Calls assigned a study code but which met the following criteria were excluded:

- caller in a public place;
- caller is not the patient or directly in contact with the patient (third-party calls) as no further assessment can take place;
- calls for children under the age of 2 years: these calls require a category A response;
- calls from medical personnel (e.g. a GP) or that have been referred from NHS Direct: these have already had some form of clinical assessment;
- calls by children under the age of 16 years.

All other callers who were assigned a study dispatch code during agreed operational hours were included in the study and were randomised to the intervention or control groups.

3.4 Description of intervention

The planned intervention was to transfer selected calls meeting the inclusion criteria to an NHS Direct nurse adviser for further clinical assessment of the problem that had prompted the 999 call. Two different models of managing this process were used.

Model A. In the Greater Manchester site the process was managed entirely within the ambulance-service control centre. NHS Direct nurses with additional training concerning the management of emergency ambulance calls were co-located with EMDs as emergency nurse advisers within the control centre. Further assessment of the transferred calls was carried out using the standard NHS Direct Clinical Assessment System. These nurses also received training on use of the control-centre Computer-Aided Dispatch (CAD) call information system so that they could update this system once a call was completed. On receipt of a call, as soon as the location was verified an ambulance was dispatched. This is standard operating procedure in all ambulance services to meet response-time performance targets. After further interrogation by the EMD and assignment of a dispatch code that met the inclusion criteria the EMD asked the caller for consent to transfer their call and, if consent was given and a nurse was available, the call was transferred. If no nurse was available the ambulance continued. For calls transferred the ambulance continued to run until the nurse completed her assessment. If the problem was resolved the ambulance was stood down. If an emergency ambulance was required the ambulance continued. In

this service the emergency nurse adviser also had the option to return the call for an urgent response within 90 minutes. In this case the emergency ambulance was stood down and a new call generated in the urgent call dispatch queue. The reason for the ambulance continuing to run once the call was transferred in this service was because of concerns about how these calls should be reported for response-time performance. As the process remained within the ambulance service the calls were monitored from receipt of the call to arrival of an ambulance where this was required. For calls returned by the nurse for an emergency ambulance it was felt that if an ambulance was stood down and subsequently reassigned but the response-time interval calculated from the time of the original 999 call then performance could be adversely affected. Late on in the study, following clarification from the Department of Health, it was agreed that for these calls the ambulance could be stood down once the call had been received by a nurse adviser and any calls returned for an emergency ambulance would generate a new call with the response time calculated from the time of the nurse's decision that an emergency response was required.

Model B. In the other two sites eligible calls were transferred from the ambulance-service control centre to the NHS Direct call centre serving the co-terminus geographical area. The Two Shires (and later Oxfordshire) Ambulance Service transferred calls to Thames Valley and Northamptonshire NHS Direct and initially one and then two of three Welsh Ambulance service control centres transferred calls to NHS Direct Wales. The process was similar to that described above: that is, on receipt of a call an ambulance was dispatched as soon as the location was verified. After assignment of a dispatch code that met the inclusion criteria the EMD asked the caller for consent to transfer their call and if consent was given, the call was transferred. Within NHS Direct, in both sites, a dedicated telephone line for transfer of ambulance calls was installed. This was to ensure that these calls were answered immediately and did not enter the general NHS Direct call-handling system and hence, at busy times, a queue. An NHS Direct nurse adviser was ring-fenced to only answer calls from this line during designated hours. As the sites were remote the EMD had no knowledge of whether a nurse was available and therefore the transfer protocol stipulated that if the call was not picked up within 90 seconds the transfer attempt ended and the ambulance continued to run. If the call was picked up the ambulance was stood down. Further assessment of the transferred calls was carried out by nurse advisers using the standard NHS Direct Clinical Assessment System. In these sites calls transferred back to the ambulance service all received an emergency response as the urgent referral option was not available. Where calls were returned a new emergency call was

generated within ambulance control and normal response targets applied.

In each ambulance-service site the CAD system was configured to produce a prompt when a study dispatch code was assigned to aid the EMD's recognition of calls potentially suitable for transfer to nurse assessment. If a call was not transferred the EMD was required to complete a field indicating the reason for non-referral before the call could be completed. In this way compliance to the referral protocol could be monitored.

In all sites hours of operation were locally defined. At the outset of the trial these were:

- Greater Manchester: emergency nurse advisers provided an assessment service from 08.00 to 18.00 for 7 days a week
- Thames Valley NHS Direct: nurse available for ambulance call assessment 11.00–23.00, Monday to Friday excluding bank holidays.
- NHS Direct Wales: nurse available 09.00–19.00, Monday to Friday.

In all services training was given to ambulance-service EMDs and nurse advisers on the use of consent and call-transfer protocols. Information sheets describing the purpose of the study and the role of staff during the trial were distributed to ambulance-service control staff, ambulance crews and NHS Direct staff. A member of the research team was assigned to each site and acted as the local liaison between the study sites. These researchers were also responsible for identification of included calls and data collection.

This was a pragmatic trial that required significant change within the study sites to set up the new processes and was undertaken during a time of considerable change within the services. As a consequence there were differences in the start dates of sites and the total length of time of participation of each site. Times of operation of the service also changed. These are discussed in more detail in Section 4.

3.5 Randomisation and consent processes

3.5.1 Study design

Ideally, participants asked to consent to take part in research should be given full information and time to understand this information before agreeing to take part. At that point randomisation can take place. However, in this case this request is being made at the time the caller is making a 999 call and an immediate response is required. This could pose difficulties in terms of explaining the randomisation process properly without unduly delaying the service response to the call. It can also be argued that consent provided in these circumstances may not be fully informed.

We have therefore used a pre-consent randomisation design. In this design participants are not asked for their consent to randomisation, they are asked to consent to treatment and follow-up. This process allows the *selection* of a random group of individuals to be offered a new service (in this case, to have their call transferred to an NHS Direct nurse). The control group are not randomised to anything except consent to further follow-up. The service (treatment) they receive is the standard ambulance response that all callers would normally get.

Another advantage of this design is that in seeking consent only the conditions of the arm the caller has been selected for need to be explained, making the process more straightforward. If consent to randomisation is required then both arms of the study have to be described and the caller at this stage still does not know what response they are going to get. The consent rate may be low as this process may be confusing and individuals could refuse to take part simply to get a more immediate response to their call. We believe the design we have chosen provides a reasonable compromise in trying to fulfil the ethical requirements of providing participants with sufficient information that they can give informed consent in difficult circumstances and the need to conduct a study that can answer the research questions.

3.5.2 Randomisation process

Randomisation occurred at the point at which a study AMPDS code fulfilling the inclusion criteria was assigned by the EMD taking the call. Two methods of randomisation were used;

- In the Two Shires Ambulance Service a randomisation program developed by the AMPDS system designer was added to the system. This was based on game theory that once an Omega code had been assigned there was a 50:50 chance that either of the two consent protocols would be selected. A randomisation button on the EMD screen appeared for included Omega level calls. This button was clicked for calls fulfilling the inclusion criteria and the consent protocol for either the intervention group or control group appeared on the screen as a pop-up box. The EMD then followed whichever protocol had been randomly assigned.
- In the GMAS an older version of AMPDS was used and Alpha calls included. In Wales, although Omega calls were used an Alpha code was also included. In both systems the randomisation program described above could not be used. Instead, EMD workstations within the control centre were randomly assigned to pass eligible calls to the nurse (intervention) or to recruit control group patients. The randomisation took place on a daily shift basis. Strings of random binary numbers (0 or 1 corresponding to intervention or control) were generated for each workstation for each day on a monthly basis. Each day at the beginning of the morning shift the control room manager allocated the study arm

to be used to the EMD at each station. For subsequent shifts that day the allocation was reversed. In this way each workstation allocated calls to both groups each day and each EMD recruited only intervention or control group calls on each shift.

In both methods, for cases allocated an ambulance response (the control group) the protocol for EMDs was to inform the caller that an ambulance was on the way, explain the nature of the research project and request verbal consent to contact them later to ask about their views of the service. For cases selected to receive transfer to a nurse adviser for further assessment the EMD was to advise the caller that their condition could be suitable for nurse advice and asked for verbal consent to transfer their call. If the caller consented their call was to be transferred. Consent for further follow-up was then to be requested by the nurse assessing the call. If the caller refused an ambulance was to be dispatched and they were to be asked if they would consent to being contacted later.

The call handling and consent protocols used are given in Figures 1–3.

Figure 1 Consent protocol for category C calls selected for the control group

For calls with study AMPDS Omega codes fulfilling entry criteria and selected for an ambulance response.

At the end of post-dispatch instructions:

EMD	'I'd like to ask you one other thing. We are taking part in some research looking at suitable responses for people who ring 999. To help with this we would like to send you a questionnaire in a few days to ask you about the service you have received. Is this OK?'
If YES response	'Thank you.' Take contact details (name, postcode, house number and phone number) for follow-up questionnaire.
If NO response	'That's fine.'

Figure 2 Consent protocol for category C calls selected for transfer to a nurse advisor

For calls with study AMPDS codes fulfilling entry criteria and selected for a nurse assessment response.

EMD

'From the details you have given it may be better to speak to a nurse adviser at NHS Direct. We are doing some research on this at the moment and I can transfer you directly. If the nurse believes an ambulance is necessary one will be sent to you. May I transfer you now?'

If YES		**If NO**	
'I will transfer you to NHS Direct. Just hold the line while I pass your details to the nurse.' If picked up by nurse within 90 seconds give handover details and end call. If not picked up in 90 seconds return to caller: 'Hello, I am afraid all the nurses are busy at the moment so I'm organising help for you now. However, to help our research we would like to send you a questionnaire in a few days to ask you what you think about our service. Is that OK?'		'That's OK. I'm organising help for you now.' After post-dispatch instructions: 'To help our research we would like to send you a questionnaire in a few days to ask you what you think about our service. Is that OK?'	
If YES	**If NO**	**If YES**	**If NO**
'Thank you. If you would like more information about the research I can send you some details.' Take contact details (name, postcode, house number and telephone number) for follow-up questionnaire and end call.	'That's fine.' End call.	'Thank you. If you would like more information about the research I can send you some details.' Take contact details (name, postcode, house number and telephone number) for follow-up questionnaire and end call.	'That's fine.' End call.

Figure 3 Consent protocol for category C calls receiving NHS Direct assessment

For Omega calls passed for nurse assessment.

At end of assessment:

Nurse advisor	'I'd like to ask you one other thing. To help with our research we would like to send a questionnaire in a few days to ask you about the service you have received. Is this OK?'
If YES response	'Thank you.' If the caller is *not* the patient take contact details (postcode, house number and phone number) for follow-up questionnaire.
If NO response	'That's fine.'

3.6 Outcomes assessment

We assessed both processes and patient outcomes to determine service effects and clinical impact for callers and patients.

3.6.1 Process measures

- Numbers of calls passed and proportions of potential calls.
- Numbers and proportions of patients who are transported to hospital.
- Ambulance-service job cycle times.
- Outcome of nurse assessment for passed calls: type of care required (self care, primary care, emergency care), urgency of the condition (immediate or delayed; e.g. see GP within 3 days) any action taken by the NHS Direct nurse (e.g. referrals to other agencies).
- Call cycle time: from 999 call to resolution (ambulance clear; NHS Direct call completed)
- Return rates to the ambulance service and whether non-emergency ambulance transport was required.
- Any treatments given by ambulance crews for patients attended by ambulance.
- Appropriateness of call transfer for calls returned to the ambulance services.

3.6.2 Outcomes

Callers randomised to the intervention and control groups and who consented to further follow-up were sent a postal questionnaire one week after the incident. The questionnaire was developed from previous related work (Medical Research Council, 2000; House of Commons Committee of Public Accounts, 2002) and is described in more detail in Section 5. Information was requested on the following:

- what action was taken by the patient following the call, including any health care contacts (GP, emergency department, admission to hospital, etc.) made within 7 days for the condition for which the call was made;
- satisfaction with and acceptability of the service provided;
- callers transferred to nurse advisers were asked about what advice was given and how helpful this advice was. Callers who received an ambulance were asked about the treatment given by and satisfaction with the ambulance crew.

We also attempted to measure the appropriateness of call transfer. One method is to record the number of adverse events, such as unexpected death, as these indicate the safety of the service change, However, the nature of the 999 calls under investigation is that on initial assessment they are categorised as low priority (compared to other calls) and therefore not clinically urgent. Although there is always a risk of serious adverse events in this population it was anticipated that these would be rare. We therefore recorded any such events reported in the patient follow-up but also included a number of other measures to assess appropriateness. These are:

- the pass-back rate of transferred calls to the ambulance service for an emergency response;
- admissions to hospital;
- NHS Direct internal audit of appropriateness of study calls referred back to the ambulance service.

3.7 Call identification and data collection

Data were collected for all calls meeting the entry criteria and randomised to the intervention or control groups. Routinely recorded, non-identifiable call data were collected for all calls. Names and addresses were only used for calls where consent to follow-up had been obtained. Linkage between ambulance-service and NHS Direct calls was made using service incident numbers.

Ambulance services provided monthly downloads from their CAD systems of all 999 calls received that had been assigned study codes. From these all potentially eligible calls and those allocated to the intervention and control groups could be identified. Intervention-group calls that were returned to the ambulance service were also identified from this source. The CAD data provided information on

- date and incident number;
- timings: call received by ambulance control, passed to NHS Direct, passed to ambulance crew, ambulance dispatched, arrived on scene, left scene, arrived at hospital, call completed;
- AMPDS code;
- reasons for not passing calls;
- patient details: age, sex, location of call, type of condition.

These routine data were collected for all calls. For calls passed for further assessment the nurse adviser completed a simple data-collection form, providing details on:

- Clinical Assessment System incident number;
- timings: call received, completed or returned to ambulance service;
- patient and caller details: who calling for, location, age, sex;
- algorithm used;
- outcome of Clinical Assessment System assessment (self care, primary care, etc.);
- whether the outcome was up- or downgraded by the nurse adviser from that suggested by the Clinical Assessment System;
- if returned to the ambulance service, reason for return.

For calls where an ambulance was sent (the control group and intervention-group calls returned to the ambulance service), where possible the patient-report form completed by the attending crew was retrieved. From this the reported condition on arrival of the crew, any treatments given and whether the patient was transported to hospital were recorded.

Caller and patient outcome data were collected using the postal questionnaire.

3.8 Statistical considerations

3.8.1 Sample-size estimation

If the intervention is to be considered an acceptable and appropriate method of call management then a high level of satisfaction with this service change needs to be detected in users of the service. We intended to combine condition codes into three clinical groups based on the frequency with which codes are recorded so that patient follow-up would not be dominated by a small number of frequently reported conditions. In order to have a reliable estimate of the proportion of callers who were dissatisfied with being passed to NHS Direct or refused this advice approximately 200 patients/callers would need to be followed up in each clinical group. This should have ensured that the estimated proportion who were dissatisfied in each group was within ±5% of the true proportion, assuming that the true

proportion was 10% and the follow-up 70% complete, or that the true proportion was 15% and the follow-up 100% complete. A total of 600 patients was therefore the target to be followed up in each of the three intervention groups and each of the three control groups: a total of 3600.

As the results in Section 4 and 5 show, we did not achieve this level of follow-up rate in the main study and could not therefore assign cases to meaningful, separate clinical groups. The results have therefore been presented as intervention and control groups only.

3.8.2 Analyses

The analysis was carried out on an intention-to-treat basis so any case exercising a preference would be included in the study arm it was randomly assigned to, not the actual service received. Measures requiring a response to follow-up were analysed for those who responded. If there was no response (drop out) only those measures we knew about (process measures) were analysed. The total numbers of eligible subjects, those consenting to the new service and follow-up and those not consenting, are described according to the agreed standards for reporting results of randomised controlled trials (CONSORT; Begg *et al*., 1996).

The different methods of randomisation give rise to the possibility of differences in the study populations in each site. In the Two Shires randomisation was at the individual patient level. In the other two study sites randomisation was by EMD. In effect, each EMD on each day was a cluster of cases and recruitment in these sites could be considered to be a cluster design. However, the mean size of each cluster was 1.84 and as a consequence any design effects due to clustering are negligible. The intervention and control cases for all sites have therefore been aggregated and analysed as two single groups.

The primary analyses were:

- patient satisfaction with the call-handling process and overall service in both groups and compared for differences between groups;
- compliance: assessed by comparing the frequencies with which the patients reported actions and the advice given by the NHS Direct nurse adviser concurred;
- acceptability of the intervention: assessed by measuring the frequency with which patients still requested an ambulance following a nurse assessment of self or primary care; and satisfaction with the advice given;
- comparison between groups of outcome in terms of the resolution of the problem 2 days after the incident;
- comparisons between groups of care processes: total call episode times and transports to hospital;

- return rates of transferred calls back to the ambulance service for an emergency response for all calls and by different dispatch codes;
- outcome of assessment by nurse advisers in terms of the service required;
- the number and proportions of adverse events occurring in 999 calls redirected to NHS Direct measured by comparing admission to hospital with 7 days of the call and treatments required by ambulance crews;
- the impact of service change on ambulance-service and NHS Direct staff.

Section 4 Results of the main study

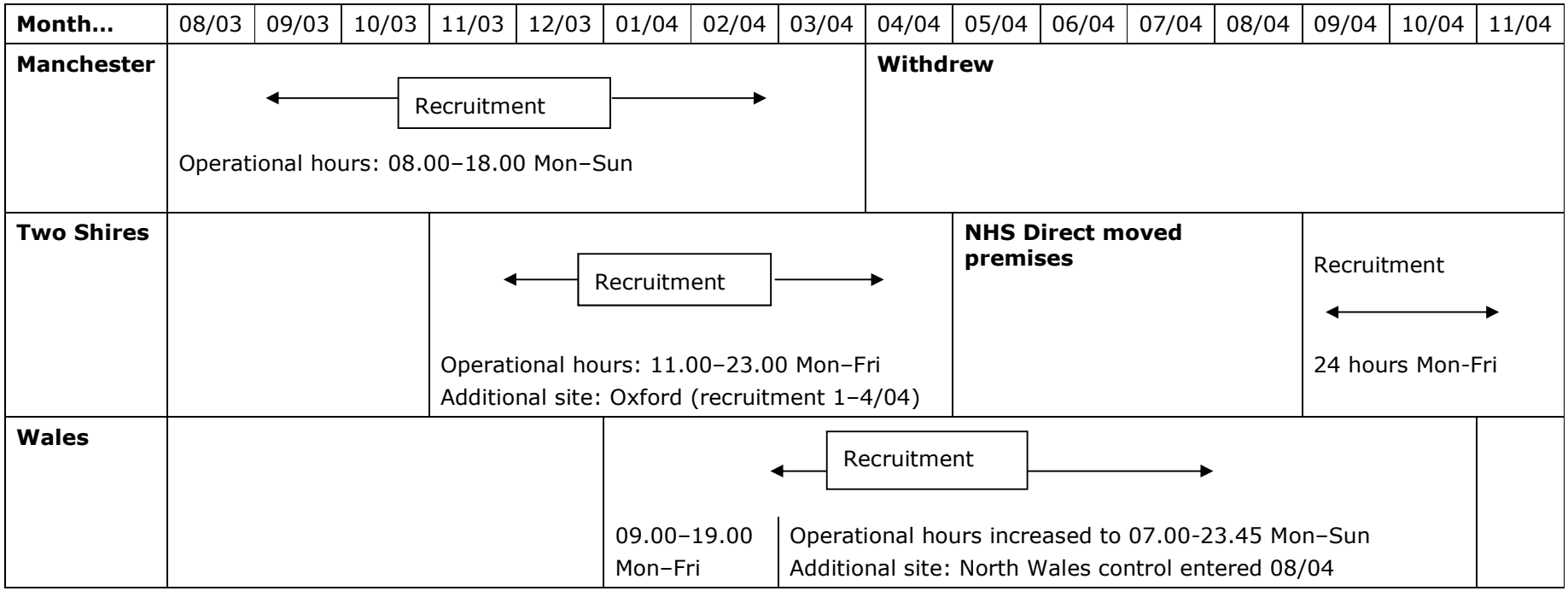
4.1 Trial time periods

The original proposal was to run the randomised controlled trial phase of the study for 1 year from July 2003 to June 2004 inclusive. However, a number of factors affected both the start time and duration of the trial in different study areas. The main issues were as follows.

- Delays in modifications to ambulance-control centre computer systems and setting up secure telephone links between ambulance control and NHS Direct centres together with longer-than-anticipated time periods for training staff meant the trial phase began late in Wales and the Two Shires.
- The Greater Manchester site was already operational and the trial started there in August 2003. However, after the start of the study significant changes were made to the management of NHS Direct. Specifically, funding of the service changed and as from 1 April 2004 NHS Direct became a Special Health Authority. When the study commenced GMAS and Greater Manchester, Cheshire and Wirral NHS Direct were part of the same NHS Trust and their resources combined. This allowed the employment of emergency nurse advisors within the ambulance control room who were additional to established NHS Direct staff. The new funding arrangements for NHS Direct did not include the additional nurses and separation of resources meant that these costs could not be covered from the ambulance-service budget. As a consequence the Greater Manchester site ceased the service and withdrew from the study on 1 April 2004.
- NHS Direct Thames Valley and Northamptonshire moved to new premises in April 2004 and it took several months for revised telephone-transfer systems to be put in place. No calls were passed from Two Shires ambulance service from the middle of April 2004 until August 2004.

The study period was extended to make up for the delayed start, with recruitment continuing in Wales until the end of October 2004, and in the Two Shires until the end of November 2004. These were the latest dates to which the ambulance services and NHS Direct were able to provide the service. Both services also increased operational hours of the service during the course of the study. Figure 4 summarises the study time periods for each site.

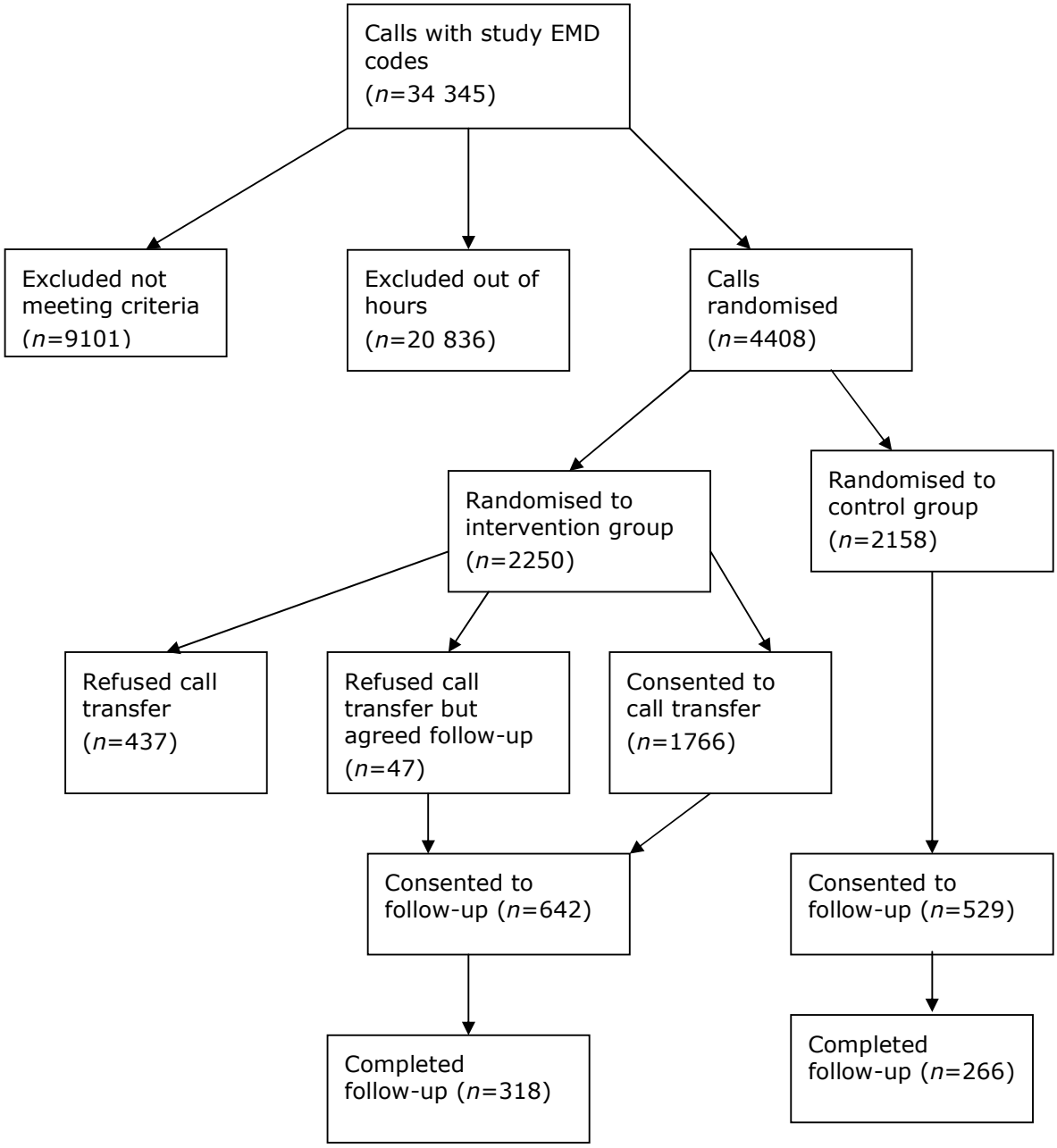
Figure 4 Time periods for case recruitment in each study site



4.2 Study numbers

There were 34 345 calls to the study ambulance services with EMD codes potentially suitable for nurse advice during the trial period. A total of 2250 cases were included in the intervention group and 2158 in the control group. Figure 5 gives the CONSORT diagram showing case recruitment. There is clearly attrition at each stage of the process.

Figure 5 CONSORT diagram of case recruitment



4.2.1 Excluded calls

Only 12.8% of potentially suitable calls were included in the study. The remainder were excluded because the calls occurred outside agreed operational hours, were unsuitable for transfer or because of technical difficulties. Figure 6 shows the proportions of included and excluded calls. Figure 7 summarises the reasons for exclusion of calls within operational hours.

