NAO
NATIONAL AUDIT OFFICE

Report by the
Comptroller and Auditor General

The National Health Service in Scotland

The Scottish Ambulance Service: A Service for Life

SE/1999/54
Published 8 December 1999

Report by the
Comptroller and Auditor General

The National Health Service
in Scotland

The Scottish Ambulance Service: A Service for Life

Laid before the
Scottish Parliament by
Scottish Ministers
6 December 1999

EDINBURGH: The Stationery Office
£0.00

SE/1999/54
Published 8 December 1999

This report has been prepared under Section 6 of the National Audit Act 1983 for presentation to the Scottish Parliament in accordance with Section 9 of the Act and with Section 121 of the Scotland Act 1998.

John Bourn
Comptroller and Auditor General

National Audit Office
3 December 1999

The Comptroller and Auditor General is the head of the National Audit Office employing some 750 staff. He, and the National Audit Office, are totally independent of Government. He certifies the accounts of all Government Departments and a wide range of other public sector bodies; and he has statutory authority to report to Parliament on the economy, efficiency and effectiveness with which departments and other bodies have used their resources.

The Scotland Act 1998 provides for the appointment of an Auditor General for Scotland on the nomination of the Scottish Parliament. In due course the Auditor General for Scotland will become responsible for the commissioning of financial and value for money audits across much of the public sector in Scotland, and reporting the results to the Scottish Parliament. This report has been prepared and presented to the Scottish Parliament under arrangements for the transitional financial year for the Scottish Parliament ending 31 March 2000.

For further information about the National Audit Office please contact:

National Audit Office
Press Office
157-197 Buckingham Palace Road
Victoria
SWIW 9SP

Tel: 0171-798 7400

National Audit Office
22 Melville Street
Edinburgh
EH3 7NS

Tel: 0131-244 2720

email: nao@gtnet.gov.uk

Web site address: http://www.open.gov.uk/nao/home.htm

Contents

Executive summary

Introduction

1 In this report we examine the achievements and performance of the emergency ambulance service of the Scottish Ambulance Service (the Service). In Part 1 we detail the Service's role and how in serving patients they work in partnership with other agencies of the NHS in Scotland. In the rest of the report we consider:

- The speed and responsiveness of the emergency ambulance service (Part 2)
- Economic and efficient use of resources (Part 3)
- Providing effective pre-hospital emergency care i.e. clinical aspects (Part 4)

2 Our main recommendations for the emergency ambulance service are at the end of this summary.

The role and objectives of the Scottish Ambulance Service (Part 1)

3 The Service are responsible for ambulance services across Scotland, at a total cost of some £86 million in 1998-99. This is a small proportion (two per cent) of the NHS in Scotland's total costs of some £4.6 billion that year. But the Service's role of providing a service to patients and supporting other health professionals across Scotland means their activity can have wider impacts on other NHS expenditure.

4 In 1998-99 the accident and emergency service cost £67 million, nearly four-fifths of the Service's total costs. Accident and emergency ambulance crews provide pre-hospital clinical care, in some cases advanced life support, whilst transporting patients to hospital accident and emergency departments and acute wards. Most of the work arises from 999 calls made by the public, which require an immediate response. The same teams also respond to general practitioners who request urgent rather than immediate transport of patients to hospital. The Service's 1,720 front line staff and 451 emergency ambulances dedicated to this work made 487,000 emergency and urgent ambulance responses in 1998-99 (Figure 1).

Figure 1

Scottish Ambulance Service - Emergency service main resources and activities 1998-99

People

54 managers and support staff
187 control room staff
574 paramedics, including trainers
1,146 technicians
90 auxiliaries and contract staff

Vehicles

451 emergency ambulances
6 air ambulances, plus access to Ministry of Defence and coastguard craft
Other specialist vehicles and rapid response units

Buildings

Edinburgh Service head-quarters
8 control centres
6 divisional offices (10 before April 1999)
152 ambulance stations
1 ambulance training college

Equipment

Radios for communication
Stretchers for moving people
Defibrillators for cardiac arrest
Oxygen and oxygen masks
Drugs for pain relief
Maternity packs
Infectious disease packs
Rescue tools

Activities

Total 487,000 pre-hospital emergency care cases, ranging from calming and reassurance only, basic ambulance aid and use of advanced care skills and including serious incident responses including:

- 277,000 999 emergency transport cases
- 193,000 general practitioner requested urgent transport cases
- 17,000 hospital doctor requested inter-hospital transport and intensive and critical care transfers
- 2,500 emergency air transport cases

Plus: Emergency incident planning, including participation in simulation exercises
Emergency care training, for new paramedics, technicians and other staff, plus continuing professional development for existing staff, and the training of ambulance and emergency care staff from elsewhere
Other health promoting work - e.g., accident prevention

Note: This Figure is illustrative of the Service's main resources and activities, not a comprehensive list

Source: National Audit Office

5 Important changes affecting the Service in the 1990s include a greater emphasis on their contribution to clinical care, and administrative and management changes including establishment of the Service as a Special Health Board in April 1999 (Appendix 1 details the Service's organisation, management and responsibilities). There has also been growing demand for emergency ambulances, with 15 per cent more responses now compared to 1994-95 including 28 per cent more 999 responses[1]. Partly the Service have met the

1 Demand from doctors' urgent calls, about 40 per cent of current emergency ambulance work, has hardly changed since 1994-95.

increased demand through improved management and productivity but they have also received more resources. In real terms they received 11 per cent more resources in 1998-99 than in 1994-95, including 18 per cent more for the emergency service with specific extra funding for various operational and patient care improvements.

6 Appendix 2 summarises our methodology, including a range of work completed jointly with the Service and comparisons made with other ambulance services in Britain. We also consulted and undertook research amongst healthcare professionals, other NHS staff, patients and patient representatives in Scotland to gain their views on the performance and development of the Service.

7 The main exclusion from this report is the Service's non-emergency patient transport service, which is responsible for some 2.4 million patient journeys a year and represents some one fifth of the Service's expenditure. These journeys include both high dependency and more routine patient transfers where there is a greater degree of pre-planning possible. The challenges and issues that this service must address are distinctively different from those of the emergency service. In early 1999 the Service announced a fundamental review of their patient transport services, which is due for completion during 2001.