Figure 6 Breakdown of inclusions and exclusions of potentially suitable calls (%)

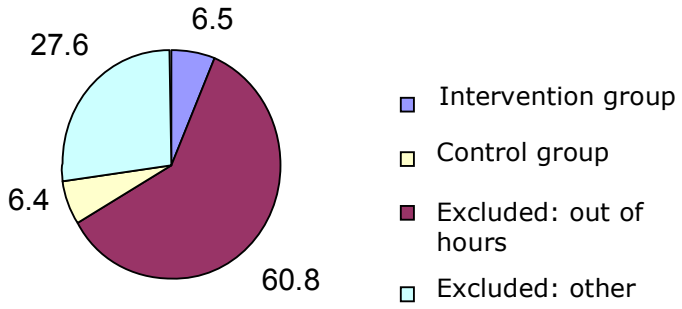
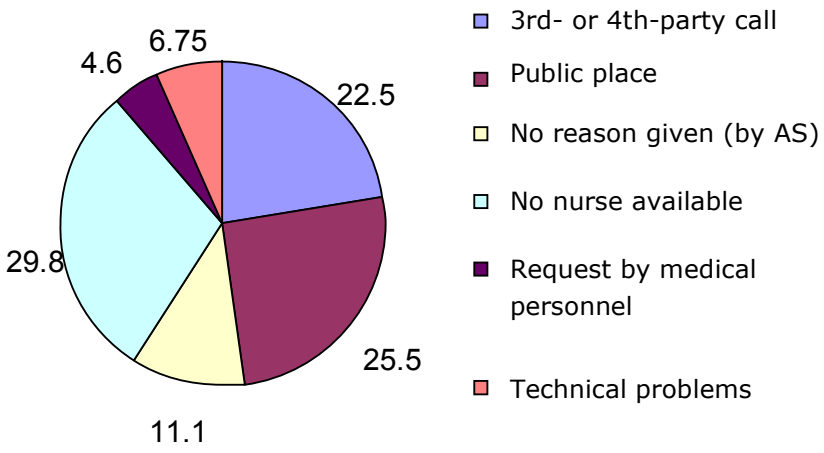


Figure 7 Reasons for exclusion of calls within operational hours (%)

AS, ambulance service.



Of calls excluded almost half were because the caller and/or patient was in a public place or the caller was not with the patient and 30% were because no nurse was available. A small proportion (4.6%) were because some form of medical assessment had already taken place (e.g. the call had been referred from a primary NHS Direct call or a GP had advised calling 999) and in 6.8% of cases transfer was not possible because of technical difficulties.

The small number of calls passed led to a review of operational hours and the criteria for excluding calls from public places. Operational hours were increased in both the Wales and Thames Valley sites and calls from public places where the patient was in a safe environment (e.g. a school or office) were included. This did lead to a small increase in numbers of calls towards the end of the trial period but nevertheless the numbers of calls passed for further assessment was very variable on a month-by-month basis and no steady pattern in referral was established (Figure 8). The variable nature of call transfer reflects the operational effects in practice of the service changes and periods when, although within agreed hours, the service became unavailable due to insufficient nurse advisers being available to assess calls. This could be a consequence of sickness or nurses being absent for training (e.g. a shortage of staff illustrated by the sharp decline in month 3 in Manchester) or, in the other two sites, high demand within the NHS Direct system resulting in no nurse being available to staff the dedicated ambulance-service telephone referral line.

Figure 8 Calls passed for nurse assessment per month by site

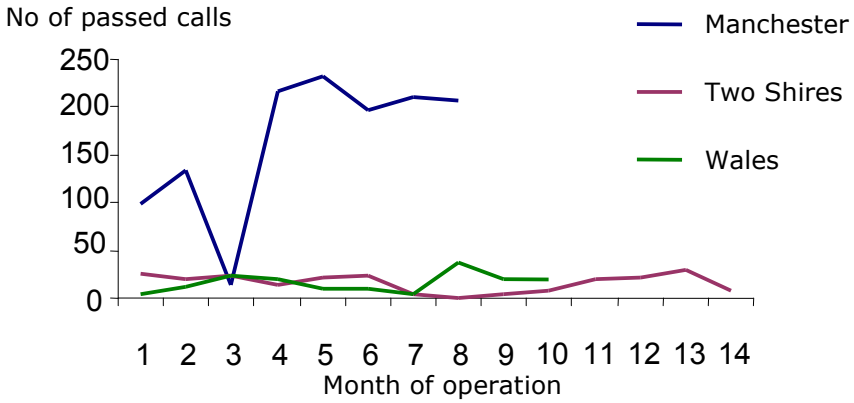


Table 5 Calls allocated to intervention and control groups in each site

Site	Intervention group *n* (%)	Control group *n* (%)	Total *n* (%)
1 Manchester	1311 (42.9)	1748 (57.1)	3059 (100)
2 Two Shires	525 (88.2)	70 (11.8)	595 (100)
3 Wales	414 (54.9)	340 (45.1)	754 (100)
Total	2250 (51)	2158 (49)	4408 (100)

4.2.2 Allocation to study group

Table 5 summarises the number of inclusions from each study site. Despite only running the trial for 8 months almost 70% of inclusions were from the Manchester site (site 1). This reflects the much higher call volume of this urban service. The proportion of calls allocated to the control group differed significantly between sites and was much lower in the Two Shires site (site 2). This was the only service to use the integrated randomisation software. In the early months of the study this disparity became apparent and the software designers were contacted. The randomisation program had been designed to allocate half of all Omega calls to the intervention group. However, the randomiser allocated calls before the exclusion criteria were applied, and the large proportion of calls not randomised at all (e.g. because the call was out of agreed hours) resulted in the randomiser more frequently allocating calls to the intervention group in order to achieve this 50% target. The US-based software designers decided the solution was to turn the randomisation software off during non-operational hours so that Omega calls during these periods would not be counted. Following this change the relative proportions of allocation improved, although there remained a bias towards the intervention group. The Wales site (site 3) had a more equal allocation rate to each group.

Attrition at consent and caller follow-up stages are discussed in Sections 5.2 and 5.4.

4.3 Casemix

Comparisons of patients allocated to the intervention and control groups show that the allocation worked well (Table 6). There were no important differences in the age or sex distributions of the groups. A large proportion of calls were for older people, with 35% of calls in each group being for people over 75 years of age. There were marginally more calls for females than for males.

There were proportionally more calls allocated to the intervention groups during night hours (20:00–07:59) than the control group. This may reflect the continually changing nature of the operational hours or less protocol compliance for control-group recruitment during hours when fewer EMDs were on duty.

Table 6 Characteristics of included cases

	Intervention group *n* (%)	**Control group *n* (%)**	***P* value**
Age (mean, years)	57.8	57.7	0.89
0–15	178 (7.9)	163 (7.6)	
16–45	590 (26.2)	586 (27.2)	
46–75	647 (28.8)	617 (28.6)	
>75	805 (35.8)	764 (35.4)	
Missing	30 (1.3)	28 (1.3)	
Total	2250 (100)	2158 (100)	
Sex			0.37
Male	979 (43.5)	906 (42)	
Female	1258 (55.9)	1238 (57.4)	
Missing	13 (0.6)	14 (0.7)	
Total	2250 (100)	2158 (100)	
Call time			<0.001
08.00–19.59	1930 (85.8)	1994 (92.4)	
20.00–07.59	320 (14.2)	164 (7.6)	
Total	2250 (100)	2158 (100)	

The intervention group comprises calls that both received the intervention and who refused transfer for further nurse assessment. There were no differences in age or sex between patients and calls where the intervention was accepted or refused but there was a difference in the time of the call, with 50% of calls where the intervention was refused occurring during evening hours compared with 8.4% where it was accepted ($P<0.001$).

There were some differences in the allocation of calls for different EMD codes (Table 7). For the majority of codes there were no or small differences. Half of the codes (40/81) had fewer than 10 calls allocated in total so differences are likely to be due to chance. Of codes with higher volumes the most notable differences were for diabetic problems (code 13), falls (17), laceration and/or haemorrhage (21), psychiatric problems (25) and traumatic injuries (30). For Alpha codes the difference is a higher proportion in the control group than the intervention group. This may reflect a perception on the part of EMDs that these particular calls require an ambulance attendance and an override of the allocated group. Interestingly, where there is a corresponding Omega code for the same condition (falls, psychiatric cases and traumatic injury) this trend is reversed, suggesting that the additional questioning required results in the EMD being more confident in passing the call for further assessment. There was no difference between passed calls and refusals in the intervention group

except for the code for falls where refusals were twice the number of consents. This is discussed in more detail in Section 4.5 but is probably the consequence of a high proportion of falls occurring in the elderly who require lifting from the floor.

Table 7 Numbers of inclusions for each EMD code

EMD code	Intervention group *n* (%)	Control group *n* (%)
01A01	107 (4.8)	113 (5.2)
01O01	16 (0.5)	5 (0.2)
01O02	7 (0.3)	5 (0.2)
02A01	20 (0.9)	18 (0.8)
02O01	5 (0.2)	1 (0)
03A01	0	3 (0.1)
03A02	1 (0)	0
03O01	2 (0.1)	0
03O03	1 (O)	2 (0.1)
04A01	2 (0.1)	3 (0.1)
04A02	3 (0.1)	8 (0.4)
05A01	69 (3.1)	99 (4.6)
05A02	5 (0.2)	13 (0.6)
07A01	3 (0.1)	5 (0.2)
07A02	2 (0.1)	4 (0.2)
07O01	2 (0.1)	0
11A01	2 (0.1)	5 (0.2)
11O01	16 (0.7)	4 (0.2)
13A01	21 (0.9)	38 (1.8)
13O01	14 (0.6)	4 (0.2)
16A01	1 (0)	0
16A02	8 (0.4)	9 (0.4)
16O01	3 (0.1)	0
16O02	4 (0.2)	2 (0.1)
17A01	204 (9.1)	281 (13)
17A02	128 (5.7)	156 (7.2)
17O01	217 (9.6)	26 (1.2)
17O02	165 (7.3)	77 (3.6)
17O03	13 (0.6)	12 (0.6)
18A01	13 (0.6)	11 (0.5)
18O01	11 (0.5)	1 (0.1)
21A01	40 (1.8)	78 (3.6)
21O01	3 (01)	0 (0.3)
21O02	11 (0.5)	1 (0.1)
21O03	12 (0.5)	8 (0.4)
23O01	23 (1.0)	16 (0.7)
24A01	9 (0.4)	16 (0.7)
24A02	6 (0.3)	14 (0.6)
24O01	6 (0.3)	4 (0.2)

EMD code	Intervention group *n* (%)	Control group *n* (%)
25A01	18 (0.8)	36 (1.7)
25O01	25 (0.1)	5 (0.2)
25O02	7 (0.3)	0
26A01	684 (30.4)	804 (37.3)
26A02	2 (0.1)	1 (0)
26A04	1 (0)	0
26A05	18 (0.8)	9 (0.4)
26A06	14 (0.6)	12 (0.6)
26A07	2 (0.1)	2 (0.1)
26A11	0	1 (0)
26A17	0	1 (0)
26A19	0	1 (0)
26A20	0	2 (0.1)
26A21	2 (0.1)	4 (0.2)
26A22	2 (0.1)	0
26A24	1 (0)	0
26A26	3 (0.1)	0
26O02	1 (0)	2 (0.1)
26O04	1 (0)	0
26O05	27 (1.2)	5 (0.2)
26O06	16 (0.7)	6 (0.3)
26O07	4 (0.2)	2 (0.1)
26O08	7 (0.3)	4 (0.2)
26O11	12 (0.5)	3 (0.1)
26O12	4 (0.2)	0
26O14	0	2 (0.1)
26O19	2 (0.1)	0
26O20	5 (0.2)	2 (0.2)
26O21	0	1 (0)
26O22	2 (0.1)	2 (0.1)
26O23	11 (0.5)	5 (0.2)
26O25	3 (0.1)	1 (0)
26O26	7 (0.3)	5 (0.2)
26O27	2 (0.1)	2 (0.1)
26O28	3 (0.1)	2 (0.1)
30A01	60 (2.7)	101 (4.7)
30A02	42 (1.9)	40 (1.9)
30O01	45 (2)	29 (1.3)
30O02	13 (0.6)	6 (0.3)
31A01	10 (0.4)	20 (0.9)
31A02	0	1 (0)
Missing	29 (0.8)	7 (0.3)
Total	2250 (100)	2158 (100)

4.4 Processes of care

4.4.1 Call cycle times

The further assessment of some 999 calls may potentially save ambulance-service resources by reducing the number of responses and hence the number of ambulance unit hours used. A unit hour is one fully crewed paramedic ambulance available for use for 1 hour. In service 1 (Manchester) there was also the option, where an ambulance was still required for calls assessed by nurses, to delay the response and therefore leave emergency ambulances free to respond to more urgent cases first. This does have implications for the total response time to the patient and these issues are discussed in more detail in Section 4.5 and the economic evaluation (Section 8). We have assessed whether there are any differences in total ambulance job cycle time for intervention- and control-group cases. Total job cycle time is the total time an ambulance is engaged for a call. When two calls are generated for the same job, for example when the original responding ambulance is cancelled once the call is passed for further assessment and a subsequent ambulance dispatched for calls returned to the ambulance service, the duration of the ambulance response for each call has been combined.

Mean job cycle times have been calculated and compared for the two groups. Using an 'intention to service' pragmatic approach to analysis, the intervention group includes calls where further assessment was refused and for all these cases an ambulance was dispatched as normal (an identical process to the control group). We have also compared mean job cycle times for passed calls only and compared this with the control group (efficacy analysis). Mean times have been compared using a *t* test for two independent samples. The results are given in Table 8.

Table 8 Mean job cycle times

	Mean job cycle time (min:sec)		***t* test**	***P* value**	**Mean difference (min:sec; 95%CI)**
	Intervention	**Control**			
All calls	41:35	50:36	$t_{3861}=-11.5$	<0.001	−9:10 (−10:33 to −07:29)
Passed calls only	41:08	50:36	$t_{2862}=-1.4$	<0.001	−9:27 (−11:11 to −7:44)

There was a significant and operationally important difference in mean job cycle times with a reduction of 9 minutes in the intervention group compared to the control group, increasing to 9.5 minutes for calls passed for further assessment, indicating the potential for saving of ambulance resources. The principal reason for this time saving is calls

resolved by the nurse. The mean cycle time for these calls is only 13 minutes as the ambulance is cancelled as soon as the nurse picks up the call and there is no subsequent time taken to travel to the location, on-scene time or transport-to-hospital time. The mean cycle time for calls where an ambulance is dispatched is 50 minutes so there is a substantial time saving for these calls and relatively low numbers of them are required to produce a significant effect on mean job cycle times.

4.4.2 Transports to hospital

Outcome in terms of whether a patient was taken to hospital or left at home has been recorded for all cases. The proportion of cases transported to hospital has been compared between intervention and control groups and also between calls passed for nurse assessment and control group (Table 9).

There was a substantial difference in transport-to-hospital rates between the groups, with the rate being lower in the intervention group. The proportion of transports was almost the same for passed calls as for all calls in the intervention group, suggesting that those who refused to be passed to NHS Direct had a similar chance of conveyance to hospital as the others in the intervention group; that is, they appear to have needed the ambulance for aid on scene rather than treatment at an emergency department.

Table 9 Proportions of patients transported to hospital

	Intervention group *n* (%)	**Control group *n* (%)**	***P***
All cases			<0.001
Transported to hospital	1097 (48.8)	1679 (77.8)	
Not transported	1153 (51.2)	479 (22.2)	
Total	2250 (100)	2158 (100)	
Passed cases			<0.001
Transported to hospital	845 (47.8)	1679 (77.8)	
Not transported	921 (52.2)	479 (22.2)	
Total	1766 (100)	2158 (100)	

However, the difference between groups for all calls, including calls where further assessment was refused and therefore an ambulance response was provided, suggests there was some difference between the two groups other than further assessment influencing the decision by ambulance crews to leave patients at home. There are a number of possible reasons for this difference. First, there may be some genuine differences in the clinical needs of the two groups of patients. Differences in the proportions allocated to different EMD codes have been discussed in Section 4.3. It is possible that some selection bias

was occurring and EMDs were recognising calls requiring some form of clinical intervention and sending an ambulance response. However, it is difficult to see how this could occur as systems were put in place to prevent EMDs from selecting calls by requiring them to record a reason for not passing calls. Even if a call allocated to the intervention group was not passed it was still allocated to and therefore analysed within that group and did not become a control-group case. Another possible explanation is that, as a result of the conversation with the nurse, patients and or ambulance crews changed their perception of risk attached to not travelling to hospital. Patients may have decided that their condition was not as serious as they had first thought and that they could either wait and seek alternative help, for example from their GP, or manage the condition themselves. Similarly ambulance crews may have felt more comfortable leaving patients at home having had a more detailed assessment by the nurse. Consequently fewer patients may have been transported to hospital as a precaution rather than because there was a genuine, clinically urgent need.

4.5 Process outcomes of calls assessed by nurse advisers

4.5.1 Numbers and call characteristics

A total of 1766 calls were passed to nurse advisers for further assessment with 1311 (74.2%) assessed in site 1, 219 (12.4%) in site 2 and 236 (13.4%) in site 3. In one-third of calls the caller was also the patient. The remainder were calls made for someone else. Over 80% of calls were for incidents in the home, with fewer than 20% being for other incident types (Table 10).

Table 10 Characteristics of passed calls

	Passed calls *n* (%)		**Passed calls *n* (%)**
Who the call was for		***Place of incident***	
Self	437 (27.6)	Home	1464 (93.4)
Other	1145 (72.4)	Work	19 (1.2)
Missing	184	School	9 (0.6)
		Other	76 (4.8)
		Missing	198
Total	1766 (100)		1766 (100)

4.5.2 Outcomes of passed calls

Process outcomes in terms of the final disposition assigned to a call by the nurse adviser using the NHS Direct Clinical Assessment System, whether the call was returned to the ambulance service and, if so, the reason for returning, were recorded (Table 11).

Table 11 Final disposition of passed calls following nurse assessment

Disposition	Site 1 *n* (%)	Site 2 *n* (%)	Site 3 *n* (%)	All calls *n* (%)
999 Ambulance	323 (24.6)	75 (34.2)	70 (29.7)	468 (26.5)
ED immediately	168 (12.8)	14 (6.4)	17 (7.2)	199 (11.3)
ED within 4 hours	89 (6.8)	17 (7.8)	6 (2.5)	112 (6.3)
GP immediately	208 (15.9)	20 (9.1)	67 (28.4)	281 (15.9)
GP other	81 (6.2)	17 (7.8)	13 (5.5)	111 (6.3)
Pharmacist	3 (0.2)	1 (0.5)	0	4 (0.2)
Other professional care	5 (0.4)	5 (2.3)	7 (3.0)	17 (1.0)
Self care	11 (0.8)	17 (7.8)	3 (1.3)	31(1.8)
Missing/unable to complete assessment	423 (32.1)	53 (24.2)	67 (28.4)	543 (30.7)
Total	1311 (100)	219 (100)	236 (100)	1766 (100)

ED, emergency department.

Just over a quarter of calls were assessed as requiring a 999 ambulance response. Of the remainder, 22% were assessed as requiring primary care and 17.6% as needing emergency-department care. Only a very small proportion were assessed as being suitable for self care or some other type of health care. Thirty per cent of calls had no disposition recorded. The reasons for this were: calls where the assessment was not completed due to technical difficulties such as assessment-system failure and call disconnection; callers refusing to complete the assessment; an ambulance arriving on scene before the assessment was complete; or the call being completed but the nurse failing to record the outcome on the data-collection sheet relating to the call.

There were some differences between sites in the proportions of calls allocated to different dispositions. Site 2 assessed a smaller proportion of calls as requiring GP care but a higher proportion as being manageable by self care. Site 1 assigned a higher proportion of calls to emergency-department categories than the other sites. This may reflect differences in Alpha- and Omega-level calls and their ability to distinguish between more subtle levels of urgency.

The overall return rate of assessed calls to the ambulance service was 67% (Table 12). There were significant differences in the return rates between sites and the return rate was much higher in service 1 than in the other two services. As only 26% of fully assessed calls had a disposition of 999 ambulance required this indicates that calls for

other types of disposition were also returned. Table 13 shows the return rates for different dispositions of calls that were assessed fully.

Table 12 Rates of return of calls to the ambulance service

	Site 1 *n* (%)	Site 2 *n* (%)	Site 3 *n* (%)	All calls *n* (%)
Returned	993 (75.7)	79 (36.1)	110 (46.6)	1182 (66.9)
Not returned	318 (24.3)	139 (63.5)	111 (47)	568 (32.2)
Ambulance arrived	0	1 (0.5)	13 (6.3)	14 (0.8)
Missing	0	0	2 (0.1)	2 (0.1)
Total	1311 (100)	219 (100)	236 (100)	1766 (100)

Table 13 Return rates by disposition for assessed calls

Disposition	Returned *n* (%)	Not returned *n* (%)	Total *n* (%)
999 Ambulance	464 (99.1)	4 (0.6)	468 (100)
ED immediately	148 (74.4)	51 (25.6)	199 (100)
ED within 4 hours	69 (61.6)	43 (38.4)	112 (100)
GP immediately	88 (31.3)	193 (68.7)	281 (100)
GP other	48 (43.2)	63 (56.8)	11 (100)
Pharmacist	0	4 (100)	4 (100)
Other professional care	2 (11.8)	15 (88.2)	17 (100)
Self care	4 (12.9)	27 (87.1)	31 (100)
Total	823 (67.3)	399 (32.6)	1223 (100)

ED, emergency department.

Clearly the more urgent the disposition, the more likely it was that the call would be returned. Nevertheless, a substantial proportion of calls assessed as requiring primary care were returned for an ambulance-service response, as were calls requiring emergency care even if this could be delayed. So, assessing a call as not requiring a 999 ambulance did not necessarily result in a cancelled ambulance journey.

Table 14 gives the reasons for returning the call for the 1196 calls returned. Just under half of calls were returned as a 999 response was required. In site 1 where the nurse advisers had the option to return the call for an urgent rather than emergency response almost 25% were returned for this reason; that is, only transport was required. Calls returned for other reasons in this area – for example, the caller requesting an ambulance – were also allocated a transport-only response. In this area half of the returned calls were for a 999 response and half for an urgent, transport-only response. Sites 2 and 3 did not have this option available and so could only return calls for

an emergency response. Nurses in these areas did record that 24/83 (28.9%) calls returned for a 999 response required transport only. So, returning a call for a 999 response is not the same as returning a call because the Clinical Assessment System assigned this response to the call and nurses were returning calls for other reasons.

Table 14 Reasons for returning passed calls back to the ambulance service

Return reason	Site 1 *n* (%)	Site 2 *n* (%)	Site 3 *n* (%)	All calls *n* (%)
Required 999 ambulance	442 (44.5)	29 (36.3)	54 (43.9)	525 (44.4)
Urgent transport	295 (29.7)	0, option not available	0, option not available	295 (25)
Required lift and assess	72 (7.3)	33 (41.3)	6 (4.9)	111 (9.4)
Caller requested ambulance	43 (4.3)	7 (8.8)	11 (8.9)	61 (5.2)
Public place or patient not with caller	33 (3.3)	2 (2.6)	1 (0.8)	36 (3)
Refused assessment or hung up	14 (1.4)	3 (3.8)	2 (1.6)	19 (1.6)
GP had advised calling 999	50 (5)	2 (2.5)	1 (0.8)	53 (4.5)
Unable to assess, disconnected/system fail	28 (2.8)	2 (2.6)	14 (11.4)	44 (3.7)
Missing	16 (1.6)	1 (1.3)	21 (18.7)	38 (3.2)
Total	993 (100)	79 (100)	110 (100)	1182 (100)

For some calls the reason for returning a call to the ambulance service even though a 999 response was not required is clear; for example, where the patient had fallen and needed lifting from the floor. The facility to return calls for an urgent response may be another reason why the return rates in site 1 were much higher than in the other study sites as the nurse advisers may have been more willing to return the call following a request for transport where, for example emergency care was required. However, this site also assessed AMPDS Alpha calls whereas sites 2 and 3 assessed AMPDS Omega calls. Differences in return rates may also be due to differences in the call-prioritisation process, and the additional questioning required to provide an Omega code may result in the more accurate identification of calls suitable for nurse assessment. However, this does not explain why calls assessed as requiring primary care are also returned for an ambulance response. We have therefore examined a number of characteristics to try and identify differences between calls returned and not returned to the ambulance service (Table 15).

Table 15 Characteristics of calls returned and not returned to the ambulance service

Characteristic	Value	Returned (%)	*P* value
Call type	Alpha	73.2	<0.001
	Omega	46.1	
Time of day	08.00–19.59	70.1	<0.001
	20.00–07.59	41.4	
Day of week	Weekday	67	0.6
	Weekend	68.7	
Age	0–15	39.2	<0.001
	16–45	56	
	46–75	72.8	
	>75	79.2	

One possible explanation for returning calls assessed as requiring primary care could be if these calls occurred out of hours. There are no differences in return rates between calls assessed on weekdays compared to weekends; however, calls assessed in the evening were less likely to be returned to the ambulance service than during the day. If the time of the call is a factor influencing return of calls assessed as suitable for primary care it would be expected that the opposite would occur and that a higher proportion of calls would be returned during primary care out-of-hours time frames.

There was a strong association with call type, with Omega calls returned less frequently, and with patient age, where the return rate increased as age increased. Age as well as clinical need may therefore be a factor used by nurses when deciding whether an ambulance response is required as this group may be less able to either self care or arrange alternative transport, or may have complex social needs that cannot be resolved in a telephone call.

4.6 Summary of call analyses

We have found in this study that a relatively small proportion (12.8%) of potential category C 999 calls were suitable for telephone advice and further assessment by nurses. This was influenced by the exclusion criteria applied and the hours of operation of the alternative service. If exclusions were reviewed and the service available 24 hours a day then clearly there is scope to increase this proportion.

For calls that were included we have found some service benefits for calls receiving the intervention including a reduction in ambulance-service job cycle time and fewer transports to hospital.

The rate of return of calls passed for nurse assessment was high, with a mean of 67%, although this ranged from 75% in one service to 36%

in another. Twenty-six per cent of calls assessed by nurses had a Clinical Assessment System disposition of 999 ambulance required but 40% were returned because the nurse decided that an emergency response was required and the remainder were returned for different reasons. For some calls, for example falls, a face-to-face contact is obviously required. If callers request an ambulance this is still sent even if the call has been assessed as not requiring this response. A substantial proportion of calls were returned for transport only. Return rate was not influenced by the timing of calls, suggesting that other factors influenced nurses' decisions about which calls to send back to the ambulance service. Calls for the elderly were much more likely to be returned and it may be that this group is more likely to need transport or a face-to-face meeting rather than telephone assessment, for example when they have fallen. They also have different social, rather than medical, needs compared to younger patients.

The differences between services in return rates may be due in part to the facility to return calls for an urgent rather than emergency response. However, there was also a significant difference in the return rate for different types of calls, suggesting that Omega calls may be more sensitive in identifying calls suitable for further telephone assessment than Alpha calls.

Section 5 Caller and patient outcomes

5.1 Introduction

One of the main objectives of the study was to establish what happened to patients after their 999 call, the health service resources they used and the acceptability of the new service. A structured survey was chosen as the method for assessing these items. The questionnaire explored the experience of users as well as their views of the service and respondents were given the opportunity to make free-text comments on any aspects of the service with which they were particularly satisfied or dissatisfied.