Providing a rapid and responsive emergency service (Part 2)

8 An ambulance service must respond rapidly to people who need emergency medical help. In Part 2 of this report we present our analysis of the Service's performance in responding quickly to 999 calls and to general practitioners' urgent calls for patient transfer to hospital.

Response times are slower than target in some areas

9 The Service answer 999 telephone calls made to them on average within 10 seconds. Thereafter, the speed with which emergency ambulances arrive at the scene of each incident, against the increase in demand of 28 per cent over the last five years, has remained largely constant. In more than half of cases an ambulance crew is on scene within 10 minutes and in 95 per cent of cases they attend within 19 minutes. In response to general practitioners' urgent calls where demand has remained constant, the Service transport over 90 per cent of patients to hospital within the required time. For most areas of Scotland response times compare reasonably with those that other ambulance services in Britain achieve.

10 However, while there are high performing ambulance services in parts of Scotland, other parts are not achieving the required response targets. Ambulances do not meet their response time targets not only in the more remote, sparsely populated areas, where ambulance stations are necessarily fewer, but also in the busy, populous areas of Scotland such as Glasgow and Lothian.

11 Performance against the response time target reveals the greatest scope for improvement in Glasgow. Here only about one in three ambulances reaches the scene of a 999 incident within seven minutes, against a target of one in two. However the Service have taken a range of actions to secure improved response times in Glasgow, and these are starting to show some evidence of improvement. It is also important to recognise that the 443 responses a year that on average each front line ambulance crew member in Glasgow makes is amongst the highest workload of any ambulance service in Britain.

12 The most common causes for long response times appear to be temporary peaks in demand which exceed the ambulance resources available at the time and, in more remote areas, travelling distances. However there is a complex balance between demand, responsiveness and ambulance resources, and it is not simply a question of increasing resources to improve responsiveness. We discuss this balance and the related question of operational efficiency below and in Part 3.

The Service need to address how they can better match emergency ambulance responses to health needs

13 An important aspect of responsiveness is how well ambulance services can react to how ill a patient is. Priority dispatch is a relatively new approach by which emergency ambulances respond to calls according to their relative urgency in order to improve response times to the most seriously ill patients and ultimately save more lives. (Appendix 3 gives further details.) Although many ambulance services in England are introducing priority dispatch for universal adoption there by 2001, in Scotland there is no decision about whether to move away from the existing system of ambulances responding to patients on a first come, first served basis, regardless of how ill they are.

14 We completed a joint clinical audit project with the Service categorising the needs and pre-hospital care of a large sample of patients (4,460) transported by ambulance in Scotland during one week in November 1997. This research confirmed that, in Scotland, how ill a patient is does not affect how quickly an ambulance arrives, nor subsequently to any great extent how quickly the patient reaches hospital.

15 Our work showed that patients who turn out to have no or only minor injuries may account for one third of all 999 ambulance responses and still benefit from rapid response and pre-hospital times (average nine and 32 minutes respectively). This does not imply that no such patients require an ambulance, because cases which involve no or only minor injury include those where it is necessary for a doctor in hospital to make a diagnosis, and it is better to be safe than sorry. However many calls in this category, albeit they are genuine calls for help meriting some form of response, clearly do not justify the same priority as a life-threatening emergency. Giving these less urgent calls the same priority as more serious cases means that some very ill and moderately ill patients who would benefit more from early treatment wait longer before an ambulance can attend.

16 Our survey research about the Service amongst healthcare professionals, other NHS staff and patient representatives showed that over 90 per cent of these users support the concept of the Service moving towards priority dispatch provided, as should be possible, the Service manage the risks of implementation effectively. It is therefore important for the Service and the Scottish Executive Health Department to determine, in consultation with the other areas of the NHS affected, whether and how best to take forward implementation of any new system.

17 While these findings suggest that there is a good case for the Service to consider a different approach to emergency ambulance deployment such as priority dispatch, there is also a need for caution. Re-designing ambulance response systems carries risk and may be costly. It needs to be clear, therefore, that priority dispatch will in practice permit faster ambulance responses to the more serious incidents and will command the confidence of patients and the rest of the NHS. It is also important to recognise that implementing a full priority based dispatch system that does not result in a slower response than present to the least serious incidents may be difficult unless extra ambulance resources are provided.

The economic and efficient use of resources (Part 3)

18 An ambulance provider needs to ensure that they are responding efficiently to need for their service and controlling cost. In Part 3 of this report we review the costs of the emergency ambulance service, including comparisons with other services in Britain, and examine how far the Service make the best use of available resources in areas such as vehicle deployment and managing crew time.

The Service have controlled core resource costs

19 Although total resources for emergency ambulance work have increased by 18 per cent in real terms since 1994-95, including significant investment in infrastructure such as new radio systems, activity and productivity have also increased. The net result is that the average cost of each emergency and urgent response that the Service make has increased by only two per cent in real terms in the same period. The Service's average cost for each such response is similar to or lower than that of other ambulance services in Britain taking into account differences in population density. The Service's management costs are lower than other ambulance services in England incur, while the Service have introduced employment terms for crews which encourage flexible working and are competitive. The Service have market tested key business areas.

There is potential to improve the efficient management of available emergency ambulance resources

20 The operational efficiency of an emergency ambulance service is concerned with two main issues: arranging ambulance resources to best match varying and difficult to predict demand levels; and ensuring that each ambulance minimises the time taken to deal with each incident.

21 There is scope for more systematic review of ambulance crew shift rosters and vehicle deployment at station level in order to achieve a more effective balance between responding to demand and keeping within available resources. Some ambulance stations appear better resourced than others relative to demand, and vehicles at some stations spend a high proportion of time working away from their normal area. These are matters that the Service should keep under regular review. However stations with most ambulances compared to demand do not necessarily have the shortest average response times. So while it is important to keep the balance between ambulance resources and demand under regular review to ensure economy and cost effectiveness, doing so will not necessarily help the Service improve response times greatly unless they operate efficiently in other areas too.