An important issue to consider was whose opinion to seek. Clearly the views of the caller are important as it is this individual who experiences the new service; that is, the initial 999 telephone call and, where provided, the additional nurse assessment. However, information on the impact on the patient, who is often not the caller, was also required.

A condition of ethical approval was that the questionnaire should be sent to the caller as it is this person who has consented to follow-up during the telephone call. This presents the potential problem that where the caller is not the patient they may not know the subsequent patient events. However, as third-party and public-place calls were excluded, it was assumed that for the majority of calls where the caller was not the patient the call was being made by someone known to the patient and could therefore obtain the requested information. Callers were therefore the initial point of contact for the follow-up.

This focus of this section is the views and experiences of service users. Subsequent use of health service resources is discussed in the economic evaluation (Section 8).

5.2 Methods

A postal questionnaire was developed drawing on previous studies assessing the views and experiences of callers to the ambulance service (O'Cathain *et al*., 2002) and NHS Direct (O'Cathain *et al*., 2000; Appendices 1 and 2). The questionnaire covered sociodemographic details, experiences and views of the call process, usefulness of any advice given, what happened after the call, the extent to which the health problem was resolved 2 days later and the satisfaction with the call and service received. A space for free-text comments was also provided.

Callers randomised to either the intervention or control groups were asked by the EMD (control) or nurse assessing the call (intervention) whether they would be willing to complete a follow-up questionnaire.

Where the caller consented, and if the caller was not the patient the name, address and postcode were recorded.

We had initially intended to sample callers for follow-up but early in the study it became clear that there were two limiting factors that were likely to severely restrict the opportunity for caller and patient follow-up and hence to achieve the intended sample of 1800 cases in each group. These were;

- the much smaller than anticipated number of calls meeting the criteria for randomisation, and
- the low consent rate of included calls in terms of the number of callers being asked for consent to follow-up and the number agreeing.

Gaining consent was a particular difficulty as, to comply with ethical conditions, this process had to be carried out by NHS staff rather than the research team. There were differences in the rate of consent for control-group calls between the sites, with the numbers being very low in site 1 (<10% initially) and high in site 3 (almost 100%). In the latter compliance with the consent protocol for calls randomised to the control group was incorporated into the EMD performance review process, ensuring a high consent-request rate. This approach was subsequently adopted in site 1 with dramatic results but unfortunately this was immediately before this site had to withdraw from the study.

Requests for consent were equally poor in the intervention group across all three sites, with nurses only asking callers for consent to follow-up in one-third of cases. A number of strategies were initiated to try and resolve this problem, such as including a box on the data form completed by nurses asking them to state why consent was not requested, but they had little effect. There was, in general, a marked reluctance on the part of NHS staff to ask callers for consent to further follow-up.

As a result of these difficulties it was decided to send a questionnaire to any caller who gave consent to follow-up. In addition, we continued to send questionnaires to callers who received the new intervention and consented to follow-up during the second, observational study. There was no scope to extend the study beyond the time periods reported in Section 3 and so, pragmatically, the number of cases actually followed up was constrained by these limitations.

Questionnaires were sent out 1 week after the index 999 call by the researcher based in each study site with up to two reminders at two-weekly intervals. An information sheet about the study was also included and a covering letter asked second-party callers to request patients to complete the relevant items.

5.3 Analysis

Comparisons have been made between the intervention and control groups for common items. The χ^2 test and Fisher's exact test were used to test for differences between groups for the quantitative questionnaire data. Free text comments were also examined for positive and negative comments about the service provided and views concerning service changes.

5.4 Results

5.4.1 Response rates

A total of 642 questionnaires were posted to intervention-group callers and 529 to control-group callers. Three were returned as unknown at that address. Completed questionnaires were returned from 340 (53%) of the 639 intervention-group callers and 261 (49%) of the 529 control-group callers who received them. Fifty-three of the intervention-group questionnaires were received from callers who made calls during the second observational study. Although these calls were not randomised, the inclusion criteria and service offered were identical to those present during the randomised study. There was no evidence of any difference in response rates between the first and second studies (χ^2=1.52, *P*=0.2). These questionnaires have therefore been included in the analysis as they increase the available information about users' views of the new service. Table 16 summarises response rates for the intervention and control groups.

Table 16 Response rates to caller follow-up

	Site 1		Site 2		Site 3		Total	
	IG	**CG**	**IG**	**CG**	**IG**	**CG**	**IG**	**CG**
RCT								
Questionnaires sent	328	180	196	42	118	307	642	529
Address unknown	3	0	0	0	0	0	3	0
Returned complete	189	103	91	17	60	141	340	261
Response rate	56.7%	57.2%	46.4%	40.5%	50.8%	45.9%	53.2%	49.3%

CG, control group; IG, intervention group; RCT, randomised controlled trial.

A total of 601 useable questionnaires were available for analysis. Some respondents did not complete all the items on the questionnaire. Results are reported as a percentage of respondents who completed the item under consideration.

5.4.2 Comparability of respondents

The low rate of asking for consent to follow-up presents the possibility of a selection bias in the groups of respondents as EMDs and nurses are effectively selecting which individuals to ask for consent. In particular, the range of outcomes is greater in the intervention group compared to the control group where all individuals receive an ambulance response. There could then be a tendency for nurses to only ask for consent to follow-up in cases where, for example, they have resolved the problem.

A number of characteristics and sociodemographic variables have been examined to determine the comparability of the two groups (Table 17).

Table 17 Characteristics of respondents to follow-up questionnaires

Characteristic	**Intervention group *n* (%)**	**Control group *n* (%)**	***P* value**
Age 55 years or older	130 (41.4)	95 (40.4)	ns
Female	256 (80)	168 (69.4)	0.004
Left school age 16 or under	197 (67)	151 (65.7)	ns
Use of a car	210 (66)	155 (65.1)	ns
Use of a telephone	316 (99.1)	235 (98.3)	ns
Calls returned to the ambulance service (%)	68.6	Not applicable	

ns, not significant.

Respondents were similar for both groups in terms of age, educational status, use of a car and use of a telephone. However, the control group had proportionally more male responders (P=0.004) than the intervention group. There was no difference in the proportion of calls returned to the ambulance service in the intervention-group responders compared with all intervention-group calls (P=0.77), suggesting that there was no selection by nurses in terms of the disposition when asking for consent to follow-up.

5.4.3 Comparison of experience and satisfaction with the call process and service

The questionnaire asked callers and patients to record their views of the initial 999 call, the advice given, their satisfaction with the call and service and how they were 2 days after the incident (Table 18). The results for questions where a single response is presented are the number and percentage of respondents who agreed or strongly agreed with the item considered.

Table 18 Comparison of experiences and views of the service

Item	Intervention *n* (%)	Control *n* (%)	*P* value
The 999 call			
Number of questions			0.25
Too many	63 (18.8)	28 (10.9)	
Right number	268 (80)	244 (87.2)	
Too few	4 (1.2)	5 (1.9)	
Type of questions			0.28
All relevant	193 (56.9)	175 (68.9)	
Most relevant	119 (35.1	63 (24.8)	
Few/none relevant	27 (8)	15 (5.9)	
Ambulance call-taker helpful	280 (92.1)	233 (96.7)	0.24
Exactly the right amount of advice given	221 (79.5)	209 (93.7)	<0.001
The overall service			
Happy with the service	221 (79.2)	220 (94.0)	<0.001
Made to feel wasting everyone's time	41 (18.3)	17 (8.8))	0.005
Generally satisfied with the service	241 (84.9%)	221 94.8%)	<0.001
Two days later			
Problem completely better	35 (15)	25 (9)	0.19
Improved	114 (48.7)	106 (46.3)	
The same	60 (25.6)	78 (34.1)	
Worse	25 (10.7)	20 (8.7)	

There was no difference between the groups in terms of the call-taking process; that is, the number and relevance of questions asked and the helpfulness of the call-taker. There was also no difference in outcome in terms of the extent to which the health problem had been resolved 2 days after the event. There were differences in caller experience and satisfaction with the service. Intervention-group respondents were 14.2% less likely to agree that they had received the right amount of advice, 14.8% less likely to agree that they were happy with the service and 10% less likely to agree they were generally satisfied with the service they had received, although almost 85% did agree with this last statement indicating that, in general, users still have a high level of satisfaction with the service. Intervention-group responders were also more likely to consider they had been made to feel they were wasting the service's time. All of these differences were statistically significant.

5.4.4 Callers' views and experiences of nurse assessment

Callers allocated to the intervention group were asked questions about their views of the additional call assessment, the advice given and whether they acted on this advice. When asked whether they had accepted the offer to transfer their call to a nurse, 285/331 respondents replied yes and 46/331 replied no. Of those who said no 16 were callers who had refused transfer but agreed to a follow-up questionnaire. Thirty callers who had their call transferred believed they had not agreed to this although the transfer protocol stipulated that callers should consent to transfer.

Callers were asked to give their reasons for choosing to accept or refuse transfer using a list of alternatives (Table 19).

Table 19 Reasons for accepting or refusing transfer to a nurse

Reason	Accepted (*n*=286)* *n* (%)		Reason	Refused (*n*=46)* *n* (%)
Felt ambulance not needed	23 (8)		Felt ambulance was needed	40 (74)
Happy to talk to nurse	56 (19.6)		Not happy to talk to nurse	5 (9.2)
Didn't realise NHS Direct provided this service	63 (22)		Thought NHS Direct was not a good service	3 (5.5)
Felt ambulance needed but happy to talk to nurse first	178 (62.2)		Would have liked to talk to nurse but thought this might waste time	6 (11.1)
Used NHS Direct before	22 (7.7)		Other	15 (27.7)
Other	29 (10.1)			
Total	371(129.6)*		Total	69 (127.5)*

**Some callers recorded more than one response.*

Over 80% of those who accepted the call transfer stated they were happy to talk to a nurse even if they believed an ambulance was needed. The majority of callers who had not wanted their call transferred did so because they believed an ambulance was required.

Callers transferred to NHS Direct were asked to record what advice the nurse had given them. Half of the respondents (131/265) reported that their call was transferred back to the ambulance service by the nurse. The remaining calls transferred back were because the caller had asked for an ambulance even though the nurse had advised otherwise. Twenty-eight per cent (74/265) were advised to contact their GP or other primary care or community service. In 55 cases the nurse contacted another service on behalf of the patient. In 23 cases the caller was given advice on how to deal with the problem themselves.

When asked how helpful the advice had been 152/279 respondents (54.5%) found the advice very helpful and 76/279 (27.2%) quite helpful. Fifty-one callers (18.3%) considered the advice to be not very helpful or not helpful at all. Of those who found the advice helpful 141/231 (61%) felt this was because the nurse had reassured them and they worried less and 76/231 (33%) because it helped them to contact the right service. A small number (37/231) learned how to deal with the problem and prevent it in future. Half of those who did not find the advice helpful (25/52) were not reassured and 15/52 (28.8%) felt it did not help them contact the right service or stopped

them from contacting a service. A small number of respondents (9/265) recorded that they sought another opinion about the problem as they were unhappy with the advice they had been given.

Table 20 summarises the responses to questions on callers' experiences of and satisfaction with the call process and service. Overall there was a high degree of satisfaction with the service, with over 80% of respondents agreeing or strongly agreeing that the nurse was helpful, that they were given clear, understandable advice and that the advice worked well in practice. However, almost a quarter of respondents were unhappy with the advice given, an unusually high proportion expressing dissatisfaction in patient follow-up of this type. One-fifth of callers did not agree that it was appropriate to transfer their call and 67.7% thought they should have been sent an ambulance.

Table 20 Views on the call process and service for callers offered transfer to a nurse

Item	***n* (%)**			
	Strongly agree or agree	**Not sure**	**Strongly disagree or disagree**	**Total responses**
I think the nurse was helpful	248 (87.3)	15 (5.3)	21 (7.4)	284 (100)
I understood all the advice I was given	268 (96.8)	7 (2.5)	2 (0.7)	277 (100)
The advice I was given worked well in practice	204 (80.3)	28 (11)	22 8.7)	254 (100)
I was unhappy with the telephone advice I was given	51 (23.7)	20 (9.3)	144 (67)	215 (100)
I think it was appropriate to transfer my call	174 (64.9)	40 (14.9)	54 (20.1)	268 (100)
I am satisfied with the information given	231 (84)	19 (69)	25 (9.1)	275 (100)
I was given clear advice about where and when to get more help	203 (82.9)	22 (9)	20 (8.2)	245 (100)
I think an ambulance should have been sent	126 (67.6)	33 (17.7)	27 (14.5)	186 (100)

Although most callers seemed happy with the advice provided there remained, for some, an expectation that when calling 999 an ambulance should be sent. Of course, a high proportion of these callers did subsequently receive an ambulance response and it is possible that this group were more satisfied with the service they received than those who did not get an ambulance response. However, comparing calls returned to the ambulance service with those not returned reveals no differences in proportions of

respondents agreeing or strongly agreeing with these items except for the statement 'I think an ambulance should have been sent', where 83.8% of respondents whose call was returned agreed with this statement compared to 39.7% whose call was resolved ($P<0.001$). This may support the caller's belief that an ambulance was necessary rather than indicate any dissatisfaction with the service. Callers who did not receive an ambulance were significantly less likely to agree with this statement, suggesting that to many of these callers the advice given by the nurse was an acceptable alternative.

5.4.5 Callers' views and experiences of the ambulance service

Callers allocated to the control group who received an ambulance response were asked about their views and experiences of the ambulance service and whether they would consider the alternative response of further advice from a nurse. When asked if they would have accepted transfer of their call for further advice 42/254 (16.5%) said yes and 212/254 (83.5%) said no. When asked for the reason for their decision, of those saying yes half said because they would be happy to talk to a nurse and half because they didn't realise the option was available. Of those who said no, 187/212 (88.4%) gave the reason that they thought an ambulance was needed and the remainder because they would not have been happy to talk to a nurse or for other reasons.

Callers were asked to record their views of and satisfaction with the service they had received and possible alternatives (Table 21). Respondents were highly satisfied with the service provided by the ambulance service and particularly by the ambulance crew. This concurs with findings of earlier studies (O'Cathain *et al*., 2002). Twenty per cent would have liked advice about alternatives to an ambulance but only 6.6% would have preferred to have been transferred to a nurse.

Table 21 Views of the call process and service for control-group respondents

Item	*n* (%)			
	Strongly agree or agree	**Not sure**	**Strongly disagree or disagree**	**Total responses**
I would have liked advice about alternatives to an ambulance	33 (21.8)	35 (23.2)	83 (55)	151 (100)
I would have preferred to have been passed to a nurse for further advice	11 (6.6)	26 (15.6)	130 (77.8)	167 (100)
I understood the advice given by the ambulance crew	221 (96.5)	4 (1.7)	4 1.7)	229 (100)
I think the ambulance crew were efficient	248 (98.4)	1 (0.4)	3 (1.2)	252 (100)
I was unhappy with the advice from the ambulance crew	18 (9.6)	3 (1.6)	166 (88.8)	187 (100)
I think it would have been appropriate to give me more advice rather than take me to an emergency department	5 (3.2)	8 (5.1)	145 (91.8)	158 (100)

So, although there was a high degree of satisfaction with the advice given when callers were transferred to a nurse, callers who were not offered this service did not seem to consider this an acceptable alternative, supporting the concept that callers to the 999 ambulance have a high expectation that an ambulance will always be sent.

5.4.6 Aspects of the service with which callers were particularly satisfied or dissatisfied

Seventy-five per cent (242/340) of the intervention-group and 75.8% (198/261) of the control-group respondents made comments in the free-text boxes provided on the questionnaire. In the intervention group there were 264 positive comments and 59 negative comments. For the control group there were 218 positive and 34 negative comments.

In both groups the majority of comments were general statements about the service in general.

Pleasant, friendly, approachable service.

Great service all round. Thanks.

I was very pleased with the help and advice the ambulance service gave.

All the service was excellent and the staff were very helpful and friendly.

Efficient, fast and professional service.

The most commonly mentioned items respondents were particularly satisfied with were the speed of response (26/264 intervention group, 52/218 control group), experiences of the initial telephone call (89/264 intervention group, 23/218 control group) and the attending ambulance crew (30/264 intervention group, 96/218 control group).

> *The person who answered the 999 call was very good and the ambulance crew were also very good. The person asked the questions simply so I could understand. I was in a panic but she stayed calm and that helped me to deal with the situation. I think everything went like clockwork and the person is recovering after a stay in hospital. Thank you.*
>
> *The speedy arrival. The good advice. The insistence of the crew that we had done the right thing by calling them. The care and tenderness they gave to my wife.*
>
> *The efficiency of the initial phone call. The friendliness and professionalism of the ambulance crew.*
>
> *The ambulance crew were fantastic, reassuring the patient all the way from arriving at the care home to settling in the hospital A&E. Very, very pleased.*
>
> *The very friendly, concerned individual that answered the call was helpful and sympathetic.*
>
> *An ambulance arrived within minutes of the cal. A very satisfactory service.*
>
> *How quick the ambulance arrived. The operator was pleasant and made me feel at ease.*

The comments that were made support the view that an ambulance arriving quickly is a key expectation for users of the service.

In the control group the most common sources of dissatisfaction were being asked too many questions (10/34), unsympathetic call-takers or crew (5/34), nurses at the scene having to answer questions when they are with a patient (3/34) and being made to feel they were wasting the ambulance services time (3/34). Other comments were about specific incidents at the scene, the time spent on the telephone and being asked if they would complete this questionnaire.

> *Too many questions. I am a district nurse phoning for my patient and said so at time of ambulance request. I knew I needed the service. Health professionals should be able to use their judgement and get ambulance. I was WITH the patient.*
>
> *Rather a lot of questions on the phone.*
>
> *The telephone operator was rather terse when I needed to hear a sympathetic voice.*
>
> *Too many questions were asked when the patient needed me. Could have had information later.*
>
> *My relative had what turned out to be chicken pox but I thought she had symptoms of meningitis. I phoned to enquire about it. They sent an ambulance just to be sure and when it arrived they made me feel embarrassed and felt as though I was wasting their time.*

There were a small number of general comments in the control group, particularly from care workers, about having to call 999 for non-emergencies:

> *You shouldn't have to dial 999 all the time. There should be another contact number as well. There should be a difference between emergency and minor calls.*

For the intervention group a number of specific comments were made about the new service. The most common comments (62/264) were about the help and advice given by the nurse.

> *They put me at ease. I didn't worry as much. They knew how to really help. There advice was really good. I would use NHS Direct again.*
>
> *Nurse tried to be helpful and was polite and reassuring.*
>
> *Clear and concise instruction from both the ambulance service and NHS nurse. Very professional confident service.*
>
> *The way the nurse spoke to me like I wasn't stupid for ringing for advice.*
>
> *Clear instructions given. Ambulance call receiver and NHS Direct nurse very calm and reassuring throughout call. Very positive and friendly manner.*
>
> *The professionalism and understanding of the nurse whom I spoke to.*
>
> *The nurse called me back to give me more information about the condition, giving me reassurance.*
>
> *The speed by which the ambulance arrived after my consultation, with the NHS Direct nurse. The pleasant/calm manner of the NHS Direct nurse and the clarity of her information and advice. The reassuring and pleasant manner of the ambulance staff.*

A number of comments were made about how speaking to the nurse had helped either reassure a caller they had made the correct choice to call 999 or helped refer them to a more appropriate service.

> *The people on the phone both 999 and NHS Direct were very helpful and pleasant. I had panicked and phoned 999 but I was reassured and felt very happy when I had spoken to the nurse, I was glad afterwards that an ambulance hadn't been sent as it would have wasted their time.*
>
> *The way the service followed through with each other and ensured the situation was dealt with from start to finish.*
>
> *Very thorough questioning so call-taker aware of whole situation. Made to feel I had taken the right action even though it was not a life threatening situation.*
>
> *The calm way in which the nurse spoke to me. A good idea. The service helped me make the right choice and gave me to support I needed.*
>
> *The NHS Direct nurse contacted my GP whereas I would only be able to contact a receptionist.*

There were 30 comments from individuals who felt the idea of providing nurse advice was a good idea. Half of these were from carers, particularly in nursing homes, who frequently called 999 for

assistance to lift some one from the floor. Many felt this was an inappropriate use of ambulance resources.

> *I strongly recommend transferring some calls to a NHS Direct nurse as it would save wasting the time of the ambulance crew as I am sure other people like me sometimes act too quickly when dialling 999 when it is not required. However, I would be concerned that if it was an absolute emergency i.e. heart attack or something then precious minutes could be lost.*
>
> *I think having a NHS number to ring is excellent as not all people need an ambulance and the advice given is great.*
>
> *I think this service is a great idea and helped me a lot.*
>
> *Only praise to have such a service. From the start of ringing 999 as advised by the doctor to being put in contact with the NHS Direct to get the correct mode of ambulance transport needed to get my foster son to hospital as needed with his problems i.e. not dire emergency but emergency enough to require hospital attention for his own particular distress. All I can say is 'well done' in restructuring the ambulance service, so that when it is needed genuinely, the service is there in an appropriate direction responsively.*
>
> *I've had to call emergency 999 number when my daughter has fallen many times. I wish they would just send an ordinary car and leave the ambulance available for those who need it. I always have confirmed that there is no bleeding and no injuries.*
>
> *Although everything was done quickly and both operator and NHS nurse were polite, I felt that the information given by myself merited an ambulance straight away, but I fully agree that a lot of the 999 calls are unnecessary and can be dealt with differently. I fully agree with the questionnaire sent and have no objections filling it in.*
>
> *Sometimes when a resident falls or has a problem that can't wait for an emergency doctors visit, but isn't a really bad emergency, I feel this service is good to cover that in between stage.*
>
> *As a warden for the elderly I have to call the ambulance service out frequently to just pick someone up. I and the residents feel guilty tying up the ambulance service when the person is not hurt just unable to get up.*
>
> *I did not need an emergency ambulance and would rather have a number for non-emergency ambulance calls, as running a care home, residents have accidents that warrant an ambulance but not always sirens blaring.*

Fewer than 20% of comments made were about dissatisfaction with the service. The most common source of dissatisfaction were being asked too many questions (16/59) and having to wait for an ambulance (11/59). The latter was confined to service 1 where the nurse adviser could order an urgent ambulance rather than an emergency ambulance. Calls changed to an urgent response had a mean patient cycle time – that is, the time from the call to the patient arriving at hospital or being left at home having been seen by a crew – of 65 minutes compared to 42 minutes for calls who received an emergency ambulance response. So although some callers thought

waiting for an ambulance was appropriate others thought having to wait was unacceptable.

> *Wasn't really satisfied with my dad having to wait 1½ hours for an ambulance due to the nurse thinking he is not really in an emergency status.*
>
> *Waiting 1 hour for non-blue light ambulance was inappropriate for an elderly person.*

A small number of comments were made concerning callers feeling they were told not asked whether their call could be transferred (7/59), a view that an immediate ambulance should be sent (4/59), satisfaction with the nurse advice but dissatisfaction with the service referred to and particularly being referred back to the ambulance service by, for example, out-of-hours doctors' services (3/59) and being asked to take patients to hospital themselves (4/59). Of the latter, two complained about the cost of taxis and two that taking elderly, disabled patients by car had proved very difficult for them. Two callers commented they felt they were wasting ambulance-service time. These comments illustrate further the view that callers who dial 999 have an expectation they will receive an immediate response and that an ambulance will be sent. There were two comments from nurses expressing the view that trained professionals should not have to answer questions when calling for an ambulance but also two comments from nurses expressing the view that they recognised not all calls for ambulances were emergencies and thought the service was a good idea.

> *I was* told *and* not asked *about the transfer of my 999 call to the NHS nurse. I was made to feel I was wasting everyone's time.*
>
> *The problem was not one that NHS could really resolve – I needed help to get an 80-year-old off the floor.*
>
> *I am not the sort of person to call an ambulance for something trivial. In this particular case no harm was done by delaying arrival at the A&E department.*
>
> *People in severe pain should not be transferred to NHS Direct but to let the ambulance come immediately.*
>
> *I think they should of sent the ambulance right away instead of putting me through to the nurse.*
>
> *I felt as though the ambulance service felt I was wasting time for them.*
>
> *Re: assessment of patient need for ambulance by another qualified person. When I deemed ambulance was necessary, as a qualified nurse. But I was reassured and understand this is to improve the service and maintain patient safety.*
>
> *I strongly feel that if professionals ring the ambulance service they should not have to be subject to such questions e.g. 'Is the patient breathing'. I feel that this unnecessary and time wasting.*

Three callers felt transfer of their call was inappropriate as the patient had a limb fracture, although in all these cases an ambulance was sent. Conversely, two callers felt discussion with the nurse where a

patient had a fracture had reassured them that they had made the right choice in calling 999.

5.5 Summary of the postal survey

The views expressed by respondents confirm the findings of the quantitative results. Speed of response is a very important component of satisfaction with the ambulance service, as is the interaction with ambulance professionals. Although measures of satisfaction were higher in the control group than the intervention group there is still a high overall level of satisfaction in both groups.

Where the system appeared to work well users of the new service were very satisfied with how their call had been handled, the advice they had been given and the service they received. There were a number of statements of support for the service change. However, there were incidents where the caller had thought transferring their call was unacceptable and wasted time because they judged an ambulance to be needed. Calls where elderly or disabled patients require lifting present a particular problem. There were also incidents recorded where an ambulance was clearly needed and views were mixed about the usefulness of nurse assessment. Some felt it helpful as talking to the nurse was reassuring and they were given advice on what to do while waiting for the ambulance. Others felt that the additional questioning was not helpful and caused unnecessary delay.

There were also concerns from some respondents about the appropriateness of delaying the ambulance and providing an urgent rather than an emergency response. Although this may be safe on clinical grounds, as further assessment has established that there is no threat to life, there clearly remains an expectation among some users that a 999 call should result in an immediate ambulance response. This is particularly true where, for example, the patient is in pain and/or distressed and this may be an equally valid reason for an immediate response as a life-threatening condition.

To distinguish between these different clinical needs there is a need to further refine the call-identification process in terms of the appropriateness of call transfer. However, reviewing the perceptions and expectations of service users will also need to be taken into account when considering further development of the service.

There are limitations to the findings. In particular, the response rate of 50% means we are uncertain of the generalisability of the findings. Non-responders may have different views on the usefulness and acceptability of the service from those expressed by those who did respond. It may be that non-response indicates neutrality and that callers had no strong views or preference for the service received. On the other hand they may have strong views, particularly if the service did not live up to their expectations, and chose to make their views known by other means. However, we think this unlikely as there were

very few complaints to either the ambulance service or NHS Direct. This is discussed in more detail in Section 7.

Section 6 Observational study of the service effects of redirecting 999 calls for nurse advice

6.1 Introduction

The true impact of the service change being evaluated can only be demonstrated when the intervention operates as it would in normal practice; that is, all suitable calls are passed as a routine ambulance-service response option. We therefore included a smaller study designed to assess the impact of the service change on ambulance service and NHS Direct workload and performance. With respect to NHS Direct we had intended to measure service effects in terms of changes in call volume, change in the time taken to call back and total time taken to complete a call episode. However, the study periods coincided with other major changes in NHS Direct services, most notably referral of GP out-of-hours services. Thames Valley and Northamptonshire NHS Direct saw periodic changes in both the number of GP surgeries utilising NHS Direct services for out-of-hours work and the hours of operation for this service. Similar changes were also taking place in Wales and as a consequence it would have been extremely difficult to isolate the impact of 999 call transfer from other factors that were influencing call volumes and subsequent performance. In addition the number of ambulance-service calls being transferred was very small. In Thames Valley the maximum number of calls transferred in a month was 36, which comprised only 0.17% (36/1800 calls) of NHS Direct workload. Compared to other changes the impact of ambulance call transfer was likely to be undetectable. We have therefore not attempted to measure changes in NHS Direct performance.

Similarly we also intended to assess any change in ambulance-service performance by comparing response-time performance for life-threatening category A calls before and after the introduction of the intervention in the study sites. However, the rationale for this assessment was based on the assumption that the majority of potentially suitable calls would receive the new service and be transferred for nurse advice. In practice only 10% of these calls were actually transferred during the observational study. This is discussed in more detail in Section 6.3 but as a result the proportion of 999 calls receiving the intervention comprised less than 0.3% of emergency call volume. It is difficult to imagine how a change in response to such a small proportion of emergency workload could produce any detectable effect on ambulance-service response-time performance, particularly as ambulance services are continually changing their operations in many other ways to meet response-time performance targets. Consequently we have also not conducted this planned analysis.

We measured call volumes of transferred calls and their management during the observational study and have made estimates of the potential proportion of ambulance-service workload that could be managed by this alternative service.

Another important consideration with this type of service change is the impact on staff. Success or failure of new services is often dependent on those who deliver the service on a day-to-day basis. We have therefore also conducted a qualitative study during this second phase to assess the effects of service change on staff and to obtain their views on the organisational impact of the service change. This study comprises the main part of this section.

6.2 Call volumes

6.2.1 Design and methods

We conducted a controlled observational study for a 4-month period in study sites 2 and 3. During this time callers making 999 calls with study EMD codes and meeting the criteria for transfer were offered the option of being passed to an NHS Direct nurse adviser for further assessment. Callers refusing had an ambulance response as normal. Callers accepting had their call transferred and once accepted by the nurse the ambulance was stood down. If a nurse adviser was not available an ambulance response was sent. Routine ambulance data on calls passed, reasons for not passing and call timings were collected. Information collected on redirected calls included:

- EMD code,
- nurse adviser's disposal outcome,
- calls returned to the ambulance service for transport.

The information on disposal outcome will be considered in Section 7. The results presented here relate to call volumes.

6.2.2 Results

Call volumes

A total of 2276 calls with study EMD codes were received by the two services during the observational study. Table 22 gives the numbers of calls passed and reasons for not transferring calls for each site.

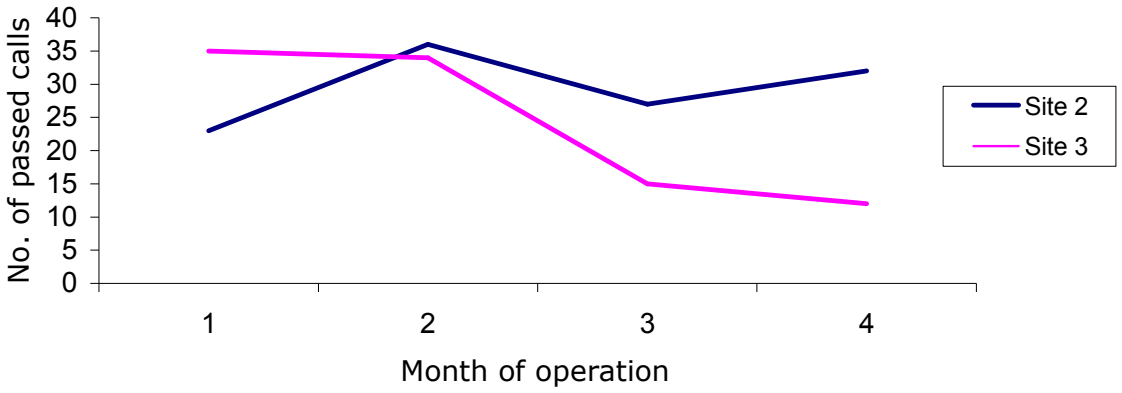
Table 22 Outcome of 999 calls with study EMD codes

Outcome	Site 2 *n* (%)	Site 3 *n* (%)	Total *n* (%)
Call passed to NHS Direct	120 (8.3%)	96 (11.6%)	216 (9.5%)
Calls not passed	1327 (91.7)	733 (88.4)	2060 (89.5)
Out of agreed hours	477 (33)	101 (12.2)	578 (25.4)
Public place or third-party call	242 (16.7)	163 (19.6)	385 (16.8)
Refused transfer	268 (18.5)	21 (2.5)	289 (12.7)
Nurse not available	30 (2.1)	1 (0.1)	31 (1.4)
999 Request by medical personnel	85 (5.9)	145 (17.5)	230 (10.1)
Other	225 (15.5)	302 (36.5)	527 (23.1)
Total	1447 (100)	829 (100)	2276 (100)

Just under 10% of all eligible calls were transferred to NHS Direct for further assessment. Twenty-five per cent of calls not passed were outside agreed operational hours and 17.8% were calls from public places or where the caller was not available. There was a much higher refusal rate in site 2 than site 3. Other reasons for not transferring calls were technical problems, calls referred from NHS Direct, and calls for children under 2 years. For 10% of calls no reason was given.

Figure 9 shows the transfer rate of calls to NHS Direct during the 4 months of the observational study. Site 2 passed on average 30 calls per month with a peak of 36 calls. Site 3 passed a similar number of calls per month at the beginning of the study period but this subsequently declined sharply to half this amount and with no increase back to this level.

Figure 9 Calls passed per month by site: observational study



The results show that, using the EMD codes and inclusion criteria used in this study, only a very small proportion of low-priority 999 calls are suitable for further assessment by a nurse. There is scope to increase this proportion, for example if the service operated for 24 hours a day, 7 days a week, and if calls were transferred as a standard response rather than giving callers the option of transfer, then this proportion would increase to 50%. Nevertheless it is clear that transfer to a nurse is not appropriate for all 999 calls with a low-priority EMD code. As a result the proportion of 999 calls that could potentially be managed by this particular alternative response is lower than anticipated.

Outcome of calls passed to NHS Direct

A total of 216 calls were passed for further assessment during the 4-month period. The number of calls resolved by a nurse or returned to the ambulance service was recorded (Table 23). Fewer than 40% of calls were returned to the ambulance service. The return rate in site 3 was 8% lower than that recorded during the first study and 2% lower in site 2. This may be as a result of better selection of calls or it could be a consequence of nurses becoming more familiar and confident in assessing 999 calls and hence less likely to return the call for an ambulance response.

Table 23 Outcome of calls passed to NHS Direct

	Site 2 *n* (%)	**Site 3 *n* (%)**	**Total *n* (%)**
Calls passed	120	96	216
Resolved by nurse	79 (65.8)	58 (60.4)	137 (63.4)
Returned to ambulance service	41 (34.1)	38 (39.6)	79 (36.6)

These results indicate that about 60% of 999 calls with EMD codes included in our study and transferred for further advice could be resolved and no ambulance response required. This does potentially reduce the number of ambulance responses required and leaves vehicles free to respond to more serious calls. However, it also demonstrates that just over a third of these calls still require either some face-to-face assessment with a health service professional or some means of transport to deliver them to an appropriate facility.

Table 24 Actual and potential numbers and proportions of ambulance-service 999 calls managed by nurse assessment and advice

	Site 1	Site 2
Actual impact		
Number of low-priority calls (% passed for nurse assessment)	26 168 (11.6)	1447 (8.3)
Number of 999 calls (% passed for nurse assessment)	187 295 (1.6)	40 395 (0.29)
Potential impact: 24-hour service and no refusals		
Annual number of 999 calls*	318 700	117 200
Estimated number sent for nurse assessment (% of all calls)	41 431 (13%)	2930 (2.5)
Estimated number resolved by nurse and ambulance journeys saved using current return rates (% of all calls)	12 429 (3.9)	1758 (1.5)
Estimated number resolved by nurse and ambulance journeys saved if only 999 dispositions returned (% of all calls)	31 073 (9.7)	2197 (1.9)

**Annual 999 call volumes are those reported by the services in the most current ambulance-service statistical bulletin (Health and Social Care Information Centre, 2005).*

Potential impact of call transfer

We have examined the actual and potential impact of call transfer to nurses (Table 24). The number of calls used for site 2 was those recorded during the observational study (4 months). Site 1 had withdrawn at this stage and so the number of calls used was those recorded during this site's participation in the first study (7 months). The information on call volumes was not available for site 3 in time for this analysis. Potential impact has been calculated for 1 year and incorporating two changes to the service models evaluated in this study, as follows.

- A 24-hour service with no refusals (that is, callers are not offered an option but call transfer is the service delivered) and a resolution rate by nurses of 60% in site 2 using Omega calls and 30 for site 1 using Alpha calls. These are the measured rates in this study.
- An assumption that only calls identified by the Clinical Assessment System as requiring a 999 response are returned. We reported in Section 4 the finding that calls not requiring this response were still returned, for example for transport, because the caller requested an ambulance or an alternative service (e.g. a falls service) was not available. If suitable alternatives were in place the number of calls returned could be reduced significantly.

The proportion of potential calls that could be redirected is much higher (13%) in site 1 using Alpha calls than in sites 2 and 3 using Omega calls (2.5%). However, the smaller return rate for Omega calls means that a higher proportion of calls could result in a saved ambulance journey. In an urban service with a high call volume, like site 1, there is the potential to save a substantial number of ambulance journeys each year. In addition this site changed the ambulance response for over 30% of returned calls to urgent rather than emergency, allowing better utilisation of available emergency vehicles. If alternative transport services were available the potential savings are greater. The potential number of ambulance journeys saved is smaller in the sites using Omega codes as the means of identifying suitable calls. There is potential scope to increase the number of passed calls in these sites by adding Alpha codes to the list of calls suitable for further assessment; however, any advantages from this would have to be offset against a potentially higher return rate for these calls, although if only disposition calls that required a 999 response were returned there should be a minimal increase.

There is scope for using telephone assessment and advice for the management of low-priority 999 calls. However the proportion of 999 calls that could be managed and resolved in this way is small. It has been estimated previously that up to 40% of 999 calls do not need an emergency ambulance response (Snooks *et al.*, 1998). The results of this study show that, whereas an emergency response may not be required for low-priority calls, the number of calls that can be resolved by a telephone call is less than 5% in a service using Alpha codes for call identification and less than 2% for services using Omega codes. However, if the resolution rate of calls by nurses were improved by only returning calls requiring a 999 response and finding a suitable response for all other calls then the potential number of ambulance-service journeys saved would increase substantially. However, it remains the case that some low-priority cases still require some form of immediate face-to-face contact and assessment from a health service professional or transport to an appropriate facility.

6.3 Qualitative study of the operational and organisational effects of the service change

An important component of any evaluation of service change is an understanding of the organisational issues that can influence implementation and hence the relative success of the new service. A qualitative study was conducted to explore these issues and to identify the practical steps that may need to be considered if this service change were to become standard clinical practice.

6.3.1 Methods

Towards the end of the second phase of data collection, interviews were undertaken with a sample of staff from all grades in the six participating services.

The local researchers involved at each site conducted the interviews. A semi-structured interview schedule was developed based upon the issues identified in the protocol and themes identified during analysis of data collected at a national conference for services interested in alternative options to 999 ambulances. The areas of substantive interest covered in the interviews were the organisational impact of the service change, the research experience, issues concerning the management and experience of the change in service delivery and the vision for the future.

Staff were selected for interview in two ways. Particular individuals were asked by the researchers to contribute because of their specific role in the study. Other staff were asked to contribute by their manager on the basis of their availability at the time interviews were conducted. The latter were members of staff who had had general involvement through handling transferred calls. To the researchers' knowledge no member of staff declined the invitation to contribute.

Participants were given information verbally and in writing about the study before being asked to consent in writing. All agreed to the interviews being recorded. It was explained that true anonymity could not be guaranteed because of the nature of data collection throughout the study. One participant exercised the right to edit the transcript following the interview.

The framework used to guide the interviews is given in Appendix 3.

6.3.2 Analysis

Interviews were transcribed verbatim and entered onto the QSR N6 qualitative research analysis software. A thematic approach was used to guide the analysis. Transcripts were read and re-read to establish familiarity and memos were made for each prior to their being coded and themed, the process being facilitated through use of N6. Emerging themes were grounded in the data and reflected the aims of the study. Categories and patterns were then used to guide the detailed analysis. A second researcher from another site examined the initial analysis and discussion led to agreement of the final interpretation.

6.3.3 Results

A total of 24 interviews were conducted across the sites. Participants included a Clinical Director, Chief Executive, EMDs and nurse advisors. Table 25 shows the breakdown of respondents by service and position, giving the code assigned to each respondent. Operational staff included those with first-line responsibility; that is, trainers and auditors.

Table 25 Respondents to qualitative interviews

	Respondent code	
	Ambulance service	***NHS Direct***
Management	1A, 1B, 1C, 1D, 1E	2A, 2B, 2C, 2D
Operational staff	1F, 1G, 1H, 1I, 1J, 1K, 1M, 1N, 1O	2F, 2G, 2H, 2I, 2J, 2K
Total	14	10

6.3.4 The organisational impact

The interviews revealed that the principle of selecting some calls for alternative management was widely subscribed to by all levels of staff. Some staff felt that callers

> *…don't necessarily want an ambulance they just want to know if they are going to be OK.*
>
> 1F

Other staff felt the service was stretched and there were benefits to altering provision.

> *…you definitely need to look at other options, especially in this area. There are shortages, they bring people into casualty and they can be sitting there for hours waiting to be seen, good to be able to turn round and say no you are not having one.*
>
> 1G

Others felt that not all calls merited a 999 response.

> *…a lot of calls that you know in my opinion do not need an ambulance response or not an immediate emergency ambulance response and by using [NHS Direct] it can help relieve our load and the caller and patient can get better advice than we can give.*
>
> 1N
>
> *Although you can say that inappropriate is not the correct word I will use it now. People have used the 999 service inappropriately and it has caused an impact on certainly meeting patients who need that 999*

service so I think it is long overdue, I think it is very good and I would hope to see it part of the normal run of business.

2F

Participation in the trial was therefore viewed positively by most respondents:

I think it's a great idea. I am 100% behind it.

1O

I think it's been excellent. It has been a really worthwhile study. It has been exciting to be part of something that could potentially shape policy so I think from an organizational and personal perspective that is excellent experience.

2D

I think it is probably one of the most exciting things I have been involved with since joining the ambulance service because it is such a huge step forward *for the ambulance service.*

1D

One manager was however disappointed with the outcome if not the process:

I don't think there has been any advantage out of it because we have not really reduced our call level by very much. It has certainly not helped towards our response standards. [And returned calls] create far more work.

1A

Involvement in the study caused staff to reappraise their service and its position within the whole, particularly in relation to working in partnership.

It's had an impact in that it has altered expectations on what the service should provide.

2B

The good thing is that it has [shown that]…we can get together, talk about it and prepare to work together to try and make it work, which we have not done a lot of before.

1A

The experience of integrated working was valued and management in particular were keen to pursue such options in the future.

I think it was a very beneficial pilot…the partnership working was really good, …and I would really like to do that again.

2A

The greatest part of the impact was having two seemingly associated services learning how to work with each other, preparing them for the future, for the likely future at least. For expanding the possibilities of working together and the different ways of working and how it can impact on patient care in the community. So as a foundation, as a launch pad for future projects I think it has been valuable.

2B

Early meetings between project partners were heavily dominated by discussion of risk minimisation. Initial stages in the decision-making process centred around which call codes would be safe to pass, not losing calls in transfer between services, and the length of the triage process. There was concern regarding the impact of an adverse incident upon the individual patient and also determining which service would accept responsibility if something went wrong. Staff have since reflected on the experiences gained during the study.

> *I think we were all very nervous, weren't we, about getting it right and…very keen not to have any bad press…and whether we set them up to be a bit more cautious than they needed to be really.*
>
> 2A

> *I still personally don't think that we had any choice. You can't do that because of the risks that I felt were involved if they were off site. There was the risk in losing calls, these were still 999 calls on which we had never done any trials before so the risk was quite high if we lost one of these. We didn't really know what would happen to these people, we had no evidence to say, yeah even though that code has been selected for transfer it's safe. So I do think we were right.*
>
> 1B

Whereas some respondents remain cautious confidence generally has increased markedly now that evidence exists to show that calls have been safely transferred. First-hand experience and networking with other sites that have had positive experiences has also boosted confidence and broadened horizons.

> *I think the other interest to come out of it is the issues between doing them real time rather than calling them back. Because if they have been properly screened then they should able to be called back really and there shouldn't be that much risk in doing that no more than we've got with ours so long as you do it within the time frame that you've agreed. …I have spoken to other [NHS Direct] sites and they come at it from a completely different point of view. They say if this had come in through the [NHS Direct] door it would have been given a priority of three not a priority one.*
>
> 2A

6.3.5 The research experience

The trial had two aspects: the change in service delivery and participation in a research project. The latter added another layer of complexity to the trial.

> *…when it first came in I think we were all very positive.*
>
> 1C

The constraints of working within a research timetable had considerable consequences.

> *…the launch of the study was pressured. If it had been less pressured we might have spent more time on the training, as it was everyone was*

trained in time, it's just the intensity of the training wasn't as great as it might have been.

2B

In two sites the ambulance service utilised Omega software to select calls suitable for passing for advice. This was not available for use by the anticipated date and when received did not function as expected. Study-imposed time pressure caused one site to adopt a partially paper-based approach, which was less than ideal:

…you can't expect anyone to be working off the screen and being told that is how you do something then to sort out from laminates for whatever they need to look at.

1A

Other aspects specific to the research made implementation of the change more complicated. Training had to encompass teaching staff to accommodate the needs of a randomised trail, the collection of data and consent additional to that otherwise needed in a service change. Some aspects were not liked.

…calls started being randomised I think that got peoples' back up a bit, that there were more calls that could have gone through but it wasn't their turn to be put through and that sort of thing.

1C

Obtaining consent to pass calls and contact callers for feedback was an issue for services and for call-handling staff, from the formative to the end stage of the project. Initially concern related to the amount of time this took and determining where the impact of this should fall. To reduce time impact for any service, consent was sought in two parts. EMDs requested permission to pass calls to NHS Direct then NHS Direct requested permission to send follow-up questionnaires.

EMDs felt that not all callers when asked whether they agreed to being passed to NHS Direct were fully aware of what they were consenting to because the stressful situation causing them to call 999 clouded their ability to understand the issues. This view was reinforced in circumstances when the EMD also had doubts about the merit of passing a certain call. Consent was often not sought by the nurse advisors.

I know what we were forgetting to do sometimes, …asking about the questionnaire.

2J

I think from the prospective of a nurse advisor, particularly when it was a high-priority call that needed to be directed back to the ambulance then it was always very difficult to approach the subject of consent or follow-up really. You know towards the end of the call you are meant to ask them whether they are happy to actually to give us feedback on how the service went, sometimes its very difficult to introduce that during the call.

2H

In some quarters the initial enthusiasm for the trial abated as the study progressed. In particular some were disappointed with the outcome not being as they had anticipated.

> *I think the number of calls that have come back from NHS Direct has outweighed all the benefits really.*
>
> 1H

> *Were your expectations at the outset met, do you think it worked as well as it should have done? It was detrimental because calls came back with the original time on them.*
>
> 1C

Overall the research element of the change in service delivery increased the workload for the services. In particular, auditing EMD compliance with the randomisation process increased workload although this had an unexpected benefit for one service of highlighting an unrelated compliance issue.

6.3.6 The experience of the change in service delivery

Communication

Communication was the vital component in determining the way the in which the study was perceived by respondents.

> *Communication between the ambulance service and [NHS Direct] has worked very well and certainly the links with the university have been very positive and the other organisations that are part of the study.*
>
> 2F

> *One of the main things that we found that was critical to the success of the project was firstly understanding the role of the other parties involved. It was very easy to become disassociated and feel we were just doing our bit and somebody else was doing their bit…the old adage that you can't communicate enough was probably true in this case too.*
>
> 2B

> *we all talked and exchanged ideas and it wasn't just at the meetings either.*
>
> 2I

The challenge to meet the communication needs of all staff was not fully met across the sites. A manger acknowledged:

> *If asked to do it again I would put more emphasis on the front-end communications before the launch of the study and for the first 3–6 months.*
>
> 2B

The ideal of enabling EMDs and nurse advisors to visit each others' sites was acknowledged by one respondent as impractical because of the distance involved. Not all respondents felt fully informed.

> *…it would be nice from their point of view, the ambulance service, to see how we work…be good for each to see how the other works. I would have liked to have known what the criteria [for selecting calls to be passed] was in the first place.*
>
> 2K

Technology in part overcame this, at least for a period in one site, in that EMDs could listen-in to the nurse side of a triage conversation which enhanced mutual understanding.

> *If we wanted to just see how they questioned or if we weren't particularly busy…to see how they did it from their end we could hear the sort of things they were asking.*
>
> 1N

The experience of the change in service delivery was tempered by a number of factors: technical issues, model issues, call volume, availability of alternatives to a 999 response and changes in the policy/practice context.

Technical issues

The assessment programs used by the two services – Clinical Assessment System and AMPDS – while similar, are not designed to be complementary.

> *…you have different systems in different organizations, you can't overcome that. If there was one approach to prioritization that was in use between [NHS Direct] and ambulance control then that would be ideal, also recognizing they are two very different services.*
>
> 2D

Both services complained that the assessment tool used by their partner at some points caused problems.

> *Well we did say that at the beginning…there must be some information there that could really inform their system to enable them to weed them out sooner so that we don't have [as many pass-backs].*
>
> 2A

Both sides voiced the opinion that the other should have made more accommodation to make the systems more compatible.

> *I was not happy with it going without the adjustments made to NHS Direct and their system to accommodate what we are trying to do.*
>
> 1A

This difficulty was highlighted by the fact that the ambulance service received some calls from NHS Direct outside of the trial, which generated study inclusion codes.

> *I just find it laughable because they are giving us a referral which generates an Omega code.*
>
> 1J

The ambulance service and NHS Direct believed that part of the problem lay with the software licensees and the way in which the system was required and designed to be used.

> *…but they [ambulance service] were quite resistant to the fact that whoever does the AMPDS system is quite rigid about how they go through their change of control process and you know wouldn't listen to ambulance services at local level. But you know maybe they would if they were given advice from everyone who was doing this.*
>
> 2A

Nurse advisors are able to exercise professional autonomy and did not always appreciate the constraints under which the EMDs worked.

> *…mainly the problems have been inappropriate calls coming through, the ambulance control does not seem particularly clued up with what has been going on…. I think it is just explaining even though people meet that criteria at the beginning, they are not suitable. It is just black and white to them [the EMD] what they select. We know straight away, say somebody elderly and not quite sure what is going on perhaps, are not the most appropriate people to have been selected.*
>
> 2K

The EMDs for their part were acutely aware of their limitations and unhappy at having to pass certain calls.

> *…that old lady I knew was poorly but…you know there are things going on but you just can't quite put your finger on it. I think if you could enhance what was being asked in a way…. At the moment it's a bit robotic really. In a way what you ask is all set out for you.*
>
> 1F

Call selection

Selecting suitable calls for transfer was difficult. Safety was the primary concern and, because of the of the research element of the change, consistency was another. The availability of alternative options for some calls was also considered. It was inevitable that staff dealing with the calls would not always be convinced that the best decisions had been made.

> *If they were valid then yes you do not mind passing them but it is the times when you know they are going to be passed back to you and we have no options but to pass them.*
>
> 1K

> *…where the elderly will go out of their way to accommodate you. …and I felt there were a lot of people who fell going into the trial that shouldn't. And the ones that should be, are being missed…. I feel it is not hitting the ones that it should be.*
>
> 1J

> *I know we have a list of the Omega calls that do not go but I think we need a list of calls that aren't Omega on our system that can go.*
>
> 1I

Codes were not necessarily selected on the basis that an alternative to 999 was available. This was particularly the case with those who had fallen, and had no reported injury but needed physical assistance to get up. The interviews highlighted staff discomfort at doing something which they did not perceive to be in the patient's best interest but which over the course of the study served the purpose of identifying a need for an alternative service. However in trying to estimate need for alternatives the point was made:

> *I don't think it should be done by group i.e. the full cat C group or all the green codes because I think each individual code sort of prioritises itself by the number of times it is used, you know. You may have a green code that would be ideal to go somewhere else but you only use it once in 6 months therefore you are looking at a referral agency setting up a process that could be quite costly that could never actually benefit anybody….*

Interestingly EMDs in two sites believed some callers were determined to get from the system what they wanted, an ambulance.

> *People knew how to work it.*
>
> 1F

These people were believed to call back giving a different set of answers so that the call then came out with a higher-priority code.

Call-taker perception of public reaction to service change

> *Do patients like it when we do this sort of thing?*
>
> 2C

It was pointed out that callers 'have that choice under the Omega study' (1O) of refusing to be passed, but the vast majority were uncomplaining. In some cases the option was welcomed:

> *sometimes if it's something not an extreme emergency, they are phoning up thinking they don't need a front-line ambulance anyway so they have already got that in their head, so…they say 'oh yes that might be a good idea', others are absolutely horrified.*
>
> 1O

However, it was felt on a number of occasions by both EMDs and nurses that the process of seeking informed consent was problematic in the emergency situation.

> *We realized that we may have to re-explain what was happening.*
>
> 2J

Some annoyance was experienced in relation to returned callers:

> *…sometimes the caller is slightly annoyed because they have been asked 10 questions by us and then they go to NHS Direct and they ask them 10 questions and they come back to us and we ask them the same 10 questions again…, most of the time they are fine.*
>
> 1K

A number of EMDs believed some callers 'would just ring back anyway but with a different set of answers' (1F) to ensure they got an ambulance response.

Among the nurse advisors interviewed there was widespread belief that the public does not 'fully understand the way it [NHS Direct] works…' (2H) and therefore does not see NHS Direct as an alternative option to dialling 999. The consensus view was that the 'the public need to be educated to try [NHS Direct] first' (2G). 'Positive publicity' (2I) was advocated.