22 In aiming to maintain and improve response times the Service must minimise the whole time to deal with each 999 and doctors' urgent incident from start to finish – the incident service time. (This is different to the response time, which measures only the time taken from the initial call to an ambulance arriving at an incident.) The more quickly ambulances can reach patients and respond to and satisfy patients' needs, the sooner each crew is available for further work. Especially at the busiest stations, where managers often task crews with the next

job as soon as they complete the previous one, reducing the time taken to deal with each call means each crew can deal with more cases in each shift. Consequently, there will also be fewer times when a 999 response is delayed because no ambulance is immediately available.

23 In aiming to reduce service time, for example by reducing the time crews take to hand over patients in a busy hospital emergency department, the Service need to ensure that they will not compromise patient care. The Service have already taken initiatives to improve service time including the use of new technology to enhance control of crew and vehicle resources. But they recognise that a more systematic approach and improved information may help them to manage incident time and other aspects of their operations more efficiently.

Providing effective pre-hospital emergency care (Part 4)

24 In Part 4 of this report we examine how the emergency ambulance service can best ensure that they meet the clinical needs of patients for whom they care.

25 The Service are far more than an emergency transport provider. In emergency cases they often provide the first link in the NHS's chain of patient care. Ambulance crews can save lives or provide early care with very significant clinical benefits for the patient, and they can help to avoid or reduce the need for subsequent more complex treatments in hospital or elsewhere, to the benefit of both patients and the NHS.

The Service need to strengthen their clinical direction and development

26 The main procedures that the Service operate to ensure effective pre-hospital emergency care include professional clinical leadership and decision making, mandatory professional training and qualification of frontline crews and written clinical protocols. These are important means to ensure that the Service achieve satisfactory standards of patient care. But there are some shortcomings in other areas that suggest that stronger leadership is needed to increase the confidence about the clinical care that the Service provide.

27 Important components of ambulance clinical care are targeting care towards areas that provide the greatest benefit to patients, and providing healthcare which is in line with professionally recognised standards and which results in measurable benefits for patients. The Service need to establish clearer

objectives and priorities in these areas. Also the Service could do more to learn from good practice in monitoring clinical quality and there is scope to improve the availability and use of clinical information to support effective patient care.

28 As a newly established Special Health Board, the Service are now completing their first Health Improvement Programme. This is an opportunity to improve their direction of clinical matters and to set clearer objectives and priorities concerning health gain, based on assessment of clinical need. It will also provide a means to assist necessary consultation with patients and the rest of the NHS.

Crew quality of service appears good

29 Our research amongst patients and NHS staff shows that they are mostly very satisfied with the quality of service that emergency ambulance crews give. While praising crew skills and care, NHS staff see scope to develop aspects of the emergency ambulance service, to improve the quality of care provided. Opportunities to improve quality of service include minimising pre-hospital time, partnership working and a customer oriented approach, and improving knowledge about the Service's clinical impact. NHS staff also emphasised the need for the Service to improve clinical audit and monitoring clinical quality.

Opportunities for service improvement

30 Our main recommendations for the Service and the Scottish Executive Health Department resulting from our value for money examination of the Service are set out below. The Service should take the lead in involving their health partners in necessary decisions regarding the ambulance service. Health partners include other Health Boards, primary and secondary care providers and patient groups.

The Service should improve how they address the clinical and health issues underlying their work

1a) The NHS seek to improve the quality of patient care provided at all levels. The Scottish Ambulance Service save lives and provide other clinical benefits for patients but it is not clear that they are directing their work to have the greatest possible impact. To help them to do so we recommend that the Service should now address the following clinical development priorities:

- Consult with health service partners and clarify and agree reasonable expectations governing the Service's role and contribution to pre-hospital emergency care.

- Organise improvements in clinical information about ambulance patients, and provide initial care needs assessment/base line planning data.

- Prioritise the most important health needs of ambulance patients, and how the Service can have the most beneficial impact on these needs.

- Build on the foundation of the Service's existing clinical protocols so that they continue to evolve and promote clinically effective pre-hospital emergency care procedures. For example, review the protocols to assess the need for increasing their evidence base.

- Develop clinical audit and clinical quality monitoring, and provide assurance that emergency crews are doing a good job.

1b) To equip better the Service to meet the Government's goal for high quality care and effective clinical practice the Service and the Scottish Executive should increase external representation on the Service's clinical governance committee and/or Board. The Service already receives advice on clinical matters from other health professionals such as the national professional advisory group and local paramedic steering committees but there is a need to improve external representation further. In particular, other Health Board experiences in areas such as needs assessment, partnership working and use of health information could help the Service to develop and implement an effective health improvement programme, and otherwise foster their new role as a Special Health Board.

1c) The full impact of the Service's work can only be demonstrated by tracking the complete patient care pathway. For example access to hospital patient care and outcome information is required to measure cardiac arrest successes and other ambulance healthcare outcomes. In developing their clinical role the Service should therefore continue to promote and extend partnership working with other health care providers in primary and secondary care.

The Service and the Scottish Executive should act urgently to consider whether and how far to introduce ambulance deployment systems which give greater priority to life threatening emergencies

2a) The Service are not achieving all response time targets, and against these there are serious problems in Glasgow and room for improvement in other urban and rural parts of Scotland. However, while faster ambulance responses to the most seriously ill patients are likely to produce health gains including more lives saved, they would not be so beneficial for a third of patients who have only minor or no injury.

2b) Compared to the existing system of ambulances responding to patients more or less on a first come, first served basis, dispatching ambulances according to each call's clinical priority offers the prospect of efficiency in resource use combined with improving health gain and ultimately of saving more lives. The Service have been considering the option of a new deployment system based on priority for several years, and resolving this issue now is an important factor in determining their further development. It is only realistic to set longer-term goals for improving ambulance response times as we recommend below by first deciding the basis by which ambulances are to be deployed.