An EMD went so far as to state,

> *I think if people were educated better in the first place we would not have to have these projects.*
>
> 1J

Call volume

The low call volume affected staff in all sites. All staff had to be trained but individuals rarely had the opportunity to put that training into practice.

> *The training was adequate it is just because you are not using it often enough, as an individual call-taker you may not pass any for a week…lacking in confidence doing it.*
>
> 1J

Alternatives to 999 ambulance

> *I hope that one of the outcomes will be it will highlight the need for an ambulance or a way to transport to the hospital but not necessarily blue light, 999…*
>
> 2J

One of the immediate consequences of the study is that services are looking at ways to enable NHS Direct to pass calls to the ambulance service for a non-urgent response.

The study also highlighted the need to look at the full range of available alternatives which NHS Direct can recommend to callers. Knowledge of local availability was acknowledged not to be extensive and further was not challenged by the Clinical Assessment System.

> *I don't think the Clinical Assessment System system supports Walk-In centres and stuff in any way, shape or form because you will come out with an A&E disposition and it's up to the nurse to think outside…that algorithm. It [Clinical Assessment System] is saying A&E but is there a Walk-In centre at…, and then if there is does it take a patient who's obviously got a fracture and can they X-ray it, pot it up?*
>
> 2A

Knowledge shared at the conference held for interested services reinforced this as an area for serious consideration with or without continuation of the trial.

In conjunction with improved databases of local services and alternative transport options, respondents felt that there was a need to publicise the fact that there is an alternative to dialling 999 and that dialling 999 in the future might not generate an emergency ambulance response.

> *Even though they are given information there and then as to what is going to happen with regards to it being passed on to NHS Direct I think generally the public need to know before they get to the stage that they dial 999 that that is something that is going to happen.*
>
> 2H

6.3.7 The impact of policy

Within the lifetime of the project the emergency care agenda has undergone change.

> *You can look at the model, we were in the centre weren't we and now all of a sudden if you look now at the Alberti model we are just over here at the side – [NHS Direct] and you know this central thing has shifted.*
>
> 2A

One service saw a marked increase in call volume coincidental to changes to GP out of hours. Staff felt that whether or not their service was a nominated out-of-hours provider, the change was having a knock-on effect with people calling 999 or NHS Direct in greater numbers because

> *…well I rang the service because my out-of-hours providers told me I was not to going to be rung back for 11 hours and I needed to know what to do.*
>
> 2D
>
> *They ring up and are told, the doctor will ring them back in 2 hours. Are they going to wait 2 hours? No, they ring 999.*
>
> 1A

A number of issues related to commissioning of services were raised by respondents, notably the pressures commissioners were under.

> *The [Primary Care Trust's] had to look at putting in contracts pretty quick and they had to turn it around by October or whenever and there was a huge amount of pressure with the new contracts.*
>
> 2A

For commissioners and providers alike there need to be,

> *…ways to link all those bits together rather than just managing and controlling their own bit of service and it has no relationship with somewhere else.*
>
> 1C

One local description graphically illustrates the consequences of not considering the full picture and/or impact of policy changes,

> *the only number printed on the leaflet was that of NHS Direct and although they did not say we were their out-of-hours, people make the link of a leaflet with 'out of hours' written on the front. Seeing a number in there and assuming that is the number they have to ring. So we have made lots of assumptions. We know the commissioners sent out leaflets with our number on, we know that a lot of GP surgeries' out-of-hours messages put our number first.*
>
> 2D

The important issues with regard to introducing change

The interviews revealed certain issues to be particularly important to the change process. Communication was *the* most important. As one respondent pointed out [above], they were two very different services who were trying to work together; in itself was a novel process. Alongside that there was also the research element to be accommodated.

What worked at one site was that at the higher level

> *…we have had very good communication with both the university and [NHS Direct] throughout, with very clear expectations.*
>
> 1D

Management appreciated that any change was going to be 'difficult in comparison to other changes' for front-line staff to adapt to and preparation was made accordingly with the result that

> *…staff got on with this very well and didn't have any great problems largely because of the background which had gone in first with what was expected of them and what they should be doing.*
>
> 1D

Another site took a different approach, focusing upon motivating staff through selling the positive aspects of the service change. This approach, however, was hampered by subsequent problems including outcomes (low call volume and high pass-backs) which then undermined the initial expectations.

> *The problem is that we went into it very positively and I think we all did get on board with it. We don't like to change things every week but we like to look at different things and if it's a trial then whatever and we sold it to our staff as something that was going to be fantastic and good option and then with the staffing problems and the effect on performance. I don't think we would do it again.*
>
> 1C

The merits of having a 'champion' were evident in one site:

> *I probably drove, well I did drive, our involvement in this study further.*
>
> 2B

Interaction between different levels of staff was appreciated, a nurse advisor was particularly appreciative that their Clinical Director had spoken to them directly, explaining the importance of the study. However, there are dangers in over-reliance upon an individual to lead

the change. In one site the change leader moved on, leaving a vacuum.

The challenge for champions is to motivate others down the line and involve them at an early stage. There were complaints that staff with responsibility for implementing the change were not involved in the early planning stages of the project.

> *The bigger challenge for me was not to be involved at the earliest outset of the discussions when we were looking at how to manage the process and how the calls were presented to the organization … 'So the agreement right at the beginning then?' I was not involved in that. It involved the head of nursing at the time who agreed to the process with maybe nobody from the operational side to look at the feasibility and maybe not examining another way to integrate it, It was up to me to operationalise the decisions that they had made and the methods that they had agreed.*
>
> 2D

The details need to be considered with the wider picture at the beginning so that as many issues as possible can be resolved at the earliest opportunity.

> *The people who had to do the work were involved a lot later on and I think that is where the problems came along.*
>
> 1G

An adequate time allowance is also needed to allow new equipment or technology to be 'tested, proven it worked before it [the trial] started' (1A) to prevent unnecessary stress and work for those involved.

Unrealised expectations are difficult to deal with especially in the context of service change and research participation. Morale was difficult to maintain across all sites because fewer than expected calls were generated and for the ambulance service many passed calls were returned.

> *When they are passed and not passed back to us that is fine but when they are continually passed back…*
>
> 1K

Providing regular feedback of the number of calls passed etc. was undertaken and was helpful.

> *When anything new comes along you always get objections even from the people who actually in the end agree that it's the best thing, so there was always a little bit of why do we have to do this and what's it going to achieve, but once we got into it and explanations were put out and feedback was made to the EMDs then most of them, …I would say realised that to pass calls to [NHS Direct] saves an ambulance.*
>
> 1M

It is perhaps cautionary, however, that care should be taken spread the perceived benefits across the broad spectrum of potential change outcomes. Taking the broader view, including the benefits gained from

integrated working, resulted in one site being less 'disappointed' with the overall experience than the other two sites.

Being able 'to talk and exchange ideas and not just at meetings either' (2I) was helpful. The experience of a project outside the study was cited as an example of good practice:

> *…with the team structure where they work together more closely I could see that that would have given them some advantages. I don't think we ever explored a joint case. For example, who's case is it once you've handed to over? If it went wrong, was it us who had got it wrong? …explore these issues on a regular basis sort of like a case conference…*
>
> 1C

Model issues

The models operating at each of the three sites varied. Two sites began with a ring-fenced nurse being available to take any passed calls during particular time periods.

This option was selected on the grounds of maximising the safety of the caller. In early discussions between services, managers were very concerned with reducing the potential risk to callers. A dedicated nurse was seen as the safest solution. The low call volume impacted significantly upon this decision. Confidence engendered by the observed lack of any adverse incidents had the result that one site:

> *…actually changed [through] several models. Originally we just had nurse advisors answering cat C calls but now what we have done is actually incorporated call handling as well so that we have been able to match demand.*
>
> 2F

The other site, using a ring-fenced nurse, reacted differently, influenced by an unexpected overall increase in NHS Direct call volume:

> *…from a governance and safety point of view…. To have to have somebody sitting there from 7am till midnight on some days without a call being presented to them, when the NHS Direct call volume has gone through the roof, it has been very hard very, difficult to justify.*
>
> 2D

Use of a ring-fenced nurse or co-located nurse was anticipated at the outset of the study as most likely to facilitate speedy and safe transfer of calls between services. Even in the co-located situation, however, there were issues around EMDs knowing when the nurse was free to take a call.

> *There were certainly early problems about knowing whether a nurse was available…nurses would sit there, hear a call that was obviously a call that they could deal with and yet it was being kept by the EMD.*
>
> 2A

Co-location had other problems. Management of the nurse advisers was an issue for both services. Responsibility, practicalities, pay differentials, liability, governance and peer support were all raised in interviews.

> *When people are working here but not being employed by you essentially but are managed and looked after by someone remotely, …caused some problems…. It was difficult, they are paid more than you are and yet you are expected to manage them.*
>
> 1C
>
> *….with five staff in there it was hard to justify having anybody in a management position all the time but I think not being there had some effect because you couldn't really see what was going on and who was doing what and whatever.*
>
> 2A
>
> *Well to have nurses in one place away from the rest of the support and to have them just doing cat C calls was quite a lot less than they would normally do.*
>
> 2A

Ring-fencing and low call volumes led to problems with boredom and lack of confidence as skill levels were not able to be built up with practice and there was the pressure of watching busy colleagues. It was not a model liked by the advisors.

> *You might have only had one or two calls and when you saw a queue of say 20 calls needing to be triaged and you had to sit and wait for the cat C.*
>
> 2G

6.3.8 The future

Opinion was divided as to what the future held; not everyone had clear ideas, in part clouded by the pressures of the current situation.

> *I don't know really, Eventually I think perhaps all calls full stop for emergency service would come to us and perhaps ambulance control as well…. 'Would you like to see it continue?'*
>
> *The trouble is at the moment I suppose we are so busy just managing ordinary calls especially with the out of hours we have taken on, we've been battered in last months so manpower is the issue at the moment, but I hope so.*
>
> 2K

Members of both services were of the opinion that they were able to provide the solution with the human resources skilled to undertake the process.

> *I think the fact that [NHS Direct] have now become part of the national service albeit a Special Health Authority, I think that is where the responsibility would lie. With [NHS Direct] you've got very experienced nurses carrying out triage assessment on patients callers to actually determine whether they need to self manage this at home or if they*

> *need to attend GP, A&E or 999. So probably being biased I would probably say that [NHS Direct] is probably the most appropriate.*
>
> 2F

> *We still need another route [as opposed to NHS Direct] into alternative health care pathways…. Well, my opinions are that from some of the secondary triaging that I've seen we may be able to educate our own EMDs to the right medical standard so that they can deal with that section of triage and I've only looked at two systems and that was my opinion on the first one. The second one was more clinically based so you would need someone with more qualifications… The [Emergency Care Practitioners] we have that are trained are also another option.*
>
> 1C

The broader view encompassing the issue of the volume of calls passed for advice raised doubts about the merit of a local solution and the possibility of a national resource to handle all such calls was being contemplated.

> *I think the capacity issue is now not local it's from a national perspective. And that might feel uncomfortable to local providers but I think that yes there is without a doubt the capacity there nationally.*
>
> 2A

6.4 The national perspective

6.4.1 Introduction

During the trial, it became apparent that the method of passing calls to NHS Direct was not working as well as expected. At the same time, the Department of Health published guidance on the development of alternative-care pathways for low-priority (category C) 999 calls (Department of Health, 2004a). We were aware that several national sites existed where different models of telephone advice delivery were being carried out successfully. It was decided that it would be timely to bring national expertise together in the form of a conference. The aims of the conference were to provide a forum for national networking between service providers using different models of advice to non-urgent 999 callers and to provide an opportunity to discuss current and future practice and research. The day consisted of key-note speeches giving the policy context and exploring clinical issues followed by presentations from ongoing research and service-development projects and discussion groups during the afternoon. The overall objectives were to share information regarding current models, evidence about effectiveness and the national policy context. The afternoon sessions answered qualitative research questions regarding what works and how, what is less successful and why, what impact such a service change has on staff and what are the practical and planning issues. These discussion sessions provided an opportunity to gather rich qualitative data to inform the trial and to contribute to the development of the qualitative interview schedule.

Discussion sessions

Aim

- To identify the factors which hinder and facilitate the provision of telephone advice to some callers instead of sending them an ambulance.

Objectives

- To identify problems and solutions both anticipated and experienced when setting up telephone advice.
- To determine the order and priority in which the identified issues should be addressed.
- To ascertain the needs and constraints on service provision imposed by the different stakeholders: policy makers, service providers, management, staff, patients/callers/public and other service providers (e.g. social services, police); technology available.
- To describe the organisational structure(s) that participants are working within and the practicalities involved in implementation and service delivery.

6.4.2 Method

There were five discussion groups, consisting of a knowledgeable facilitator, a note-taker and 12–15 delegates mixed for experience, organisation and service level.

The facilitator explained the purpose of and outlined the procedure for the session, including that data collected would only be used in anonymised form. Each group nominated a spokesperson to provide feedback later. The note-taker was someone familiar with the study and they were also responsible for tape-recording the sessions. Their role was to aid transcription by making a seating, plan giving each person a number used to attribute comments to the person making them.

The first discussion question was common across the groups.

What do you think are the most important issues you need to consider when setting up a telephone advice service?

Prompts

What problems do you anticipate having to overcome and how do you envisage solving these?

What problems did you experience and how did you solve them when setting up such a service?

Participants recorded a list individually then the facilitator formulated a group list of all issues identified. This was recorded on the flipchart.

The second question was different for each group.

What are the merits of on- or off-site call handling and by whom: NHS Direct or other?

What are the issues involved in working across organisational boundaries?

How are/should/could calls be selected for passing to telephone advice?

What organisational issues need to be considered when managing such a change in service provision?

What alternatives to 999 response would delegates like to see and how does or could the availability of alternatives to 999 affect telephone advice?

This was an open-ended discussion within the group. All the groups reconvened and the discussions from each were fed back, with an opportunity for further input from delegates and comments from an expert panel.

The recorded sessions were transcribed with the aid of the notes taken and analysed by two researchers. The results aided the development of the qualitative interview schedule and supplemented the data gathered from the qualitative interviews.

6.4.3 Results

What are the merits of on- or off-site call handling and by whom: NHS Direct or other?

Within co-located and remote call handling there was huge variation in remote, from miles apart to different spaces in the same building. Remote operation has the disadvantage of 'out of site out of mind' whereas co-location has the benefit of a visual link. It was pointed out that the cultural and organisational differences between services was the bigger challenge, each having different approaches which impacted notably upon communication flows between the two services. Co-location had the benefit of facilitating communication because accessibility was little or no problem. As a consequence problem-solving could be more immediate and mutual understanding between operational staff was enhanced through being able to see not only how the other side worked but also having access to information on call outcomes because staff met informally and could exchange information. Close proximity and the resulting social contact fosters confidence building and team performance.

Within either model the choice of dedicated as opposed to generic call handling was an issue threatening consistent service provision. Dedicated call handlers are difficult to justify when demands generally are swamping the service. In contrast, dedicated call handlers for these calls reduce time delays and are therefore seen to reduce risk of adverse incidents.

What are the issues involved in working across organisational boundaries?

Research and discussion are needed but we also 'need to get on and do'. The past has featured too much lengthy considering and planning. What is needed is to start with small projects/pilots which are regularly reviewed and 'taken forward in a structured way and not limited exclusively to category C calls'. 'We need to begin to see ourselves as an extended team even though we are employed by different organisations.' This involves identifying clear leadership, engendering belief in the contribution of the staff in other organisations through communication and understanding of each others' contribution. Clinical placements help in this regard.

How are/should/could calls be selected for passing to telephone advice?

Lots of different approaches are possible and practised: Omega software, expert opinion, minimum data-set. A major problem was seen to be the lack of consistency nationally within and particularly between services in relation to the clinical decision software used. Omega codes were liked because they felt 'safe' but these codes are not yet widely available. Another option was to use minimum data-sets. This led to debate over protocols or guidelines. London 'steers away from rules' and allows staff 'the possibility of using common sense'.

The huge number of possible scenarios has the potential to complicate immensely protocol use and raises training issues for EMDs in particular and may need reappraisal of who handles calls of this nature.

Use of a minimum data-set is limited by lack of national consistency, particularly variations in locally available alternatives to a 999 response. Additional to availability, the capacity in alternative services needs to be considered. Intermediate care services were considered to be particularly vulnerable to increased use. There is therefore a need to consider the impact upon other services of changes at the emergency entrance.

Call selection is not a static process and criteria need to be revisited in the light of ongoing experience and the changing context in which the service is delivered.

What organisational issues need to be considered when managing a change in service provision?

Getting and establishing commitment between parties was the first priority. This included commitment from purchasers in terms of realistic budgets and time frames. For partners, commitment from everyone to 'actually do it' and the establishment of clearly articulated objectives and goals for all stakeholders was important. Identifying and taking ownership of the risks involved was also a priority issue.

Technical compatibility between services was an important practical consideration, as was the establishment of productive communication links and channels. Seeking ways to address the potential problems of

pay differentials between staff in different services now working together was also a potentially problematic area needing to be addressed within the entire change-management process. Success was seen as hanging upon how the change process was handled.

An issue raised throughout the day was that of public expectation. Public experience was being/would be challenged by the various trials and considered changes. Public information/education is therefore needed to inform callers that they might not receive the ambulance they expected and also to encourage them to consider whether their dialling 999 in the first instance was their best option. Services had differing approaches to information dissemination in this regard. A problem identified was that, individually, members of the public rarely use the 999 service.

What alternatives to 999 response would delegates like to see and how does or could the availability of alternatives to 999 affect telephone advice?

Alternative referral pathways are key to reducing emergency-ambulance use, such as knowing what is available locally and in useful detail; for example, what a minor injuries unit will accept, when it is open, etc. Such considerations extend to 'total working across boundaries, barriers have to broken down and all work for the patient'. Such knowledge stops complaints from providers when patients are inappropriately referred. Such information is not currently readily available compromising efficiency and relationships with other services. Compiling detailed information into an accessible and usable database is therefore seen as vital. It is, however, a considerable task. This was undertaken by one service and the database is now updated annually. Its availability is crucial to the success of that project. Its usefulness, however, extends beyond the category C trial that instigated its creation.

Access to information of what alternatives are available assumes that alternatives do exist.

In some areas deficits were identified and work has been needed to work with others to fill the gaps, notably in the area of services for older fallers.

6.4.4 Key issues for conference delegates

A number of key issues emerged from review of the whole data-set compiled at the conference. There was general consensus on the following points.

- Delegates were appreciative of the opportunity to share experience which it was believed would enable services to avoid 're-inventing the wheel'. This was felt to be a real issue because there were so many different ways to approach the issue.
- There was a need to see low-priority calls within 'the whole system', not within the isolated parts. Not from the single-service

perspective but the comprehensive whole, from gateway services through acute to community provision across the social policy spectrum.

- It was important to determine categorically whether passing low-priority calls to an alternative route was cost-effective within the whole structure of health and social care provision. Delegates were keen that public money be used well for the benefit of the majority. Passing calls was not taken as being necessarily a cost-effective option.
- For integrations to work, the establishment of 'realistic and honest plans' for inter-organisational working, including acknowledgement of the impact of changes upon Government-set targets, were essential.
- Establishing good communication between and within organisations who are working together is of fundamental importance.

There was far less consensus on the attitude to risk both between and within the organisations represented. It was a primary consideration when considering changes in service delivery and partners might have very different standpoints. Establishment of responsibility and clinical governance issues between services working together are important considerations.

6.4.5 Conclusions

Organisational impact

- Call passing is considered a good idea among all levels of staff and there are some calls for whom it is a better option at service and patient levels.
- Participating in research was greatly appreciated by some. For some the actual outcome differed from what they had anticipated, causing disappointment.
- Integrated working was valued and will be considered in the future.
- Services now have an evidence-based perception of risk and thus greater confidence and scope for future decision-making.

The research experience

- The research experience as on the whole viewed positively.
- The constraints of the research timetable placed time-frame constraints upon the project and made implementation stressful.
- Particular elements of the research were not liked: randomisation, form-filling, consent-seeking.
- Some were disappointed that the outcome was not as they had anticipated.
- The research element increased workload.

Important change facilitators

- Communication, regular exchanges of: information, ideas and experience, case review; feedback and clear and articulated expectations were all considered important;
- early involvement of all staff;
- motivators and leaders;
- planning for the change, anticipating what will be needed, allowing time for implementation and for communication.

The future

- NHS Direct saw itself as well placed to provide the service.
- The ambulance service felt that it had the resources to also provide the service using additionally trained EMDs or Emergency Care Practitioners.
- A national rather than local response was advocated on the basis of the low call volume.

6.5 Summary of the observational study

The observational study has shown that the number of 999 calls redirected for nurse assessment and advice in the service models studied is a small proportion of total ambulance-service workload. The proportion of all 999 calls redirected is greater when Alpha-level calls are used (1.6%) compared with Omega calls (0.29%). This phase also showed no difference in return rates to the ambulance service to those found in the first randomised study. The number of calls passed in these studies was constrained by the operating processes set up at the beginning of the study and hence there is potential to increase these proportions. Using the data on call volumes and numbers of calls passed measured in these studies we have estimated that if the service were to be available on a 24-hour 365-days-a-year basis and if all suitable calls were passed as the standard response to these calls almost 4% of 999 calls could be resolved by nurse assessment where Alpha codes are used and 1.5% where Omega codes are used, assuming the rates of return to the ambulance service measured here. We have also found that many passed calls are returned to the ambulance service for reasons other than clinical urgency. If the return rate to the ambulance service could be reduced by providing suitable alternative care or transport the estimated proportion of 999 calls that could be resolved by nurse assessment rises to 9.7% in a service using Alpha calls as the means of call identification.

Interviews with both ambulance-service and NHS Direct staff have shown that the service change has been viewed as a primarily positive experience. The opportunity to develop and implement an integrated service and joint working was seen as a major step forward. Detailed planning, enthusiastic leaders and the involvement of all levels of staff at each stage of development were identified as key issues to the

success of any future developments. There was some disappointment that the service change had not produced the benefits that had been anticipated, in particular the small numbers of calls passed and the high return rates back to the ambulance service. Development at a local level of suitable alternatives for care was seen as a necessity if the potential benefits are to be realised.

Section 7 Safety and reliability of call transfer

7.1 Introduction

Two key issues to consider with the intended service change are the safety and reliability of call identification. Safety is concerned with the ability to exclude calls that require an immediate ambulance response for a time-critical emergency. Reliability is concerned with the ability to identify calls that are suitable for further assessment and can be referred to another service or provided with self-care advice and so avoid unnecessary ambulance journeys.

The original proposal for this study included a phase of work to assess the suitability of a range of EMD codes for redirection to an NHS Direct nurse adviser. From October 2002 GMAS (site 1) began passing some calls directly to nurse advisers. Data on the disposal outcomes for these calls and whether or not they were returned to the ambulance service was collected over a 6-month period. The intention was to use these data to measure the rate at which each EMD code is passed back from the NHS Direct nurse adviser to the ambulance service for an emergency (999) response (the pass-back rate) and to identify any codes that were going to be clearly unsuitable for re-direction to NHS Direct. This may be because an emergency (999) ambulance is required for on-scene assistance or immediate transport to hospital is required, necessitating the call to be passed back to the ambulance service.

At that time a pass-back rate of 5% or less was to be considered a safe level for further empirical testing of an EMD code. However, it became apparent during this pilot study that the pass-back rate to the ambulance service was much higher than had been anticipated and that no code would have a pass-back rate of 5% or less. Similar findings were emerging from other sites exploring the use of nurse advice for low-priority 999 calls. Clearly, if the pass-back rate of 5% or less had been upheld then the project would not have been able to continue. However, a distinction can be made between whether a call is passed back because it was clinically inappropriate to pass it and potential harm could result to a patient; that is, a poorer outcome results from the delay in providing an ambulance response and calls passed back for a different type of response or other form of non-time-critical intervention where outcome is unaffected. Analysis of these pilot data showed, as already described in Section 4, that a high proportion of calls passed back to the ambulance service were for transport, lifting and as a result of patient request. Furthermore there were no complaints to the ambulance service or NHS Direct during the pilot study and no reported serious adverse incidents; that is, cases where delay in sending an ambulance was considered to have resulted

in a worse patient outcome. It was therefore agreed by all sites that the 5% pass-back rule was unrealistic, that there appeared to be a low risk of significant mis-triage and that the study should go ahead using all the agreed codes with a view to gathering further empirical data to allow re-examination of the suitability of individual EMD codes for transfer for nurse advice.

7.2 Reliability of EMD codes

7.2.1 Methods

We have examined the pass-back rates by EMD code for calls transferred for nurse advice. To increase the number of calls available for analysis we have combined data from a number of different sources. These are:

- the randomised study and observational study reported here;
- the pilot study conducted by the GMAS prior to the main study taking place;
- data from NHS Direct Strategic Health Authority collected from three other sites, which have been conducting their own pilot studies of transferring low-priority 999 ambulance calls to NHS Direct for further assessment and advice.

This combined data-set has provided information on 5250 calls passed for nurse advice. For each call information has been recorded on AMPDS code, clinical disposition and whether the call was resolved or returned to the ambulance service.

7.2.2 Results

The overall pass-back rate varied between ambulance services (Table 26), with a mean return rate to the ambulance service of 48.2%. The highest return rate was in site 1 as reported above. The lowest rate was in site 6, although a relatively small number of calls were available for analysis from this site. Sites 5 and 6 used AMPDS Alpha codes to identify suitable calls. Site 7 used AMPDS Omega codes. Site 5 had a pass-back rate of just under 50% compared to site 1, suggesting that using Alpha codes to identify calls is not the only factor influencing the return rate to the ambulance service.

Table 26 Pass-back rates of calls transferred for nurse assessment

Site and data source	*n* (%)			
	Returned	**Resolved**	**Not recorded**	**Total**
1 Main study	992 (72.8)	360 (26.4)	10 (0.7)	1362 (100)
2 Main study	118 (31.9)	252 (68.1)	0	370 (100)
3 Main study	134 (44.5)	152 (50.5)	15 (5)	301 (100)
4 Site 1 pilot study	1810 (69.3)	698 (26.7)	105 (4)	2613 (100)
5 NHS Direct pilot	247 (48.2)	265 (51.8)	0	512 (100)
6 NHS Direct pilot	11 (19.3)	46 (80.7)	0	57 (100)
7 NHS Direct pilot	18 (51.4)	17 (48.6)	0	35 (100)
Total	3330 (63.4)	1790 (34.1)	130 (2.5)	5250 (100)

The pass-back rate for individual EMD codes are given in Table 26. A large number of codes had small number of calls, which makes any assessment of their suitability for transfer difficult; therefore, only codes with at least 10 calls recorded have been reported.