2c) Implementing a new ambulance deployment system based on priority will present complex challenges and new costs. The main issues to resolve include:

- What specific benefits priority dispatch is likely to secure, quantified in terms of both improvements in response times to more seriously ill patients and measurable improvements in health outcomes.
- What, if any, additional resources are required to secure these improvements, and whether they are commensurate with the benefits obtained.
- The potential risks and costs of not moving towards a system of priority dispatch.
- How best to categorise the seriousness of incidents under priority dispatch, and response time targets for each level of categorisation.
- For 999 calls which may be categorised as low priority for an emergency response, the other health care options available and how members of the public may best access these. How to address any concerns the public may have on this aspect.

- How to manage the risk of "under prioritisation", when based on the information received, control centre staff would assess a patient's condition to be less serious than it really is.

- The need for publicity and information on the reasons for priority dispatch and the health care options available when a caller dials 999.

2d) In framing proposals for any change, the Service should consult with their health care partners.

In other ways the Service should target improved responsiveness to provide the greatest benefit and impact

3a) In order to maximise their impact the Service should set goals and targets that correspond to real and specific health needs that they should aim to satisfy through improved responsiveness. They should do so as part of the process of developing and implementing a health improvement programme now required of them as a Special Health Board, and to inform goals and targets the Service should obtain wider NHS and patients' views.

3b) In Glasgow slow response times coincide with a large population that has a poor health record[2]. Issues where the Service can contribute to health gain in Glasgow include heart disease, strokes and dealing with the consequences of mental health emergencies such as suicide and drug overdose. The Service should work with Greater Glasgow Health Board to assess the specific health risks of not meeting existing ambulance response targets in Glasgow. The Service should set specific targets for improved response times linked to these needs, and taking account of their decision whether to implement a new ambulance deployment system based on priority.

3c) In more remote areas of Scotland where ambulance response times are unavoidably long, the Service should develop further alternative approaches which place emphasis on greater collaboration with other local health care providers and community support. By building on existing collaborative work the Services' aim should be to secure with other providers an emergency care service which best meets the immediate care needs of rural populations.

2 For example, see the Annual reports of the Director of Public Health for Greater Glasgow Health Board 1994-95 to 1996-97 and 1998.

3d) The recent Arbuthnott report anticipates changes in the distribution of NHS resources across Scotland to achieve greater equity and to reflect better variations in health needs[3]. There are substantial differences in the resources available to the emergency ambulance service in different parts of Scotland[4]. Accordingly, with other Health Boards, the Service should aim to allocate their resources so as to achieve most health gain overall.

The Service should improve the planning and deployment of operational ambulance resources.

4a) There is potential to improve the management of available resources to provide better Service responsiveness. The Service should review existing practice regarding the disposition and deployment of emergency ambulances. They should confirm what is best practice, and identify where gaps against best practice occur and priority areas to implement changes. Specific opportunities which offer potential for the Service to consider a more systematic approach include:

- Review and reconfigure as required establishment and shift patterns at stations where many ambulances work outside their normal areas of operation.
- Use specialised operational research techniques already available in the Service to review resources and deployment at individual locations on a more frequent, systematic and deliberate basis.
- Set targets and monitor positively all aspects of incident service time, so as to promote overall productivity.
- Improve exception reporting and analysis when long response times occur, and act to resolve any problems highlighted.

4b) The Service should undertake as soon as possible a fundamental review of the existing eight separate control centres to establish whether improvements in effectiveness and economies in provision through reduced numbers could be achieved. Control centres are the first points of contact between the Service and those who need emergency medical help, yet there is little or no evidence that eight separate centres foster the most economic, efficient or effective service. Control centres will have an increased role to play if the Service develop towards

3 *Fair Shares For All* Report of the National Review of Resource Allocation for the NHS in Scotland, chaired by Professor Sir John Arbuthnott, the Scottish Executive Health Department, July 1999

4 See Part 3 of this Report

implementing some degree of priority dispatch, and may face other challenges from wider NHS initiatives such as NHS Direct[5]. We note that the Service are committed to review the number, role and purpose of their control centres by March 2000.

The Service and the Scottish Executive should set and monitor new performance measures to focus the development of the Service, including resource efficiency and healthcare impact

5a) As part of our work we co-operated with the Service to explore the scope for enhanced performance measures. We have already reported directly to the Service our conclusions that there are some important potential gaps in the coverage that the Service's performance measures presently provide. The Service should implement enhanced performance measures, to help the overall direction of the Service and to improve management of resources and accountability.

5b) As a newly established Special Health Board from April 1999, the Service's Health Improvement Programme and corporate contract with the Scottish Executive Department of Health provide the basis for new and better performance measures, including measures of health outcome.

5c) We recommend that, in developing and agreeing new performance measures, the Scottish Executive and the Service aim to:

- Select measures indicating the contribution the Service makes to healthcare improvement as well as responsiveness and resource efficiency.
- Look at new targets for (i) response times to seriously ill patients and (ii) total pre-hospital time.
- Improve measures in the area of vehicle and crew deployment.

5 The Government announced details of NHS Direct Scotland in March 1999. In brief it is a two-year £2.5 million investment in primary care to pilot the expansion of existing general practitioner out-of-hours services to include 24-hour access for patients to health advice from trained nurses. The pilot arrangements aim to encourage Primary Care Trusts and general practitioner co-operatives to explore the potential for nurse provided advice/triaging including 24 hour telephone advice lines. These would help patients who have worries about their health but which may not be serious enough for a GP visit. The pilot also aims to foster better links between general practitioner out-of-hours services, out-of-hours social work services, and hospital accident and emergency services. Once developed the new services may also provide a better response to 999 callers who do not require the immediate dispatch of an ambulance.

- Improve measures in the area of crew productivity, including incident service time.

- Improve measures in the area of control room performance.

Part 1: The role and objectives of the Scottish Ambulance Service

1.1 This part of our report summarises the Service's objectives and position within the NHS in Scotland, and recent changes affecting the Service including continued growth in resources and demand for the emergency ambulance service. We describe the scope of our work and summarise our methodology.

The Service work in partnership with other agencies of the NHS in Scotland

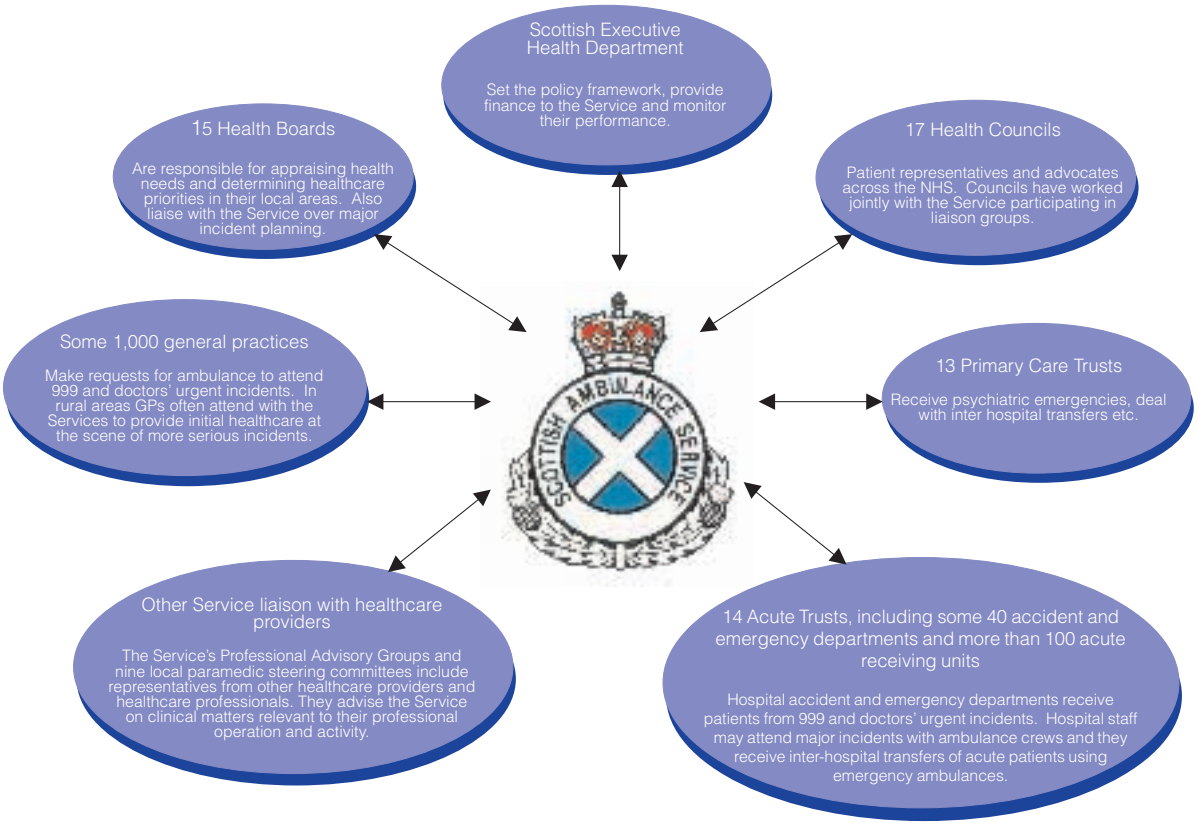
1.2 The Scottish Ambulance Service (the Service) have responsibility for ambulance services across Scotland, at a cost of some £86 million in 1998-99. While this is a small proportion of the NHS in Scotland's total costs of some £4.6 billion that year, the Service play an essential role complementing particularly hospital and community based healthcare across Scotland.

1.3 The Service's role is to provide a service to patients and to support other health professionals. As an emergency healthcare provider the Service provide early pre-hospital care, in some cases advanced life support, whilst transporting patients to hospital accident and emergency departments and acute wards. As a non-emergency transport provider, the Service transports patients to and from hospital appointments including geriatric day patients and patients being admitted to or discharged from hospital. Partnership working to provide as far as possible seamless care to patients is thus fundamental to how the Service interact with other agencies in the NHS (Figure 2).

1.4 In summary, the stated purpose of the Service has remained since 1995: "To provide Scotland with a national ambulance service by delivering and supporting comprehensive accident and emergency services; non-emergency patient transport services; other associated services to the ultimate benefit of patients" (Appendix 1 details the Service's current "Mission, Core Purpose and Key Corporate Objectives").

Figure 2

Links between the emergency ambulance service and other NHS providers in Scotland



Note: In addition to the 14 acute trusts and 13 primary care trusts there is one integrated trust in Scotland.

Source: National Audit Office

Many patients of the NHS in Scotland rely on the Service for aspects of emergency and non-emergency healthcare

1.5 The Service have some 1,720 front line staff and 451 emergency ambulances dedicated to accident and emergency work. They made some 487,000 emergency and urgent ambulance responses in 1998-99 at a cost of £67 million (approximately 78 per cent of total costs in the year).

1.6 The Service's accident and emergency teams provide crucial often life saving transport and pre-hospital patient care. Most of the work arises from 999 calls, mainly from members of the public, and in most cases the Service respond and are on the scene within ten minutes. The same teams must also respond to general practitioners and hospital medical staff who, separately from 999 cases, may also request urgent rather than immediate transport of patients to hospital.

For example, a general practitioner may see a patient at home at 11.00 a.m. and request that the Service transport the patient to hospital for further treatment by 12.30 p.m. In almost 90 per cent of these urgent call cases, the Service respond in less than two hours.

1.7 The Service's non-emergency patient transport service teams are responsible for patient transport in more routine, pre-planned cases. They provide more than 2.4 million non-emergency patient transport journeys a year for people who travel to day hospitals and are having outpatient or elective treatment. While this is many more patients than the accident and emergency service treat, the costs of the non-emergency patient transport service are much lower, some £16 million in 1998-99.

1.8 Our report does not include the non-emergency patient transport service. The challenges and issues that this service must address are distinctively different from those of the emergency service. In early 1999 the Service announced a fundamental review of their patient transport services, which they expect to complete during 2001.