As reported in Section 4, the pass-back rate was lower for Omega calls than for Alpha calls. Within the same condition this was also the case, for example choking, pregnancy and trauma, supporting the view that the additional questioning required to produce an Omega code results in a more accurate identification of calls suitable for nurse advice.

With the exception of a small number of specific conditions in category 26 (sick person) no Alpha codes had a pass-back rate lower than the resolution rate. For four categories – diabetic problems, falls, traumatic injury and one code for haemorrhage or laceration – the pass-back rate was over 75%. This would suggest that these codes are unsuitable for transfer. However, they also tend to be high-volume calls and therefore even with a low resolution rate has the potential to save a larger number of ambulance journeys. Falls is a particularly difficult category as the majority of calls in this category are for elderly patients who are on the floor with no apparent injury but who need lifting. Other services passing low-priority calls to NHS Direct have referred these calls to a falls service, rather than the ambulance service, with a subsequent reduction in the number of calls passed back.

Table 27 Pass-back rates for EMD codes

Code and condition	*n* (%)			
	Returned	**Resolved**	**Not recorded**	**Total**
Abdominal pain 01A01	198 (50.3)	181 (45.9)	15 (3.8)	394 (100)
Allergies 02A01	24 (46.2)	25 (48.1)	3 (5.8)	52 (100)
Back pain				
05A01	124 (56.9)	85 (39)	9 (4.1)	218 (100)
05A02	10 (50)	9 (45)	1 (5)	20 (100)
Choking				
11A01	7 (58.3)	4 (33.3)	1 (8.3)	12 (100)
11O02	3 (18.7)	13 (81.3)	0	16 (100)
Diabetic problem 13A01	47 (74.6)	13 (20.6)	3 (4.8)	63 (100)
Eye problem 16A02	9 (60)	6 (40)	0	15 (100)
Falls				
17A01	588 (84)	105 (15)	7 (1)	700 (100)
17A02	251 (86)	39 (13.4)	2 (0.7)	292 (100)
17O01	116 (77.3)	34 (22.7)	0	150 (100)
17O02	56 (51.9)	47 (43.5)	5 (4.6)	108 (100)
Headache				
18A01	29 (63)	17 (37)	0	46 (100)
18O01	3 (30)	7 (60)	0	10 (100)
Haemorrhage				
21A01	94 (68.6)	34 (24.8)	9 (6.6)	137 (100)
21A02	10 (83.3)	2 (16.7)	0	12 (100)
21O02	2 (18.2)	9 (81.8)	0	11 (100)
Poisoning 23O01	5 (20.8)	17 (70.8)	2 (8.3)	24 (100)
Pregnancy				
24A01	16 (57.1)	11 (39.3)	1 (3.6)	28 (100)
24A02	13 (72.2)	5 (27.8)	0	18 (100)
24O01	0 (0)	10 (100)	0	10 (100)
Psychiatric				
25A01	34 (51.5)	29 (43.9)	3 (4.5)	66 (100)
25O01	4 (14.8)	22 (81.5)	1 (3.7)	27 (100)
Sick unknown 26A01	997 (62.4)	554 (34.7)	47 (2.9)	1598 (100)
Can't urinate				
26A05	23 (65.7)	12 (34.3)	0	35 (100)
26O05	5 (25)	15 (75)	0	20 (100)
Catheter problem				
26A06	27 (67.5)	8 (20)	5 (12.5)	40 (100)
26O06	4 (23.5)	13 (76.5)	0	17 (100)
Constipation 26A07	4 (40)	6 (60)	0	10 (100)

Code and condition	*n* (%)			
	Returned	**Resolved**	**Not recorded**	**Total**
Defecation problem 26O11	2 (20)	7 (70)	1 (10)	10 (100)
Transport only 26O26	3 (27.3)	8 (72.7)	0	11 (100)
Trauma/injury				
30A01	188 (73.3)	61 (23.9)	6 (2.4)	255 (100)
30A02	110 (73.8)	38 (25.5)	1 (0.7)	149 (100)
30O01	26 (36.1)	46 (63.9)	0	72 (100)
30O02	2 (18.2)	9 (81.8)	0	11 (100)
30O03	7 (53.8)	6 (46.2	0	13 (100)
Unconscious/passing out				
31A01	17 (41.5)	21 (51.2)	3 (7.3)	41 (100)

It is also possible that the pass-back rate is influenced by the service handling calls and the alternative options for referral available. To explore this we have compared the pass-back rates for Alpha codes with a high volume of calls for sites 1 and 4 (Greater Manchester main study and pilot study) and site 5, which has the highest volume of calls of the NHS Direct pilot sites (Table 28).

Table 28 Comparison of pass-back rates for high-volume EMD codes by site

Code and site	*n* (%)			
	Returned	**Resolved**	**Not recorded**	**Total**
01A01				
Site 1	57 (60.6)	37 (39.4)	0	94 (100)
Site 4	122 (56)	81 (37.2)	15 (6.9)	218 (100)
Site 5	19 (23.2)	63 (76.8)	0	82 (100)
02A1				
Site 1	9 (45)	11 (55)	0	20 (100)
Site 4	15 (46.9)	14 (43.8)	3 (9.4)	32 (100)
Site 5	24 (46.2)	25 (48.1)	3 (5.8)	52 (100)
05A01				
Site 1	38 (64.4)	21 (35.6)	0	59 (100)
Site 4	78 (56.1)	52 (37.4)	9 (6.5)	139 (100)
Site 5	8 (40)	12 (60)	0	20(100)
17A01				
Site 1	159 (85.5)	26 (14)	1 (0.5)	186 (100)
Site 4	373 (87.1)	49 (11.4)	6 (1.4)	428 (100)
Site 5	56 (65.1)	30 (34.9)	0	86 (100)
17A02				
Site 1	97 (88.2)	13 (11.8)	0	110 (100)
Site 4	124 (86.1)	18 (12.5)	2 (1.4)	144 (100)
Site 5	30 (78.9)	8 (21.1)	0	38 (100)

Code and site	*n* (%)			
	Returned	**Resolved**	**Not recorded**	**Total**
18A01				
Site 1	11 (91.7)	1 (8.3)	0	12 (100)
Site 4	16 (61.5)	10 (38.5)	0	26 (100)
Site 5	2 (25)	6 (75)	0	8 (100)
21A01				
Site 1	31 (83.8)	5 (13.5)	1 (2.7)	37 (100)
Site 4	59 (62.8)	27 (28.7)	8 (8.5)	94 (100)
Site 5	4 (66.7)	2 (33.3)	0	6 (100)
25A01				
Site 1	8 (53.3)	7 (46.7)	0	15 (100)
Site 4	24 (58.5)	14 (34.1)	3 (7.3)	41 (100)
Site 5	2 (20)	8 (80)	0	10 (100)
26A01				
Site 1	288 (67.3)	137 (32)	3 (0.7)	428 (100)
Site 3	48 (45.3)	52 (49.1)	6 (5.7)	106 (100)
Site 4	629 (65.3)	296 (30.7)	38 (3.9)	963 (100)
Site 5	32 (32)	68 (68)	0	100 (100)
30A01				
Site 1	42 (82.4)	8 (15.7)	1 (2)	51 (100)
Site 4	132 (78.1)	32 (18.9)	5 (3)	169 (100)
Site 5	14 (41.2)	20 (58.8)	0	34 (100)
30A02				
Site 1	29 (80.6)	7 (19.4)	0	36 (100)
Site 4	79 (78.2)	21 (20.8)	1 (1)	101 (100)
Site 5	2 (16.7)	10 (83.3)	0	12 (100)
31A01				
Site 1	6 (60)	3 (30)	1 (10)	10 (100)
Site 4	11 (40.7)	14 (51.9)	2 (7.4)	27 (100)
Site 5	0	4 (100)	0	4 (100)

There are some marked differences between sites in the pass-back rates for the same code. A higher proportion of calls for abdominal pain (code 01), headache (18) psychiatric problems (25), injury (30) and passing out (31) were returned to the ambulance service by site 1 in both phases when compared to site 5 although there are a small number of cases for some codes. Code 26, a general code for sick with an unknown problem, showed differences between site 1, site 3 (which included this as the only Alpha code) and site 5. This suggests that differences between sites do influence the final disposition of a call and further investigation of the factors that affect the decision on whether or not to return a call is warranted. For other codes pass-back rates were similar. There was a high pass-back rate for falls (17) in all sites,

although there was a reduction in site 5. This site has developed a referral pathway with a local falls service which has reduced the number of calls returned to the ambulance service.

At the outset of this study the task of identifying calls suitable for transfer for further advice seemed a relatively simple and straightforward task. However, we have found that there are no EMD codes that generate a pass-back rate of less than 5% and although there are differences between services in the rate of return to the ambulance service it would seem that a much higher return rate would have to be accepted by services introducing this change. Similar findings have occurred in other services that have attempted to manage low-priority 999 calls using telephone advice. Using Omega codes does appear to be more sensitive in the identification of calls suitable for primary or self care; however, using only codes of this level reduces the proportion of 999 calls that can be managed by this alternative pathway.

The variation in and high level of return rates of calls passed for nurse advice found in this study does not allow us to compile a list of codes which should and should not be used to identify calls suitable for transfer. A more practical approach may be for services to both re-examine call codes and the expectations of the service. The results indicate that a high proportion of low-priority 999 calls cannot be resolved by telephone advice alone. A more pragmatic approach may be to view the process as one of additional triage that allows more appropriate allocation of resources, for example by reducing the level of ambulance response. Individual services could also consider what level of pass-back is acceptable and use that as a means for deciding which calls to transfer and which to provide with an immediate ambulance response.

7.3 Safety of call transfer

Delaying an ambulance response and referring some 999 calls for further advice involves clinical risk. Adverse events can be viewed in a number of ways. The most serious form is where a change in clinical management results in a worse outcome for the patient, for example an avoidable death or complication that results in an additional hospital stay. As the population under study here is 999 calls that have been assessed by a priority dispatch system as low priority it would be expected that such serious events would be rare and therefore difficult to detect, particularly as the limitations of the study did not allow follow-up of cases through hospital. Previous research has estimated that the risk of serious under-prioritisation by EMD systems – that is, assessing a call that is high priority as low priority – is 1 in 2200 (Nicholl *et al*., 1996). At another level an adverse event in the context of this study could be described as the transfer of a call that clearly needs an ambulance response and hospital assessment and where delay causes additional pain or distress for a patient

although outcome is not altered. An example is bone fractures where hospital treatment is required and early splintage and analgesia by the ambulance crew reduces pain. We therefore attempted to measure adverse events and inappropriate referrals in a number of different ways.

7.3.1 Methods

We used three different sources of information to identify adverse events and inappropriate referrals.

- Self-reported events by users. These are complaints to the study ambulance services or NHS Direct sites and events described by users in the free-text sections of the follow-up questionnaire described in Section 5.
- Internal audit by site 2 and 3 NHS Direct sites of calls transferred back to the ambulance service for a 999 ambulance response using the NHS Direct National Call review tool.
- Examination of ambulance-service patient-report forms for study calls to identify treatments given by ambulance crews for patients receiving an ambulance response.

7.3.2 Results

Self-reported events

All of the study sites monitored patient complaints during the study so that any events associated with call transfer could be identified.

Sites 2 and 3 received no complaints from callers or patients whose call had been transferred for nurse assessment and advice. In site 1 over the period of the pilot study and main study two events were reported that had resulted in an adverse patient outcome from 3975 calls passed.

The free-text sections of the 340 returned questionnaires from intervention-group cases during the trial phase were examined for descriptions of specific events related to care. There were no reported events where the respondent felt that having their call managed in this way had resulted in a worse outcome for a patient. One respondent from a care home reported that her elderly client (who received an ambulance response and had been taken to hospital) had died 1 week later but did not in any way attribute this event to the call management.

The events that were reported were concerns about the appropriateness of the response and delays where an urgent ambulance was sent. These were as follows.

- Three reports of patients being on the floor and in pain where delay or further questioning were thought to be unnecessary and distressing.

- Three report of patients being in severe pain at the time of the call and where additional questioning was thought to be unhelpful.
- Two cases where the respondent had been with a patient they considered to be very ill and who thought transfer inappropriate and distressing and that an ambulance should have been sent away.
- Two cases where patients had subsequently been taken to hospital following a second 999 call. One was on the same day and the other the next day.
- Four cases where fractures were reported. Two were for fractured hips. One was identified by the nurse adviser at the time of the call and the respondent in this case was satisfied with her conversation with the nurse as it confirmed her decision to call 999 to be correct. In the other case no ambulance was sent and the fracture not detected until 4 days later. In this case the respondent felt this had caused unnecessary pain and suffering. Two other cases were for a fractured ankle and a fractured lower femur and knee. In both of these cases the respondents felt that further assessment by a nurse was inappropriate as hospital treatment was required.

No serious adverse events were reported; that is, where the change in management had resulted in a worse patient outcome than expected. There were 14/340 events reported where providing nurse advice offered no clinical advantage as hospital treatment was clearly needed or where the caller and/or patient felt that additional time and questioning had increased pain and distress. Clearly in cases of, for example a fracture, an immediate ambulance response is the most clinically safe option and transfer for further assessment can confer no benefit. However, this presents the dilemma associated with telephone assessment in that the EMD code only provides a basic assessment and the true nature of the complaint may only become apparent during further questioning by the nurse. There will therefore always be some calls within the present system that are inappropriately transferred as there is insufficient information provided at the first assessment to allow a high degree of discrimination in choosing which calls to transfer.

The proportion of callers receiving the new service and consenting to and completing a follow-up questionnaire was low and so we do not know if there were other, unreported events that had affected callers or patients. However, the negligible number of complaints to services leads us to believe that the number of serious adverse events was low.

Internal audit of calls returned for a 999 response

Sites 2 and 3 conducted call reviews of passed calls returned to the ambulance service for a 999 response. Site 2 reviewed 102 returned calls and site 3 a random sample of half of the returned calls (57).

In site 2, 10 of the 102 calls returned to the ambulance service were recoded by the EMD system to a higher level. The other 92 remained coded as Omega-level calls. Five calls were recoded as Alpha codes (category C), two calls were recoded as Bravo and one as Charlie (category B) and two calls were recoded to the highest level, Delta (category A). In this service almost half of the reviewed calls (43/102) were returned because a patient needed lifting and assessing only. Ten calls were returned because the caller insisted on an ambulance and 14 were for transport only. Thirty-one calls (30%) were returned because a Clinical Assessment System disposition of 999 ambulance was given as the reason for return. Of these the reviewer considered that 11 of these did not require a 999 ambulance but did require transport so 20/102 calls were returned because an immediate ambulance response was required. This is 20/340 passed calls and only two calls were returned as needing a category A response.

The information from site 2 is less detailed but the review here considered 44/57 calls returned for a 999 response as being appropriate although it is not possible to discriminate how many of these may have required a category A response. Two callers requested an ambulance, four calls required transport only and there were seven calls where further questioning may have resulted in a lower-level response.

The call review does not identify adverse incidents but can help to make some judgement on the appropriateness of call transfer. The results highlight the findings reported in earlier sections that a large proportion of calls returned to the ambulance service were not for clinical reasons. There was a proportion of calls returned to the ambulance service for a 999 response although of these the number seriously under-prioritised – that is, requiring a category A response – was very small. It can be argued that the calls returned for a 999 response were inappropriate referrals for nurse advice but given that a much larger proportion were either resolved or returned for non-clinical reasons, and that when needed an ambulance response was still provided, then this level of mis-triage may be acceptable within the current system.

Treatment by ambulance crews for cases receiving an ambulance response

The combined sites generated 2033 passed calls during the two study periods. We obtained information on treatments provided by ambulance crews to patients attended for 1552 of these cases. In site 1 this information was retrieved from the computerised clinical audit system that records all information provided by crews on the patient-report form they complete for each case. In sites 2 and 3 we retrieved paper copies of the patient-report form and abstracted information on treatments given. One hundred and twenty-five cases (8%) had at least one treatment recorded. No treatment was given in 1427 cases.

The number and frequency of treatments are shown in Table 29. Some patients received more than one treatment

Table 29 Number and frequency of treatments provided to patients with passed calls

Treatment	Number (% of reviewed calls; *n*=1552)
Oxygen	67 (4.3)
Entonox	38 (2.4)
Cardiac monitor	63 (4.0)
Intravenous cannula	12 (0.8)
Vacuum splint	6 (0.4)
Blood sample	4 (0.25)
Glucagon	3 (0.2)
Aspirin	3 (0.2)
Cervical collar	1 (0.5)
Nubain	9 (4.4)
Morphine	1 (0.06)
Intubation	1 (0.06)
Intravenous fluids	2 (0.12)
Total	210

The most commonly administered treatments were oxygen therapy and analgesia with 47/1552 patients requiring pain relief. Six patients had vacuum splints applied, which suggests a fracture although without hospital follow-up this cannot be confirmed. Three patients received aspirin, suggesting a suspected cardiac event. One patient required morphine for a reported severe headache. All of these cases were assigned the dispatch code 26A01 at the time of the call. This code is for calls where the patient is reported as sick with an unknown problem and tends to be used as a default category where insufficient information is available to categorise the call into a more specific condition type. Consequently a wide range of conditions tend to be assigned to this code and as such is the code considered by the AMPDS system developers to be the one with the most clinical risk with regards to delaying an ambulance (J. Clawson, personal communication). One patient was reported as having an endotracheal intubation suggesting a serious, time-critical emergency. The CAD details for this case state the problem to be a fall with suspected fractured hip in a 29-year-old male. Further investigation is required to determine the exact series of events and cause of the problem in this case although an ambulance did arrive on scene within 7 minutes of the call being made, which is within current response-time standards.

Examination of patient-report forms for the control group (1790 records) found two cases where patients required intubation and five cases requiring aspirin, indicating that there is some under-prioritisation within Alpha and Omega codes.

7.4 Summary of the safety and reliability assessment

Combined data from a number of services have shown there is variability within services in the return rate for an ambulance response for calls passed for further assessment and advice. There is also variability in the return rates for individual EMD codes and as a consequence no definitive recommendations can be made as to which codes are appropriate for transfer for nurse advice. The decision on which codes to use is one that should be subject to local agreements between services, taking into account the referral services that are available.

We have made a limited assessment of the potential risk attached to call transfer by identifying potential adverse events from the information available. Only two complaints were made by service users during the course of this study and the pilot study in site 1. Internal audit of nurse decisions has shown these to be consistent and appropriate.

The analysis has shown that potentially 4/1552 cases (three possible cardiac problems and one intubation) had events where time and therefore immediate dispatch of ambulance may have been an important factor. In all of these cases an emergency ambulance was dispatched by the nurse following further assessment and in three cases an ambulance arrived within 15 minutes of the call and in the other within 20 minutes. However, this additional assessment may have been inappropriate in these cases. In 3% of cases for which information was available patients required analgesia. Presence of pain and early medical help is an issue identified by respondents to the questionnaire as being an important factor which influences their satisfaction with the service.

Clinical safety is an important issue for ambulance services and NHS Direct. The risk of serious adverse events associated with transfer of low-priority 999 calls for further assessment and advice appears to be small, with 2/3975 cases reported to services and 4/1552 cases where time may be an important factor identified from details of on-scene treatment. Nevertheless there is a potential risk of under-prioritisation and hence delay in sending an ambulance response to a time-critical emergency. The identification of the rate of true adverse events where such events are likely to be rare would require a much larger and more detailed study. Furthermore, any potential risk from under-prioritisation needs to be set against the potential gains that could be made by freeing ambulance resources to attend category A calls by reducing the number of responses for low-priority calls.

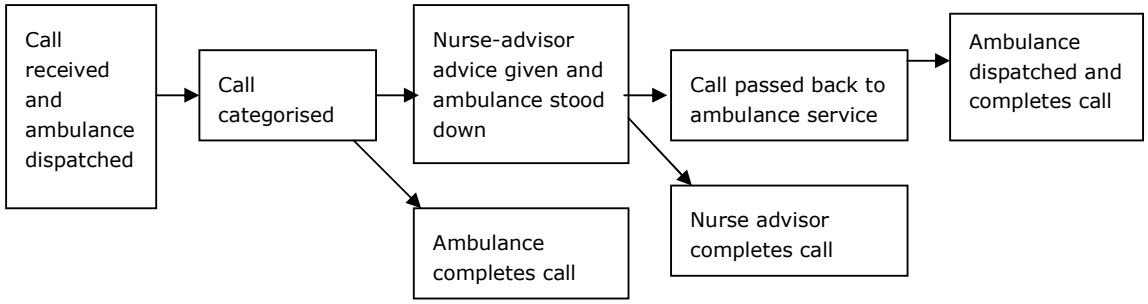
Section 8 Economic evaluation

8.1 Introduction

The use of a nurse advisor as an alternative to selected low-priority ambulance calls has several potential training and nurse-advisor resources that can potentially be offset by fewer ambulance service and hospital resources. However, NHS Direct advice may not end the patient episode, and may require the call to be passed back to the ambulance service or instruct the patient to seek care elsewhere. An economic evaluation was undertaken alongside the study to capture these changes in resources. The resulting costs can then be set alongside the differences in outcomes to allow an informed decision to be made about the value for money of the intervention.

A careful consideration of the call and ambulance-activation process is required to understand the potential resource consequences of the intervention, and hence the research methods required. The process is shown in Figure 10.

Figure 10 Patient episode in the two study arms



In terms of call process, the key differences are the provision of advice by nurse advisors and the possibility of a second ambulance activation. There may also be some minor differences in terms of EMD call-handling time as passing the call over to the nurse advisors requires some additional explanation; however, these have been excluded as they were expected to be negligible and data collection impractical. In cases where the call is passed back, any additional time is also negligible as the EMDs are simply activating another ambulance using existing call data.

The other clear difference between the two approaches is the additional training, and hardware requirements for the implementation of the new call-handling approach. Both EMDs and nurse advisors need additional training, and in some circumstances the new system is fully integrated into the CAD systems.

Less apparent are possible differences in care received by the patient after the ambulance or nurse-advisor episode is complete. These are considered in the economic evaluation.

8.2 Methods

The economic evaluation followed the technology appraisal guidelines used by the National Institute for Clinical Excellence (NICE, 2001), and as such takes the NHS and social service perspective. Costs are at 2003/4 levels. No outcome measures were included within the economic evaluation; however, outcome data are available from other parts of the study.

The cost components included within the economic evaluation and their associated data sources are given in Table 30. In summary, they cover nurse-advisor training and time, all ambulance activations, emergency-department attendances, and other NHS care in the week following the incident. The main data sources were ambulance-service records and the patient survey. A set of unit costs (2003/4 prices) is given in Table 31.

Table 30 Measurement and valuation of resources

Resource	Measure	Source of data	Source of unit cost
Training and set-up costs	Staff time	NHS Direct and ambulance trusts	Ambulance trusts
Nurse-advisor call contact	Number or contacts per patient	CAD systems	Bottom-up costing for emergency nurse advisors, and reported costs for NHS Direct
Ambulance call-outs	Length of call between call and time 'green'	CAD systems	Cost per minute based on total emergency ambulance expenditure and total ambulance minutes for trusts
Emergency-department attendances	Number of attendances	CAD systems	NHS Reference Costs
GP attendances	Number of attendances	Patient survey	PSSRU*
Inpatient admission	Admission	Patient survey	Trust financial returns
Other	Number and type of contacts	Patient survey	Various

PPSRU, Personal Social Services Research Unit.

**See Netten and Curtis (2000).*

Table 31 Unit costs

Resource	Unit cost (£; 2003/4)	Source
Emergency ambulance	TS, £3.39/min; GMAS, £2.45/min; WAS, £5.49/min	See Cost note 1 (below)
EMD training	£0.001 per call	See Cost note 2
ENA provision (completed call)	£49	See Cost note 3
Nurse advisor (completed call)	£26 Wales, £25 England	Annual report and TFR1G* (Wales); Hansard and Department of Health (England)
Nurse advisor/ENA call passed back to ambulance service	25% of NHS Direct/ENA completed call	Assumption
ED treated and discharged (or treatment unknown)	£70	NHS Reference Costs (ED low-cost investigation, referred/ discharged)
ED no treatment and discharged	£57	NHS Reference Costs (ED no investigation, referred/ discharged)
ED treated and admitted	£119	NHS Reference Costs (ED low-cost investigation, admitted/ died)
Inpatient admission	£1261	TFR2A*, average cost per episode for medical specialties for England
Surgery	£1415	TFR2B*, average cost per episode for surgical specialties for England
Minor injuries unit	£38	NHS Reference Costs, discrete minor injuries unit
GP visit	£21	PSSRU
GP home	£65	PSSRU
Practice nurse	£9	PSSRU
Dentist	£21	Statement of dental remuneration no. 91, examination and treatment planning
Subsequent emergency ambulance	£159	Mean of TS, GMAS, WAS cost per call
Urgent ambulance	£13	See Cost note 4
Physiotherapy	£29	PSSRU, 0.75 h of hospital physiotherapy

Resource	Unit cost (£; 2003/4)	Source
Care manager/social services	£36	PSSRU, intensive case manager for older people
Outpatients	£120	NHS Reference Costs, trauma and orthopaedics first attendance
Obstetrics	£125	NHS Reference Costs, other expectant mothers

**See NHS Executive (2005).*

ED, emergency department; ENA, emergency nurse advisor; GMAS, Greater Manchester Ambulance Service; PPSRU, Personal Social Services Research Unit; TS, Two Shires Ambulance Service; WAS, Welsh Ambulance Service.

Cost note 1 *Cost per minute for TS calculated using expenditure on emergency patient transport services (TFR6; NHS Executive, 2005) and total cycle time for a sample of calls (pro rated). Cost per minute for other services calculated using the ratio of cost per minute and cost per call from TS, and applying to other services. Cost per call calculated using expenditure on emergency patient transport services and number of emergency calls (Department of Health, 2004b; National Assembly of Wales, 2004).*

Cost note 2 *Training in WAS consisted of 1.5 h training in classes of one or two. Training and supervision by EMD manager. Total cost of £1685, equivalent annual cost of £196 (10 years life, 3.5%), 252 964 calls.*

Cost note 3 *Salaries in GMAS for first year of operation were £193,567 (based on Netten and Curtis, 2000), training costs £1321, equivalent annual cost of equipment £8112. Scale of service halved for 2090 calls per annum (pro rated) in the second year.*

Cost note 4 *Cost per call calculated for GMAS only using expenditure on non-emergency patient transport services (TFR6; NHS Executive, 2005) and total number of urgent and special journeys (Department of Health, 2004b).*

In order to avoid long lists of resources and costs, cost components were aggregated into groups which are similar in nature. The cost categories created in this way were as follows.

Immediate care. This is used to identify all immediate care including emergency-department attendances.