The accountability of the Service has changed with the abolition of the NHS internal market

1.9 Under the internal market, which operated within the NHS between 1993 and 1998, the Service were established as an NHS Trust from 1995. They fulfilled a service provider role under some 70 separate contracts for ambulance services negotiated annually with each Health Board and Trust across Scotland. These contracts generated almost all the Service's income each year.

1.10 The White Paper "Designed to Care" published in December 1997 included Government proposals to reduce bureaucracy and management costs by abolishing the internal market in the NHS. One of the proposals outlined in the White Paper was to change the status of the Service to become a Special Health Board, thereby strengthening accountability to the then Scottish Office Department of Health (now the Scottish Executive Health Department). Under previous arrangements the Service negotiated annual contracts with each of some 70 Trusts, Health Boards and other NHS units in Scotland and there was a danger that the Service would not operate fully effectively as a national service without simplifying these arrangements.

1.11 A consultation exercise[6] subsequently confirmed the proposal and the Scottish Ambulance Service Special Health Board came into effect in April 1999. The expected benefits of Special Health Board status and a single operating contract included:

- The Service's increased ability to influence strategic change and the allocation of ambulance resources in such a way so as to address issues of assessed need and equity of care.
- Reduced bureaucracy, although it was recognised that the Service would still need to work closely with Health Boards and others so as to contribute effectively to local plans for health improvements.
- Enhanced status for the Service in relation to other Health Boards thereby ensuring that reviews of hospital services adequately take into account the effect on ambulance services.
- Clearer and simpler focus for accountability, with the Service accountable to one body, the Scottish Executive, for the level and quality of service provided.

1.12 As a consequence of Health Board status, the contract with the Scottish Executive now requires the Service to prepare a Health Improvement Programme. This is a relatively new NHS health planning process through which the Service are required to set out their health strategy and aims and to demonstrate a collaborative approach to service planning, in consultation with other NHS organisations, general practitioners, patients and others. The Service are currently developing their first such programme.

There has been rising demand for, and increasing resources, applied to the Service in Scotland

1.13 The volume of 999 and doctors' urgent responses are the main measures of the Service's emergency service activity. Consistent with increasing NHS activity overall, demand for emergency ambulances in Scotland rose by 15 per cent over

6 *The Scottish Ambulance Service NHS Trust:* Consultation paper issued by the Common Services Agency for the NHS in Scotland July 1998

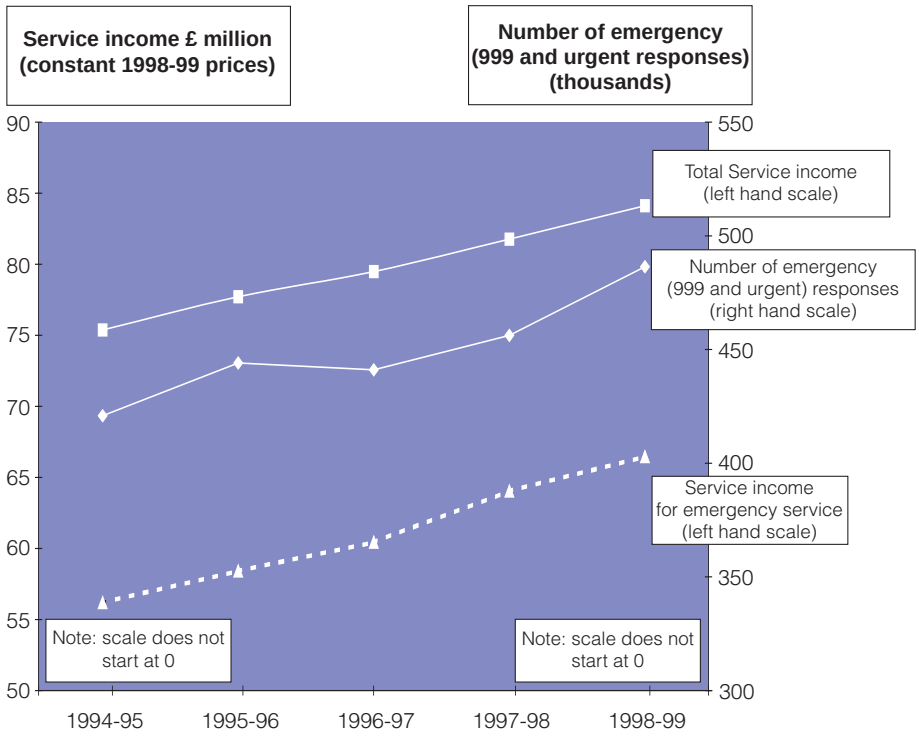
the five years since 1994-95. This increase in demand reflected no significant change in the number of doctors' urgent responses but a 28 per cent increase in 999 calls.

1.14 Resources for the Service have grown substantially in the same period with increases mainly linked to specific initiatives such as investment in new radio systems and the elimination of single crewing of emergency ambulances. Income from contracts with Health Boards for the delivery of emergency ambulance services was some £67 million in 1998-99 out of a total income of £86 million. The Service's total income has risen 11 per cent in real terms since 1994-95 whilst income from the provision of emergency services has risen by 18 per cent over the same period (Figure 3). This is in contrast to real growth of five per cent in the overall Scottish NHS programme in the same period. The net effect of increased activity and extra resources is that the average cost per emergency response rose by only two per cent in real terms between 1995 and 1999, from £134 to £137.

The Service's income and emergency ambulance service activity since 1994-95

Figure 3

This Figure shows that since 1994-95 there has been a substantial increase in the resources available to the Service in real terms, corresponding to an increase in emergency ambulance activity in the same period



Source: National Audit Office

Since 1991 there has been major change affecting the Service

1.15 Since 1991 the Service have implemented changes in their internal organisation and management. They have also introduced changes in the operational practices and procedures with the objective of improving overall their effectiveness and the quality of care and service provided to patients (Figure 4).

Figure 4

Main changes affecting the Service in the 1990s

Changes in organisations and management of the Service

1990-91	**New leadership and organisation**	The Scottish Office undertake a strategic review of the Service. They appoint a new general manager for the Service in January 1991 to oversee the creation of a revised management structure and to improve performance.
1991-92		The Service introduce a new management structure based on three regions
1992-93	**Ambulance control improvements**	The Service centralise ambulance control work in eight regional (previously 36 local) control centres staffed 24 hours a day. The following year they begin installation of a modern computerised command and control system for emergency ambulance control work, which they complete in 1996-97.
1995-96	**NHS Trust status**	On 1 April 1995, the Service become Scotland's only national NHS Trust.
	New training college with private sector	The Service establish the Scottish Ambulance College in partnership with the private sector as a centre of training excellence within Scotland, the UK and abroad.
	New Trust terms and conditions for staff	80 per cent (later increasing to 95 per cent) of Service staff accept new, more flexible Trust contract terms and conditions.
1996-97	**Revised organisation**	The Service introduce a new management structure based on two regions.
1997-98	**New Chairman**	The Secretary of State appoints the Service's new Chairman.
April 1999	**Special Health Board status and new chief executive**	The Service introduce a new management structure based on one region and six divisions. The status of the Service changes from being a NHS Trust to being a Special Health Board. A new Chief Executive of the Service takes up post.

Changes concerned primarily with improving patient care

1988-89	**Defibrillators**	The Service provide defibrillators in all emergency ambulances. These are life saving devices for delivering an electric shock to restart and/or regulate heart rhythm in cases of cardiac arrest
1991-92	**Paramedics**	The Service introduce extended training for paramedics, with the long term aim to have a paramedic on every emergency ambulance. By 1999 the Service have on average a paramedic on 64 per cent of emergency ambulances.
	Elimination of single crewing in rural areas	The Service begin the recruitment of an additional 230 emergency ambulance crew staff to eliminate the practice of single crewed ambulances in rural areas. The Service have achieved their aim to eliminate rostered single crewing by 1997, though unforeseen staff absences require continued occasional single crewing.
1992-93	**Consultant Medical Director**	The Service appoint a Consultant Medical Director, the first UK ambulance service to do so, to oversee the development of clinical standards and audit.

Continued...

Figure 4

Main changes affecting the Service in the 1990s *continued*

1993-94	**Air ambulance**	The Service establish a national integrated air ambulance service for Scotland, under contract with the private sector.
1997-98	**New communication system**	The Service complete the £20 million national mobile communications project introducing a new radio system throughout Scotland for their emergency vehicle and control centre staff.
1998-99	**Extended air ambulance cover**	The Service extend the cover of the national integrated air ambulance service for Scotland, under a new contract with the private sector.

Source: National Audit Office

Our study examined the Service's achievements to date and opportunities for change

1.16 While the Service can claim that changes in recent years have contributed to improved quality of patient care and to improved efficiency, there are no measures in place which can readily confirm this. Because of the nature of their work, and its inter-relationship with the rest of the NHS, it is of course difficult to provide definitive measures of the quality of service and the impact of healthcare provided. Nevertheless it is evident that in some areas of Scotland the Service have not met some key activity targets, for example concerning response times for emergency ambulances.

1.17 This naturally raises a question about the Service's performance. Accordingly, our study aimed to assess the overall performance of the emergency ambulance service and whether they make an effective contribution to healthcare using their resources efficiently. In assessing the performance of the Service we examined three main aspects:

(i) **Providing a rapid and responsive emergency service.** Part 2 of this report presents our analysis of the Service's performance in responding quickly to 999 calls and to general practitioners' urgent calls for patient transfer to hospital. We also consider the dimension of how well the Service respond to patients with different levels of need and examine related new developments in the approach to emergency ambulance dispatch.

(ii) **Economic and efficient use of emergency resources.** Part 3 of this report reviews the resource input to the emergency ambulance service, including comparisons with other services in Britain, and examines how far the Service make the best use of available resources in areas such as vehicle deployment and managing crew time.

(iii) Providing effective pre-hospital emergency care. Part 4 of this report considers clinical aspects and examines what evidence there is giving assurance that the Service provide effective pre-hospital emergency care.

1.18 The main exclusion from our work examining the emergency ambulance service was the air ambulance service. Although, at £4 million, this makes a significant part of the Service's running costs, the service is provided under contract which the Service re-appraised, re-tendered and awarded to the lowest tenderer in April 1999. The air ambulance service made 2,500 responses in 1998-99.

Our methodology included research amongst users of the Service and comparisons with other ambulance providers

1.19 Our methodology included examination of documentation within the Scottish Executive and the Service and visits to most of the Service's ambulance divisions across Scotland to examine aspects of service efficiency. We also worked jointly with the Service in areas where it was particularly helpful to do so. For example, we issued survey questionnaires and conducted focus group work with Service staff to assess the scope for enhanced performance management systems. Similarly, we worked with Service staff to review the scope for improved clinical information and monitoring systems.

1.20 To ensure that we obtained sufficient external perspective of the Service we appointed Frontline Ltd management consultants to capture the views of clinicians, NHS staff and patients. This involved both survey research and qualitative focus group research to obtain views in-depth.

1.21 We also worked with the Audit Commission for England and Wales, who provided access to financial and activity data as part of their own value for money examination of ambulance services in England and Wales. (The Audit Commission's report "A Life in the Fast Lane" was published in September 1998). We used this information in various ways to compare the performance of the Service with other UK ambulance services.

1.22 Appendix 2 gives further details of our methodology.

1.23 We acknowledge with thanks the help and support of all those in the Service, and more widely in the NHS and elsewhere who contributed to our study.

Part 2: Providing a rapid and responsive emergency service

2.1 This part of the report presents our analysis of the Service's performance in responding quickly to 999 calls and to general practitioners' urgent calls for patient transfer to hospital. It includes details of the Service's performance against the response time targets which have been set and places this in the context of the Service's responsiveness compared with other ambulance services in England. We also consider the dimension of how well the Service respond to patients with different levels of need, including the use of priority dispatch.

2.2 The speed of response of the 999 ambulance service is dependent on two main factors. Firstly, there is the time taken by control centre staff to answer the telephone and take sufficient details to permit the dispatch of an available ambulance. Secondly, there is the time taken for the ambulance crew to mobilise and then drive to the scene of the incident.