Other immediate care. This is used to identify immediate care other than emergency-department attendances, and includes attendances at minor injury units and GP contacts on the same day as the initial call.

Subsequent care. This is used to identify all care not associated with immediate treatment, and includes urgent ambulance journeys on the same day as the initial call, and all other contacts in the week following the initial call (e.g. admissions to hospital, emergency-

department attendances, minor-injury-unit attendances, GP attendances, etc.).

8.3 Analysis

Mean resource use and costs were compared between the study groups and confidence intervals around the incremental costs presented. An incremental cost-effectiveness ratio was not estimated as there is no suitable measure of outcome. Area-specific analyses were considered as most appropriate as different operational models were apparent in terms of the way in which nurse advice was provided.

Separate analyses were also undertaken depending on the source of the data: the main analysis is based on data collected from routine sources whereas separate analyses are undertaken for all data (available from either routine sources or patient questionnaires). These separate analyses were thought necessary as problems with data collection in the trial highlighted a potentially large missing data problem for patient questionnaires.

The most obvious analysis is to use data just from the randomised part of the study (phase 1). However, this may not reflect what would happen if implemented, as patients were given the option of refusing to be passed through to a nurse advisor. When implemented outside, this option may not be given, or at least, less discretion given to the patient. Phase 2 was meant to better reflect a real-world implementation of nurse advice; consequently, a second comparison was made, using data from phase 2 as the intervention data, and data from the phase 1 control arm as the control data.

Statistical tests are data dependent; dichotomous data utilised the Wilson method for estimation of confidence intervals, continuous data used independent-sample *t* tests. It was thought unnecessary to use bootstrapped confidence intervals due to the large numbers in the comparisons. When comparisons were made with data pooled across areas, differences in study area were corrected for use in a general linear model.

Several sources of uncertainty exist. Uncertainty relating to stochastic variation is described by the use of confidence intervals in the analysis. Other sources of uncertainty have been incorporated into the economic evaluation via sensitivity analysis.

8.4 Results

For the analysis of cost components based on routine data, there was 100% complete data. The nurse-advice intervention was implemented differently between the three areas and this is reflected by the different proportions of nurse-adviser consultations and full ambulance activations (Tables 32–36). Manchester, in particular, operated quite differently, with few patients refusing transfer through to the nurse in

phase 1. Contrary to expectations, the proportion of calls going through to nurse advisers dropped from phase 1 to phase 2 by around 12%. Manchester did not participate in phase 2 of the study.

Table 32 Resource use and cost for all Greater Manchester cases for phase 1

Item	Control (*n*=1771)	Intervention (*n*=1311)	Mean difference	95% confidence interval of the difference
Nurse-advisor consultations (%)*	0.0	100.0	+100.0	+99.6 to +100.0
Full ambulance activations (%)†	100.0	75.9	−24.3	−26.7 to −22.1
Mean cycle time (min:s)	50:02	32:14	−17:48	−19:28 to −16:07
ED attendances	77.8	59.6	−18.2	−21.4 to −14.9
Mean cost of nurse advisor, ED and emergency ambulance (£)	178	170	−8	−13 to −3

ED, emergency department.

**Proportion of patients not refusing.*

†*Proportion of calls passed back to ambulance control.*

Table 33 Resource use and cost for all Two Shires cases for phase 1

Item	Control (*n*=70)	Intervention (*n*=528)	Mean difference	95% confidence interval of the difference
Nurse-advisor consultations (%)*	0.0	42.4	+42.4	+35.8 to +46.7
Full ambulance activations (%)†	100.0	72.2	−27.8	−31.8 to −21.5
Mean cycle time (min:s)	44:30	33:18	−11:12	−16:24 to −6:01
ED attendances	67.1	35.0	−32.1	−42.7 to −19.7
Mean cost of nurse advisor, ED and emergency ambulance (£)	203	162	−40	−64 to −16

Footnotes as for Table 32.

Table 34 Resource use and cost for all Wales cases for phase 1

Item	Control (*n*=340)	Intervention (*n*=414)	Mean difference	95% confidence interval of the difference
Nurse-advisor consultations (%)*	0.0	57.0	+57.0	+52.1 to +61.7
Full ambulance activations (%)†	100.0	73.2	−26.8	−31.3 to −22.6
Mean cycle time (min:s)	52:40	35:05	−17:36	−21:47 to −13:25
ED attendances	74.7	39.9	−34.9	−41.2 to −28.0
Mean cost of nurse advisor, ED and emergency ambulance (£)	349	246	−102	−129 to −76

Footnotes as for Table 32.

Table 35 Resource use and cost for all Two Shires cases (phase 2 compared with phase 1)

Item	Control (*n*=70)	Intervention (*n*=386)	Mean difference	95% confidence interval of the difference
Nurse-advisor consultations (%)*	0.0	30.6	+30.6	+23.8 to +35.3
Full ambulance activations (%)†	100.0	79.0	−21.0	−25.5 to −14.7
Mean cycle time (min:s)	44:30	30:43	−13:47	−19:03 to −8:31
ED attendances	67.1	23.6	−43.6	−54.2 to −31.1
Mean cost of nurse advisor, ED and emergency ambulance (£)	203	146	−57	−81 to −33

Footnotes as for Table 32.

Table 36 Resource use and cost for all Wales cases (phase 2 compared with phase 1)

Item	Control (*n*=340)	Intervention (*n*=57)	Mean difference	95% confidence interval of the difference
Nurse-advisor consultations (%)*	0.0	47.4	+47.4	+34.9 to +60.1
Full ambulance activations (%)†	100.0	78.9	−21.1	−33.3 to −12.4
Mean cycle time (min:s)	52:40	35:43	−16:58	−26:22 to −7:34
ED attendances	74.7	38.6	−36.1	−48.4 to −22.2
Mean cost of nurse advisor, ED and emergency ambulance (£)	349	249	−100	−158 to −41

Footnotes as for Table 32.

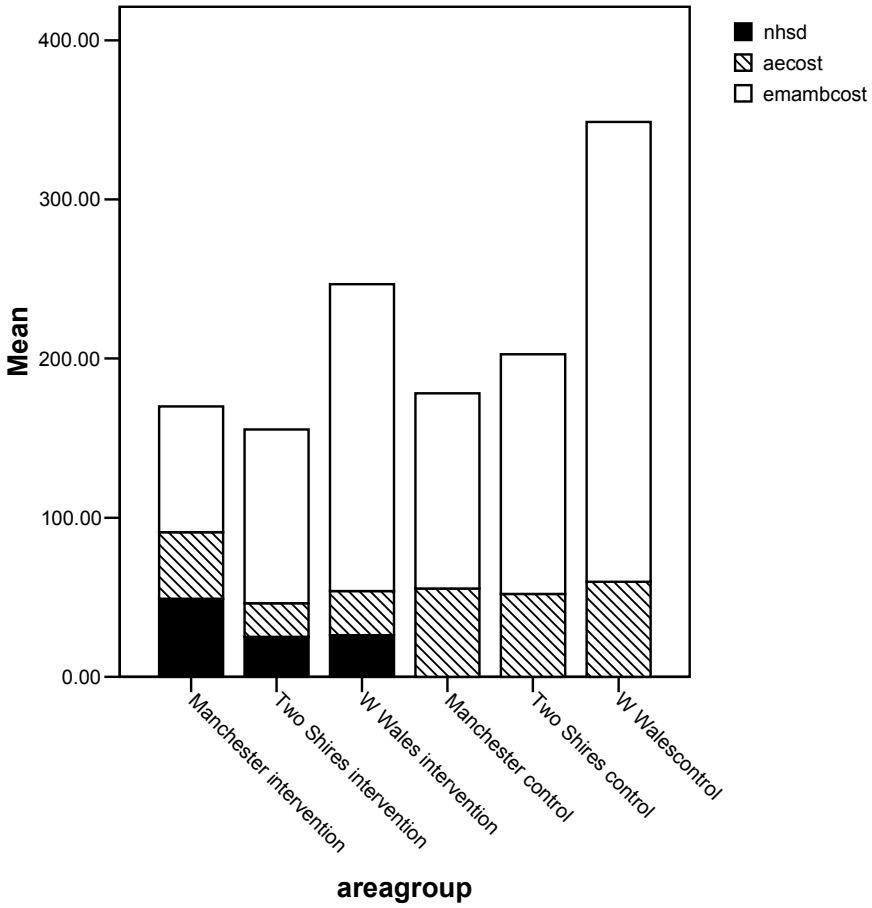
Despite the marked differences in proportions being put through to the nurse adviser in phase 1, the number of full ambulance activations was remarkably similar, being between 72 and 76% (Tables 32–34). This is likely to be due to Manchester giving nurse advisors the option of sending an urgent ambulance and hence producing a high pass-back rate. The other services did not offer this, and so, whereas they had a greater number of refusals, fewer were passed back for full activations.

All differences in nurse-advisor consultations, full ambulance activations and ambulance cycle times were statistically significant, which is unsurprising as these are driven by the study protocol. The differences in emergency-department attendances were also large, and statistically significant in all three areas (Tables 32–36).

When looking at all cases in phase 1, mean costs were lower in the intervention group by £8, £40 and £102 in Greater Manchester, Two Shires and Wales, respectively (Tables 32–34; Figure 11). Overall, all differences in resource use and cost between the phase 1 comparison and the comparison using phase 1 and 2 data were minor (Tables 35 and 36).

Figure 11 Nurse advisor, emergency-department and emergency ambulance costs for all patients, by location

Mean costs (£) are shown for nurse advisors (nhsd), emergency-department visits (aecost) and emergency ambulances (emambcost).



When other NHS cost components were examined, a much smaller sample was available for analysis (n=584) compared to the full phase 1 sample (n=3082), representing only 19% of the data. As only 28 responses were available from phase 2, these were excluded from the analysis. These data show increases in other 'immediate' care (i.e. minor injury units and GP contacts) and 'other' care, but reductions in admissions (Table 37); all of these changes were statistically significant at the 5% level. The differences in use of other immediate care and admissions to hospital were large, at 11 and 33%, respectively. These figures are unadjusted for potential differences in area.

Table 37 Resource use for patients responding to questionnaire for phase 1 (unadjusted)

Item	Control (*n*=266)	Intervention (*n*=318)	Mean difference	95% confidence interval of the difference
Nurse-advisor consultations*	0	83.6	+83.6	+79.0 to +87.3
Full ambulance activations†	100	73.9	−26.1	−31.2 to −21.4
Mean cycle time (min:s)	52:45	24:52	−27:53	−31:47 to −24:00
ED attendances (%)	78.2	49.7	−28.5	−35.6 to −20.9
Other immediate care (%)‡	3.8	15.1	+11.3	+6.7 to +16.0
Admissions within 7 days (%)	45.5	12.6	−32.9	−39.7 to −25.2
Mean number of other contacts within 7 days¶	0.5	1.0	+0.6	+0.4 to +0.7

ED. emergency department.

**Proportion of patients not refusing.*

†*Proportion of calls passed back to ambulance control.*

‡*Includes minor injury units and GP care on same day as call.*

¶*Includes all other NHS contacts.*

When looked at together, and having adjusted for study area, the differences in the two models of service provision are clear (Table 38). Increased costs associated with nurse advisor time (£39), are offset by reductions in the use of emergency ambulance services (£88), other immediate care (£38), and subsequent care (£412); all differences are statistically significant at the 5% level. Consequently, the mean cost in the intervention group is much lower than that in the control group by £498 (P<0.001; Table 38). Costs for the individual services are shown in Figure 12.

Table 38 Costs for up to 7 days for patients responding to questionnaire for phase 1 (adjusted)

Item	Adjusted mean cost (£)*		Mean difference (£)	95% confidence interval of the difference (£)
	Control (n=266)	*Intervention (n=318)*		
Nurse advisor	−3	36	+39	+18 to +21
Emergency ambulance	204	116	−88	−106.6 to −68.7
Immediate care†	72	34	−38	−44 to −31
Subsequent care‡	585	173	−412	−507 to −316
Total cost	857	360	−498	−601 to −394

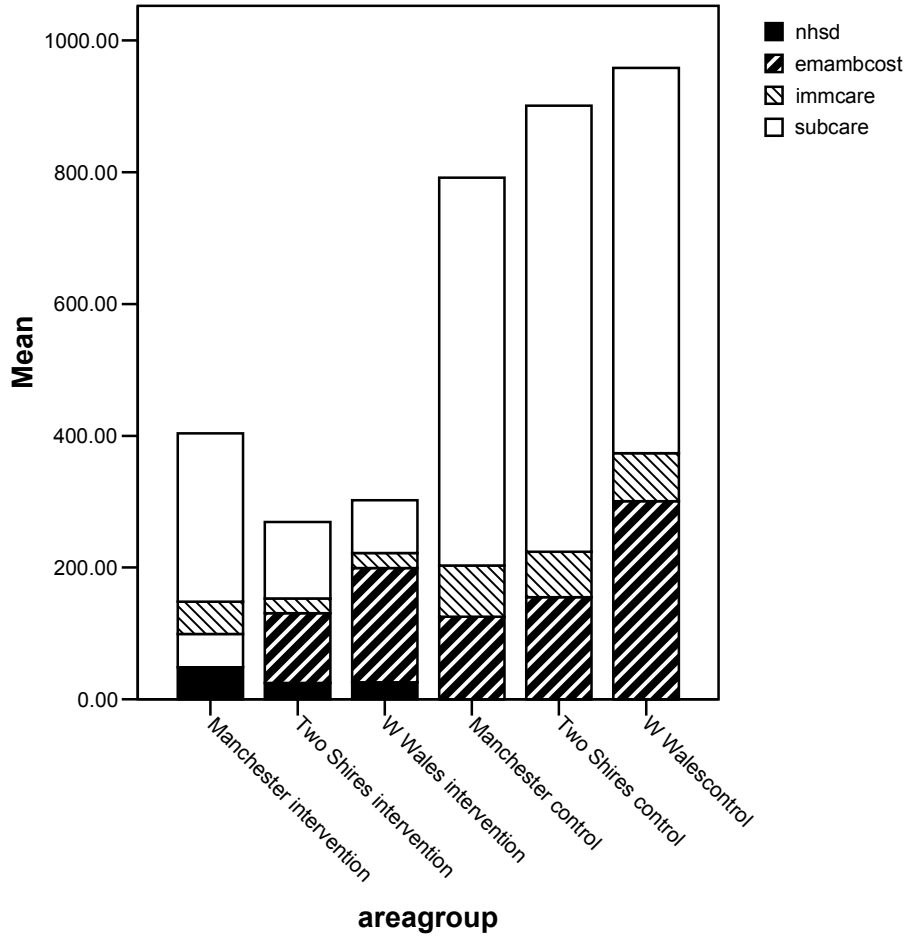
**Adjusted with general linear model for different areas. This produces an estimated mean negative cost for NHS in the control group, when the exact figure is zero.*

†Emergency department, minor injuries units and GP contacts on day of call.

‡Admissions, and all other NHS contacts.

Figure 12 NHS costs for all patients, by location

Mean costs (£) are shown for nurse advisors (nhsd), emergency ambulances (emambcost), immediate care (immcare) and subsequent care (subcare).



8.5 Discussion and conclusions

The analyses show that the introduction of nurse advisors leads to reductions in costs due to reduced ambulance cycle times, emergency-department attendances and hospital admissions. These will not lead to overall cost savings for the ambulance service, however, as reduced cycle times will be replaced by additional jobs in the current climate of increasing ambulance call volume. It should, however, make the accommodation of increased activity slightly easier within current resources.

The impact on admissions must be treated with caution as the questionnaire data came from a small self-selected sample of patients who returned questionnaires. However, the results are plausible; by reducing the number of patients going to an emergency department, the intervention may reduce the number of patients admitted. The questionnaire results also show that those in the intervention group receive more immediate and other care, which may reflect their actions following advice from the nurse advisers.

There may also be further difficulties in interpreting the questionnaire data relating to resource use and costs. Two separate questionnaires were used for the control and intervention groups, and within these separate designs questions relating to some aspects of resource use were phrased differently. It is possible that framing effects may have biased these data.

Given the importance of hospital admissions and the potential framing effects associated with different questionnaire designs, it would be valuable to consider other ways of looking at the impact of such schemes on admissions. Without these data, the cost–effectiveness of using nurse advisors is not obvious in all areas; the cost difference is only £8 in Manchester when ignoring hospital admissions and using complete data (Table 32).

Generalising these results is difficult. Greater Manchester operated a different model of nurse advice based in the ambulance control room. This had a higher cost per call than NHS Direct, but a very low refusal rate, a higher pass-back rate and the use of urgent ambulance journeys. This more integrated approach produced results that are slightly different from those of the other two areas.

From examination of the Two Shires and Wales results, it is apparent that cost per minute of ambulance time is a key driver of cost. Greater savings were generated in trusts with a higher cost per minute, although reductions in cycle time were similar across the three areas.

The implementation phase (phase 2) did not have a dramatic impact on the way in which calls were put through to nurse advisors; there were still high refusal rates (69% in Two Shires and 53% in Wales). Consequently, if the intervention is fully implemented, with no allowance for refusals in these two areas, we cannot be certain about what will happen. Although Greater Manchester appeared to operate such a system in phase 1, this was part of a system that was different in several other ways.

The results of the economic evaluation are clear: the use of nurse advisors for selected low-priority calls, while generating additional nurse-advisor costs, reduces ambulance cycle time and the number of emergency-department attendances. Together this reduced costs by £8–102 per patient in the study areas. The impact on the wider NHS are less clear, due to a low response rate for the patient questionnaire and other potential difficulties in the interpretation of the

questionnaire. However, there are indications that the intervention group also had fewer hospital admissions, but a greater number of other contacts in the 7 days following their call. If these additional effects are included at face value, the use of nurse advisors becomes very cost-effective, with cost reductions of around £500 per patient.

Section 9 Discussion and conclusions

9.1 Summary of main findings

We have attempted to evaluate the costs and benefits of a service change involving the transfer of some low-priority 999 ambulance calls for further assessment and advice by nurse advisers. Two studies, a randomised controlled trial and an observational study, have been conducted.

9.1.1 Randomised study

We have assessed 2250 calls receiving the new intervention and 2158 calls receiving an immediate ambulance response in three services. The return rate of calls passed for nurse assessment to ambulance services varied from 75 to 36.1% (mean 66.9%). However only 26.5% of passed calls were assessed as requiring a 999 ambulance response by the Clinical Assessment System. The remainder required an ambulance for non-clinical reasons including lifting, transport only and caller or patient request. In one service 25% of returned calls were given a lower-level, urgent response rather than an emergency response. Calls were more likely to be returned if the patient was elderly. One of the perceived advantages of this service was considered to be the referral of callers requiring primary rather than acute hospital care to alternative care pathways. However, a substantial proportion of calls assessed as requiring primary care still received an ambulance.

Calls passed for further assessment resulted in 30% fewer transports to hospital and the ambulance-service job cycle time was reduced by a mean 9 minutes 27 seconds. Where passed calls were resolved by the nurse and no ambulance was required this time was reduced by 37 minutes. Resources are therefore saved through diversion of non-urgent 999 calls to NHS Direct and, if fully operational, this has the potential to provide a cost-effective service.

A postal survey of both intervention- and control-group callers has been carried out to assess satisfaction with and acceptability of the new service. Three hundred and forty intervention-group callers and 266 control-group callers responded. There was a high level of satisfaction in both groups but callers to the new service were less satisfied (75%) when compared to the control group, where 85% of respondents agreed or strongly agreed that they were satisfied with the service they received. A number of callers expressed the view that they thought the service to be a good idea as they had called 999 because they had been unclear what else to do. The reassurance and advice given by nurses was highly appreciated even among callers who received an ambulance response, with 80% of respondents

reporting that they found the advice given very helpful or helpful. The main sources of dissatisfaction were having to wait for an ambulance (although this was not universal and others thought waiting appropriate as they understood their call was not an emergency) and repeated questioning. Further development and integration of the processes of triage and assessment may provide a more acceptable service. A small number of service users thought the transfer of their call was inappropriate and that an ambulance should have been sent immediately. This was particularly the case where patients were in pain and distressed. Although the call-assessment process may detect a call as not being clinically urgent (that, is the absence of any life-threatening condition), future service development will also need to take into a count other factors such as pain that are important to patients and callers. These findings may, in part, reflect differences in perception and understanding between emergency medical service personnel and the public about what an emergency is.

9.1.2 Observational study

The observational study was designed to evaluate the use of the alternative service as standard operational practice. We have found that, in the models of service delivery studied here, the number of 999 calls redirected for nurse assessment and advice is a small, comprising 1.6% of total 999 call volume when Alpha-level calls are used and 0.29% for Omega calls. Changes in the operation times of the nurse advice service and better alternatives for care where a 999 ambulance response is not required could improve this considerably. We have estimated that if the service were to be available on a 24-hour/365-days-a-year basis, all suitable calls passed and the return rate to the ambulance service reduced by providing suitable alternative care or transport, the estimated proportion of 999 calls that could be resolved by nurse assessment would rise to 9.7% in a service using Alpha calls as the means of call identification. For an ambulance service receiving 200 000 calls a year a potential 15 000 ambulance journeys could be saved.

We also conducted a qualitative study to assess the views of both ambulance-service and NHS Direct staff on the service change. This has been viewed as a primarily positive experience for both groups of staff and the opportunity to develop and implement an integrated service and joint working was seen as a major step forward. Detailed planning, enthusiastic leaders and the involvement of all levels of staff at each stage of development and from the outset were identified as key issues to the success of any future developments. There was some disappointment that the service change had not produced the benefits that had been anticipated. The small numbers of calls passed and the high return rates back to the ambulance service had not met expectations. The development of suitable alternatives for care at a local level was seen as a necessity if the potential benefits are to be realised.

Two levels of emergency priority dispatch codes were used, Alpha and Omega. The return rate for Omega-level calls was significantly less than for Alpha calls, suggesting that the additional questioning involved to reach this disposition provided a more accurate identification process for suitable calls. Comparison of pass-back rates between services using Alpha codes showed some variation suggesting that factors other than the dispatch code influence the decision about whether or not to return a call to the ambulance service.

The high return rate of calls suggests the use of EMD code alone is not a reliable means of identifying calls suitable only for primary or self care. At the beginning of the study we had suggested that a pass-back rate of less than 5% would be a suitable cut-off point for identifying suitable EMD codes. In practice, with the exception of a small number of Omega codes, this has proved not to be an achievable standard in any service and the EMD categories included proved to be neither highly sensitive nor specific in the identification of calls suitable for telephone advice alone. Other studies have also demonstrated that priority dispatch systems cannot always identify patients with important clinical signs and symptoms (Neely *et al*., 2000) and that use of Alpha-level codes is not a good indicator of patients with low-acuity needs (Shah *et al*., 2003). This reflects the fact that systems are being used to make triage decisions they were not designed for. Although it may be possible to make some reductions to the pass-back rate, for example by further development of appropriate referral pathways for nurses, it would seem that a relatively high pass-back rate will have to be accepted while current EMD systems are used to triage 999 calls.

We were unable, within the scope of this study, to follow patients beyond their initial call to the ambulance service and it is therefore difficult to make a robust assessment of the risk of adverse incidents that may result from the service change. The preliminary attempt we made to assess safety identified only a very small number of potentially serious adverse incidents. Any form of triage will involve some risk of under-prioritisation and these findings support the estimate of risk made in previous work (Nicholl *et al*., 1996). Risk will be present in any form of alternative response for low-priority 999 calls which incorporates a delay of longer than the current 14- or 19-minute response-time standard. A further study would be warranted to make a more robust assessment of risk and associated adverse events for all alternative responses.

The other issue worth further consideration would be the inappropriate transfer of calls for some groups, for example elderly fallers, that may result in distress and inconvenience.

9.2.3 Economic evaluation

Resource use and costs were compared for the new service and the control service. There were some clear differences between the

services. Transferring calls for nurse advice resulted in shorter job cycle times and fewer emergency-department attendances, reducing the cost per patient by £8–102. The cost reduction was smallest in the service using nurses within the ambulance-service control room, but this service also had the highest pass-back rate to the ambulance service. The data available on other health-service resource use was limited by the small number of questionnaire responses, but from this we have shown that intervention-group patients had more contacts with other immediate care services but fewer hospital admissions. Additional costs incurred for nurse-adviser time were offset by reductions in the use of ambulance services, other immediate care and subsequent care, resulting in a mean cost in the intervention group that was £498 lower than in the control group. Further study to validate these figures would be useful but they do indicate that use of nurse advisers for selected low-priority calls is potentially a very cost-effective service option.

9.2 Service delivery

One of the key findings of this study has been the small number of calls passed to NHS Direct or ambulance-service-based nurse advisers. This was a much smaller proportion than anticipated, or than could be expected to be appropriate. In addition, the high pass-back rate was also a concern in terms of the effective use of resources. The principal reasons for the low volume of calls passed are listed below.

1 The triage systems were not designed for and therefore were not able to accurately identify calls suitable for telephone advice.

2 Calls within the study inclusion categories were further reduced due to the location of the patient, because the caller was not with the patient or because the caller refused to have their call transferred.

3 Organisational arrangements limited hours of service availability.

4 There were difficulties in working across organisational boundaries resulting in periods of service disruption and at times a lack of confidence between services.

5 There were change-management issues related to the introduction of a new service.

6 Changes within the wider NHS resulted in a re-assessment of priorities. Changes to the management of primary care out-of-hours work had a particular impact on the provision of NHS Direct services.

The main consequence of the small study numbers is that a much smaller proportion of the 999 call volume than anticipated has been diverted to the new service and the high pass-back rate means the number of saved ambulance journeys was lower than anticipated. The high pass-back rate was particularly disappointing to services and it is possible that the rate of almost 70% found in one service was a

particular characteristic of that service. It is also possible that this is a feature of nurses' attitude to risk and that, in a new service, they were erring on the side of caution during the early phases of the service. The addition of data from other services testing call transfer has shown that this can be reduced but a pass-back rate of less than 50% is unlikely when Alpha codes are used as the means of call identification. One service outside this study that was testing call transfer abandoned the service because the pass-back rate approached the 70% reported here. It is therefore likely that these results are generalisable and the experiences of the services involved in this study provide valuable lessons for others considering this service change. None of the three services involved in this study have continued passing calls for nurse advice. One stopped the service when financial constraints imposed by the creation of NHS Direct as a Special Health Authority meant the service could no longer be funded. The other two ceased call transfer as soon as the study was complete.

It is possible to reduce pass-back rates for Alpha calls. The lower pass-back rate found in one of the other services used in the reliability analysis was considered by that service to be the consequence of developing a comprehensive, locally based directory of information for their nurse advisers, allowing them to make appropriate referrals. This could include falls services, mental health services, alternatives to the emergency department (walk-in centres, minor injuries units, primary care centres) and the ability to make appropriate appointments on behalf of patients. This was an issue considered important by our study services and the lack of development in this area was cited as one reason why, for example, calls assessed as requiring primary care were still being referred back to the ambulance service. It is also clear that the capacity for nurse advisers to resolve some calls, for example elderly fallers who made up a substantial contribution to the number of passed calls, will be limited without the option to refer to a suitable alternative such as a falls or lifting service. Until such services are in place the continued transfer of these calls is questionable as an ambulance will be sent in up to 80% of these cases. The key message for other services to learn from these findings is that *development of appropriate local care and referral pathways for calls assessed by telephone is critical if the service is to achieve its full potential.*

9.3 Policy implications

It is over 10 years since the original policy review of ambulance-service performance standards and the recommendation that alternative methods of management for low-priority or non-urgent category C calls be developed (Chapman, 1996). For most of that time category C calls have remained within the response-time performance framework although the need to explore other options of response, and in particular telephone advice and better integration of the ambulance-service and NHS direct call-handling services, has remained a key policy objective (Department of Health, 2001b, 2003).

It has been estimated that up to 40% of 999 calls do not require an emergency ambulance and that alternative responses could both save ambulance resources and provide a better service for patients. It was only in 2004 that category C calls were removed from response-time performance targets and ambulance and commissioning services given responsibility for developing local standards and response options for these calls (Department of Health, 2004a). The provision of clinically appropriate response options for category C calls is seen as a key strategic objective for modernising ambulance services, as set out in the policy document *Taking Healthcare to the Patient* (Department of Health, 2005). Enhanced call handling, including providing telephone advice and support to help patients make the right choice for their needs, is highlighted as one of the main developments required to achieve these objectives. This policy initiative also recognises that for such a service to function effectively patients should only have to make one telephone call and that referral pathways need to be in place to direct patients to appropriate care. Both of these principles are confirmed by the findings of this study and, importantly, we have shown that the consequences of not setting these processes in place results in a service of limited value to a very small number of patients.

The use of telephone advice and assessment as one alternative method for management of category C calls has been explored for a number of years and preliminary studies found the service to be safe and acceptable (Dale *et al*., 2000). Early estimates suggested that up to 12% of 999 calls could be managed in this way with a comparable reduction in ambulance-service responses. This study has shown that in practice this level of reduction in ambulance responses is unrealistic. Study site 1 did show a potential referral rate of 13% of 999 calls. However, the combination of restricted operational hours, exclusion criteria such as calls from a public place and the high pass-back rate means the number of ambulance journeys saved is only one-quarter of that expected. Using Omega codes reduces the number of pass-backs but these codes comprise only 5% of 999 workload and the other operational limitations mean that potential ambulance journeys saved are reduced to less than 2% of total 999 call volume. Previous attempts to estimate the impact of transfer of 999 calls for telephone advice, including our own when this study was designed, have been based on the assumption that this would result in a high proportion of calls being referred away from the ambulance-service system and into primary care or self care. One of the most useful findings of this study is that it has shown that this is not the case and a high proportion of calls with low-priority dispatch codes still require some form of immediate response or face-to-face medical assessment. The requirement for suitable referral processes to manage this process has already been discussed in detail. However, there are two other considerations that need to be taken into account:

1 that these callers to the 999 service genuinely have a medical problem that requires an emergency ambulance response and

therefore transfer for further assessment produces no advantages, or

2 callers have a problem that does not require an emergency ambulance response but does require transport or a face-to-face contact with a health professional that cannot be arranged outside of the ambulance service within a suitable time frame, and hence an ambulance response becomes the default option.

In the first case we have demonstrated that, within the limitations of the current EMD and Clinical Assessment System systems some inappropriate referrals are inevitable. One option would be to abandon telephone referral until such time that a more sensitive system of triage and referral is developed. However, we have shown that where the system works well it is very effective, users are satisfied and even a small reduction in ambulance transports is cost-effective. Therefore, even in its present state there are some advantages. Furthermore continued call transfer can increase the empirical evidence base needed on which to base decisions about those calls that are suitable for transfer and those that are not. Increasing policy emphasis on telephone assessment at the time of an emergency call means that continued research in this area is now more essential.

In the second case there are a number of options that could improve the effectiveness of the service.

- A reappraisal is needed of the role of nurse assessment of the management of 999 calls that moves away from the expectation that this will result in a cancelled ambulance journey for the majority of calls that receive this service and towards an enhanced level of triage that provides a more detailed assessment of selected calls and hence a more considered response in terms of the use of ambulance-service resources. This is a particularly pertinent issue for ambulance services. As the range of response options available increases so does the requirement for a more sensitive means of appraising the nature of calls and the most appropriate response. During the life of this study the development of the role of Emergency Care Practitioners has moved forward at a rapid rate (Mason *et al.*, 2004). This role involves providing health care professionals with additional diagnostic, assessment and treatment skills that will allow them to provide an enhanced level of clinic care to patients in their home or to provide initial treatment and then refer patients to appropriate continuing care. Provision of this level of care at home in partnership with other services and hence reducing the number of patients taken unnecessarily to hospital is another objective of *Taking Healthcare to the Patient* (Department of Health, 2005). To date the majority of Emergency Care Practitioners are ambulance-service professionals and have been employed by ambulance services. However, there remains a difficulty for ambulance services in identifying calls suitable for an Emergency Care Practitioner response in much the same way that there is difficulty

in identifying calls for a telephone advice response. The benefits of additional clinical assessment of calls may be as much concerned with aiding decisions about the deployment of an appropriate ambulance-service response, including the effective use of Emergency Care Practitioners, as saving ambulance-service journeys.

- The adoption of enhanced assessment to aid the decision-making process around deployment of ambulance-service resources raises issues about where this process takes place and who performs it. In our study we have only investigated the use of nurses to provide further assessment and advice. However, there are questions around who should provide this assessment and it has been suggested that ambulance-service personnel could fulfil this role. Earlier studies have successfully used both paramedics and nurses to perform further assessment (Woollard, 2001) and within our qualitative study there was a view among ambulance-service control-room staff that, with additional training, they could take on this responsibility. The recognition that transfer of calls for further assessment will still result in an ambulance response has lead to a reappraisal of where this assessment should take place. The early exit of the site in this study that had employed nurse advice within the ambulance-service control room has made it difficult to compare this system with transfer to an NHS Direct service. There were however some clear issues identified. One is that the difficulties encountered within site 1 were more concerned with issues around management of staff than the call-transfer processes. In this site there seemed to be fewer technical difficulties in the call-transfer process than when routed to a remote site. In the latter case there was sometimes confusion as to when a nurse was available, particularly if NHS Direct was busy and the ring-fenced nurse was temporarily moved back to other call-taking duties. In both cases the small number of calls transferred led to long periods when the assigned nurses were not utilised and therefore resources were wasted. Site 2 in this study changed the method of answering category C ambulance calls. Initially they used a ring-fenced nurse but after moving premises and implementing an enhanced telephone system this allowed category C calls to be flagged up in the NHS Direct call queue and answered by the first available nurse, thus dispensing with the need to provide a dedicated nurse for these calls.
- If call-taking roles are to be used effectively there seems to be some case for considering expanded and more generic call-taking roles. An additional workload for NHS Direct was created by changes in primary care out-of-hours provision and a shift in priorities and management of ambulance-service 999 calls is viewed by some to be a minor consideration within the current system. The combination of a shift in priorities for NHS Direct and the need to more appropriately deploy ambulance resources where cases cannot be referred elsewhere is increasingly leading

ambulance services to consider keeping enhanced assessment and telephone advice within the ambulance-service setting.

- The high pass-back rate to ambulance services highlights problems within emergency care systems and in particular the referral of patients to alternative services in an acceptable time frame. The true potential of referring some 999 calls for further assessment will only be achieved when the appropriate service is available at the time of need. The development of properly integrated emergency care networks would seem to be a key issue in achieving this potential. Until then many calls will continue to be referred back to the ambulance service for non-clinical reasons, as illustrated in this study. Attempts are under way to better integrate services, for example an enhanced priority dispatch system which integrates with a Clinical Assessment System allowing better flow of information between systems with a resulting reduction in the amount of questioning needed of callers is already being utilised in the UK. However, the current system of ambulance service, NHS Direct and out-of-hours call-handling systems for the most part remain separate but with referrals to each other. While this system remains there remains the likelihood that some calls, as experienced by respondents to our questionnaire, will be successively transferred through a series of services only to end up back where they started. A properly integrated single emergency care *system* call-handling service would appear to be the logical way forward (Department of Health, 2001b). A recent report by the National Audit Office supported this view and recommended that 'emergency care networks should achieve maximum flexibility in the range of providers to which ambulance services transport or refer patients' (National Audit Office, 2004).

One further consideration is the expectations of the public in terms of what the 999 service will provide. The findings of our study have shown that, although some callers to the 999 service are aware that their call is not an emergency and are happy to receive an alternative service there are others who believe that if they call 999 and request an ambulance one should be sent without delay. The National Audit Office report found a similar view expressed in the survey they conducted among members of the general public, with only 30% of respondents agreeing that being connected to another service such as NHS Direct following a 999 call was acceptable (National Audit Office, 2004). The qualitative study found a degree of frustration among EMDs in handling calls which they did not consider to be emergencies and the alternative service was seen by them to be a real step forward. Thus there are differences in the perceptions of emergency medical personnel and the public about what constitutes an emergency medical condition. This is likely to increase. One of the main sources of dissatisfaction in our study was delays in receiving an ambulance and we have given some consideration to the clinical risk that may result from this response. However, one of the consequences

of removing category C calls from response-time performance standards is that some ambulance services have implemented a policy of providing a response within 1 hour for these calls on the basis of the EMD code assigned. The system we have evaluated added an additional level of assessment which would result in an immediate ambulance response for some of these calls and therefore provided a 'safety net' to ensure that a delayed ambulance response was an appropriate action. Where a response-time standard of 1 hour is employed without this additional assessment then clinical risk is likely to be increased and the consideration of safety becomes more important. It would be interesting to measure user satisfaction with this service change as one of the biggest challenges would appear to be changing public perception and expectations of the service they are likely to receive when they call 999.

9.4 Limitations of the study and research methods

The major limitation to the study was the small study numbers recruited and in particular the low proportion of subjects who were followed up following their 999 call. The lower-than-anticipated number of calls passed for further advice is a valuable finding in a pragmatic study such as this as it provides a more accurate picture of how the service would operate within the health service context and still allowed us to identify significant differences between the intervention and control groups in ambulance-service job cycle times and transports to hospital and pass-back rates between different levels of EMD codes. The poor follow-up rate however has restricted the power of our analysis. We failed to reach our estimated sample size of 1800 callers in each arm of the randomised trial component of the study and so we could make no comparisons between different clinical groups of calls. However, given that a large number of calls were confined to a relatively small number of codes this may be a less important issue than we had originally anticipated. A key outcome measure was satisfaction of users with the new service and despite the small number of respondents to the follow-up questionnaire we have demonstrated a significant difference between the intervention and control groups in overall satisfaction. However, we did not detect differences for more discrete items and cannot know if differences do not exist or if they are not identifiable from the sample we had available to analyse. The relatively small number of follow-up questionnaires did still provide a rich source of data about the views of users of the new and established service.

It was not within the scope of this study to follow all patients through the health care system. We were therefore reliant on the follow-up questionnaires to provide self-reported information on health service use and adverse events. The small number of responses limited the conclusions we were able to reach on safety and the cost-effectiveness of the service.

The smaller-than-anticipated number of cases recruited and successfully followed up has occurred as a result of a number of events, as listed below.

- Overestimates in the research literature and by the services involved about the true number of calls suitable for transfer.
- Changes and restrictions in service provision. During the course of the study operational hours changed a number of times, a move of premises resulted in one service halting the study for almost 5 months and a national change in the organisation of NHS Direct lead to the early exit of another site.
- Constraints set by adhering to ethical requirements limited recruitment to the follow-up component to the study. Service providers were reluctant to ask callers to consent to participate in the study, and with hindsight the ethics and reality of gaining informed consent within the context of a 999 call are debatable. Furthermore, research evidence has shown that the stage at which consent is requested, and indeed if consent is requested at all prior to sending a simple postal questionnaire, has a significant bearing on recruitment and response rates (Nelson *et al.*, 2002). A better method may be to contact callers or patients after the event but under current restrictions the responsibility for contact would still lie with the service providers who do not have the resources or time to fulfil this role. In this study the research team did have these resources and contact of all callers or patients would have been a priority but we could not always be supplied with the personal information that would allow us to carry out this task without the consent of the caller or patient. In particular, two-thirds of the calls included in this study were made by people who were not the patient but ambulance-service data only records patient, not caller, details. The task of requesting caller contact details at the time of the call still fell to service providers and so we seem to be presented with an insoluble problem.

These difficulties highlight the challenges involved in conducting research to evaluate a complex intervention across diverse health care settings. These problems should not be underestimated and even thoroughly planned methodologies need to be able to adapt to rapidly evolving health care delivery systems.

9.5 Recommendations for further research

The study has revealed a number of issues requiring further investigation and research.

- Further development of EMD systems to improve their ability to identify calls suitable for telephone assessment and advice.
- Development of a system for gathering cumulative evidence about the pass-back rates of individual EMD codes transferred for further advice and assessment so that services can make a more

informed choice about which codes to use for referral. This could be a collaborative study with all services using telephone advice as an alternative response for low-priority 999 calls contributing routine data on call outcome.

- More detailed investigation of the factors that influence the nurse's (or other assessor's) decision about whether or not to return a call to the ambulance service so that pass-back rates can be minimised.
- Evaluation of integrated systems as they develop and further investigation of who should provide telephone advice and where.
- Development of a system for measuring and monitoring adverse events that may result from alternative management of category C ambulance calls. This includes all alternatives, for example delayed response, and not just telephone advice.

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Appendices

Appendix 1 Patient Satisfaction Questionnaire, Intervention Group

- Your name and address do not appear on this booklet and the information you give will not be used in any way that could identify you.
- Please complete all the questions as best you can.
- If you called on behalf of someone else please answer the questions with the help of that person.
- Return this form in the envelope provided which does not need a stamp.

Section A The 999 telephone call

1 Who did you make the 999 call to the ambulance service for?

- ☐ yourself
- ☐ a friend or relative
- ☐ a stranger
- ☐ other, please say: _____

2 When the ambulance service answered, what did you think about the *number* of questions they asked you?

- ☐ They asked too many questions.
- ☐ They asked about the right number.
- ☐ They did not ask enough questions.

3 What did you think about the *type* of questions they asked you?

- ☐ All of them seemed relevant.
- ☐ Most of them seemed relevant.
- ☐ Only a few of them seemed relevant.
- ☐ None of them seemed relevant.

4 When the ambulance call-taker offered to transfer you to an NHS Direct nurse adviser for further advice did you accept this offer?

- ☐ yes
- ☐ no

5 If you said YES please tick the reasons for your choice below.

- ☐ I felt that an ambulance was not needed.
- ☐ I was happy to talk to a nurse about my problem.
- ☐ I did not realise that NHS Direct provided this service.

- ☐ I felt that an ambulance was needed but was happy to talk to a nurse first.
- ☐ I have used NHS Direct before and thought it was helpful.
- ☐ Other, please say what: _____

6 If you said NO please tick the reasons for your choice below.

- ☐ I felt that an ambulance was needed.
- ☐ I was not happy to talk to a nurse advisor.
- ☐ I think NHS Direct is not a good service.
- ☐ I would have liked to talk to the nurse but thought this might waste time.
- ☐ Other, please say what: _____

Section B The telephone call with the nurse

1 What advice did the nurse give you? (please tick all that apply)

- ☐ to go to an accident and emergency department by myself
- ☐ to contact a GP *immediately*
- ☐ to contact a GP *in the next 24 hours*
- ☐ to contact a GP *at the next available appointment*
- ☐ to contact someone else at my general practice, e.g. practice nurse
- ☐ to contact a pharmacist
- ☐ to contact someone else, please say who: _____
- ☐ to call back if the health problem got worse or did not improve
- ☐ I was told how to treat it myself
- ☐ my call was transferred back to the 999 ambulance service
- ☐ the nurse contacted another service for me
- ☐ I don't know/can't remember
- ☐ other, please say: _____

2 How helpful was the advice given?

- ☐ very helpful
- ☐ quite helpful
- ☐ not very helpful
- ☐ not helpful at all

If you found the advice VERY HELPFUL or QUITE HELPFUL please say why. (please tick all that apply)

- ☐ I felt reassured and worried less.
- ☐ It helped me to realise that I did not need to contact any services.
- ☐ It helped me to contact the right service.

- ☐ I learned how to deal with the problem myself.
- ☐ I learned how to prevent the problem in future.
- ☐ other, please say: _____

If you found the advice NOT VERY HELPFUL or NOT HELPFUL AT ALL please say why. (please tick all that apply)

- ☐ I did *not* feel reassured and did *not* worry less.
- ☐ It stopped me contacting a service.
- ☐ It did *not* help me to contact the right service.
- ☐ I did *not* learn how to deal with the problem myself.
- ☐ I did *not* learn how to prevent the problem in future.
- ☐ other, please say: _____

3 Did you act on the advice? (please tick one)

- ☐ yes, all of it
- ☐ yes, some of it
- ☐ no

IF NOT, why did you not act upon the advice?

- ☐ I did not agree with the advice.
- ☐ I did not understand the advice.
- ☐ I was unable to act on the advice.
- ☐ other, please say: _____

Section C What happened after you spoke to the nurse?

1 *After* you had called the ambulance service and been referred to NHS Direct did you visit or contact any health service on the *same day for the same problem*? (please tick all that apply)

- ☐ accident and emergency department
- ☐ minor injuries unit
- ☐ GP
- ☐ someone else at your general practice (e.g. practice nurse)
- ☐ dentist
- ☐ ambulance service
- ☐ other, please say: _____

2 After you talked to the NHS Direct nurse, did you seek *another* opinion about what to do *because you were not happy with the advice you had been given by NHS Direct?* (please tick one)

- ☐ yes
- ☐ no

If YES, who did you contact? Please say: _____

3 *Two days* after the call to NHS Direct, how was the problem? (please tick one)

- ☐ completely better
- ☐ improved
- ☐ the same
- ☐ worse

4 During the 7 days after your call to the ambulance service did you visit or contact any health service for the *same problem?* (please tick all that apply)

- ☐ accident and emergency department
- ☐ minor injuries unit
- ☐ GP
- ☐ someone else at your general practice (e.g. practice nurse)
- ☐ dentist
- ☐ ambulance service
- ☐ other, please say: _____

Section D Satisfaction with the call transfer

1 Below are comments showing how people might feel about the service they received. From your experience of the service, please mark the boxes that seem closest to your views. Tick one box on each line.

	Strongly agree	**Agree**	**Not sure**	**Disagree**	**Strongly disagree**	**Does not apply**
a. I think the ambulance service call-taker was helpful	☐	☐	☐	☐	☐	☐
b. I think the NHS Direct nurse was helpful	☐	☐	☐	☐	☐	☐
c. I was given exactly the right amount of advice needed	☐	☐	☐	☐	☐	☐
d. I understood all the advice I was given	☐	☐	☐	☐	☐	☐
e. The advice I was given worked well in practice	☐	☐	☐	☐	☐	☐
f. I was	☐	☐	☐	☐	☐	☐

unhappy with the telephone advice I received						
g. I think it was appropriate to transfer my call to NHS Direct	☐	☐	☐	☐	☐	☐
h. I am satisfied with the information I was given	☐	☐	☐	☐	☐	☐
i. I was given clear advice about where and when to get more help	☐	☐	☐	☐	☐	☐
j. I was generally satisfied with the service	☐	☐	☐	☐	☐	☐
k. I think an ambulance should have been sent	☐	☐	☐	☐	☐	☐
l. I was made to feel I was wasting everyone's time	☐	☐	☐	☐	☐	☐
m. I am completely happy with the call	☐	☐	☐	☐	☐	☐

2a Please describe any things about the service that you were particularly *satisfied* with.

2b Please describe any things about the service that you were particularly *dissatisfied* with.

2c Any other comments about the service.

Section E Some questions about you

1 How old are you ? ___ years old

2 Are you

- male
- female

3 How old were you when you left full-time education?
_____years old

4 At home, do you have the use of a car?

- yes
- no

5 At home, do you have the use of a telephone?

- yes
- no

If you rang on behalf of someone else:

6 How old are they? ___ years old

7 Are they

- male
- female

Thank you for your help.

Please return this form in the envelope provided, no stamp is required.

Appendix 2 Patient Satisfaction Questionnaire, Control Group

- Your name and address do not appear on this booklet and the information you give will not be used in any way that could identify you.
- Please complete all the questions as best you can.
- If you called on behalf of someone else please answer the questions with the help of that person.
- Return this form in the envelope provided which does not need a stamp.

Section A The 999 telephone call

1 Who did you make the 999 call to the ambulance service for?

- ☐ yourself
- ☐ a friend or relative
- ☐ a stranger
- ☐ other, please say: _____

2 When the ambulance service answered, what did you think about the *number* of questions they asked you?

- ☐ They asked too many questions.
- ☐ They asked about the right number.
- ☐ They did not ask enough questions.

3 What did you think about the *type* of questions they asked you?

- ☐ All of them seemed relevant.
- ☐ Most of them seemed relevant.
- ☐ Only a few of them seemed relevant.
- ☐ None of them seemed relevant.

4 If the ambulance call-taker had offered to transfer you to an NHS Direct nurse for further advice instead of sending an ambulance, would you have accepted this offer?

- ☐ yes
- ☐ no

5 Please tick the reasons for your choice of answer to question 4.

- ☐ I felt that an ambulance was needed.
- ☐ I would have been happy to have talked to an NHS Direct nurse.
- ☐ I did not realise that NHS Direct provided nurse advice.
- ☐ I would not have been happy to talk to an NHS Direct nurse.
- ☐ None of the above.

Section B The ambulance crew

1 When the ambulance crew arrived and assessed you, did they… (please tick all that apply)

- ☐ take you to the accident and emergency department?
- ☐ take you to the minor injuries unit?
- ☐ take you directly to a ward or other hospital department?
- ☐ contact your GP or some other service to see you at home?
- ☐ advise you to go to the minor injuries unit yourself?
- ☐ advise you to contact your GP instead of going to accident and emergency?
- ☐ give you treatment and leave you at home?
- ☐ advise you to contact someone else? Please say who:

  _____
- ☐ advise you to contact your dentist instead of going to accident and emergency?
- ☐ give you other advice? Please say what:

  _____

2 If you were taken to an accident and emergency department or minor injuries unit were you…

discharged without treatment?

- ☐ yes
- ☐ no

treated and discharged?

- ☐ yes
- ☐ no

or, treated and admitted to hospital?

- ☐ yes
- ☐ no

Section C What happened in the days following your 999 call?

1 *Two days* after the call to the ambulance service, how was the problem? Please tick one

- ☐ completely better
- ☐ improved
- ☐ the same
- ☐ worse

2 During the 7 days after your call to the ambulance service did you visit or contact any health service for the *same problem?* (please tick all that apply)

- ☐ accident and emergency department

- ☐ minor injuries unit
- ☐ GP
- ☐ someone else at your general practice (e.g. practice nurse)
- ☐ dentist
- ☐ ambulance service
- ☐ you were a patient in hospital
- ☐ other, please say: _____

Section D Satisfaction with the 999 service

Below are comments showing how people might feel about the service they received. From your experience of the service, please mark the boxes that seem closest to your views. Tick one box on each line.

1 These comments are about the telephone call you made to the ambulance service when you dialled 999.

	Strongly agree	**Agree**	**Not sure**	**Disagree**	**Strongly disagree**	**Does not apply**
a. I think the ambulance service call-taker was helpful	☐	☐	☐	☐	☐	☐
b. I was given exactly the right amount of advice needed	☐	☐	☐	☐	☐	☐
c. I was generally satisfied with the 999 call service	☐	☐	☐	☐	☐	☐
d. I would have liked advice about alternatives to an ambulance	☐	☐	☐	☐	☐	☐
e. I would have preferred to have been passed to a nurse for some advice rather than an ambulance being sent	☐	☐	☐	☐	☐	☐
f. I was made to feel I was wasting	☐	☐	☐	☐	☐	☐

everyone's time

g. I am completely happy with the service	☐	☐	☐	☐	☐	☐

2 These comments are about when the ambulance crew arrived.

	Strongly agree	**Agree**	**Not sure**	**Disagree**	**Strongly disagree**	**Does not apply**
a. I think the ambulance crew were efficient	☐	☐	☐	☐	☐	☐
b. I was given exactly the right amount of advice needed	☐	☐	☐	☐	☐	☐
c. I understood all the advice I was given by the ambulance crew	☐	☐	☐	☐	☐	☐
d. I was unhappy with the advice from the ambulance crew	☐	☐	☐	☐	☐	☐
e I think it would have been appropriate to give me more advice rather than take me to accident and emergency	☐	☐	☐	☐	☐	☐
f. I was generally satisfied with the ambulance crew service	☐	☐	☐	☐	☐	☐
g. I was made to feel I was wasting everyone's time	☐	☐	☐	☐	☐	☐
h. I am completely happy with the service	☐	☐	☐	☐	☐	☐

3a Please describe any things about the service that you were particularly *satisfied* with.

3b Please describe any things about the service that you were particularly *dissatisfied* with.

3c Any other comments about the service.

Section E Some questions about you

These questions will help us to know the kinds of people who have called NHS Direct.

1 How old are you ? ___ years old

2 Are you

- male
- female

3 How old were you when you left full-time education? _____years old

4 At home, do you have the use of a car?

- yes
- no

5. At home, do you have the use of a telephone?

- yes
- no

If you rang on behalf of someone else:

6 How old are they? ___ years old

7 Are they

- male
- female

Thank you for your help.

Please return this form in the envelope provided, no stamp is required.

Appendix 3 Interview schedule

Introduction to interview and exploratory questions

The trial started in _____, although preparation and training started before this date.

What do you know/understand about the trial?

What do you know/understand about non-urgent 999 calls and telephone advice?

(national and local policy and practice)

What input has your organisation had?

What specific input/involvement have you had?

What differences have you noticed since the introduction of the trial?

For staff; management; overall?

What practical changes were made before and during the trial to accommodate it?

What were the problems and how were/could they be overcome? What were the good points?

What are your views on the service? Is it a good thing or a bad thing? How could it be done differently?

If this were to become standard practice how would the change be planned for; what would you require? (capacity planning)

As a result of participating in this trial, will your service take anything on board for the future? How will it be going forward from this point?

Apart from trial, has anything else been going on that might have had an impact? (service/organisational changes)

For call-takers/front-line staff

What has been your experience of the trial, how have you found it?

How did it change your daily work?

How did it affect the service you provide overall?

What were you told about it beforehand/during?

Did you receive any specific training?

What other practical issues need to be taken into consideration?

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Addendum

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