The average time to answer 999 telephone calls is 10 seconds

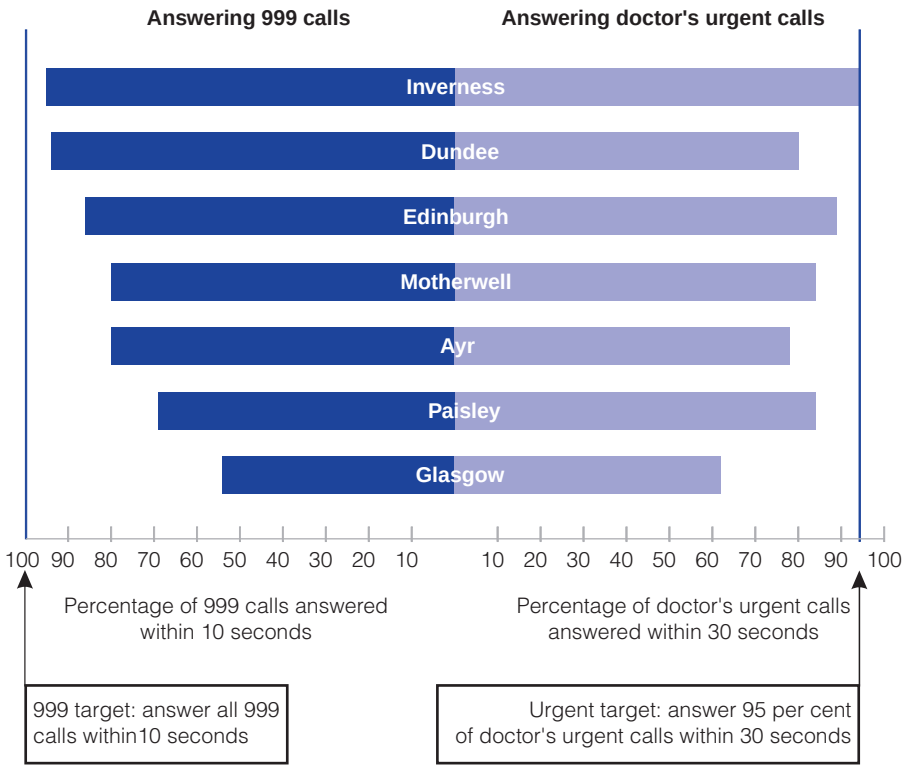
2.3 Control rooms are central to the Service's operations. Generally, they are the first points of contact between the Service, the public and doctors requiring urgent patient transport. They must ensure the efficient deployment of emergency ambulances and for some 999 calls control staff may have an enhanced role, providing emergency medical advice by telephone whilst an ambulance is on the way to a call. The Service are unique amongst ambulance services in the United Kingdom in having eight control centres. Most other services (including the largest in London) have a single control room, though none have as large a catchment area as the Service in Scotland.

2.4 The Service have targets for how quickly control centre staff answer telephone calls but most centres do not achieve these. The targets are to answer all 999 calls within 10 seconds and 95 per cent of doctor's urgent calls within 30 seconds. In 1997-98 the average time to answer 999 calls was 10 seconds and the Service answered 79 per cent of doctors' urgent calls within 30 seconds. For each control centre the proportion of 999 calls answered within 10 seconds ranged from 54 per cent to 95 per cent, and for urgent calls answered within 30 seconds performance ranged from 62 per cent to 94 per cent. For the seven of eight centres for which there was data only one, Inverness, came close to meeting the targets (Figure 5).

Telephone answering targets and performance 1997-98

Figure 5

This Figure shows that the Service have set targets for how quickly control centre staff answer telephone calls but most centres do not achieve these



Source: National Audit Office

Note: There was no available data for emergency service telephone answering targets for Aberdeen.

2.5 While the Service have not investigated the causes, they consider the most likely explanation for missing telephone-answering targets is simply that at busy times there are not enough operators to answer every call immediately. Unfortunately, however, there is no further information to indicate how far the missed targets may represent a serious problem. Clearly, while missing the target by a few seconds is unlikely to be critical, it could be a very serious problem if some callers are taking significantly longer than the target of 10 seconds to get through to the Service. Accordingly, the Service have agreed the need to investigate the distribution of caller waiting times for each centre and to use this data to assess whether there is a need to improve response times, for example by altering operator shifts to better match peaks in demand.

Emergency response targets are not met in parts of Scotland

Response time performance has remained largely constant in recent years

2.6 Looking at how quickly ambulances arrive at incidents, the health departments in Scotland, England and Wales first issued performance targets for 999 and urgent responses in 1974. For 999 responses, the target is the response time i.e. the period between the receipt of the 999 call and the arrival of the first fully equipped ambulance at the scene of the incident[7]. For urgent calls from general practitioners outside the 999 system, the target is how promptly the patient is delivered to hospital compared to the time the doctor specified. For both types of incident, targets are the response time to achieve in a prescribed minimum percentage of responses, and for 999 calls there are different targets for different parts of the country dependent on population density. Figure 6 summarises the current targets in Scotland.

Figure 6

999 and urgent ambulance response time targets in Scotland

There are two sets of response time targets for emergency ambulance service responses, for emergency responses to 999 calls and for responses to doctors' urgent calls:

Emergency response targets

These measure the percentage of ambulances arriving at an incident within specified times from receipt of a 999 call. In Scotland the targets are:

- High population density areas, such as Glasgow, Edinburgh, Dundee - 50% within 7 minutes, 95% within 14 minutes
- Medium population density areas, towns such as Motherwell, Paisley - 50% within 8 minutes, 95% within 18 minutes
- Low population density areas, such as the highlands and islands- 50% within 8 minutes, 95% within 21 minutes

Doctors' urgent calls

In Scotland the target is to deliver 95% of patients to hospital within 15 minutes before or after the time specified by a commissioning doctor.

Note: Slightly different targets apply elsewhere in the UK. For example English metropolitan ambulance services have a target to respond to 50% of 999 calls in eight not seven minutes

Source: National Audit Office

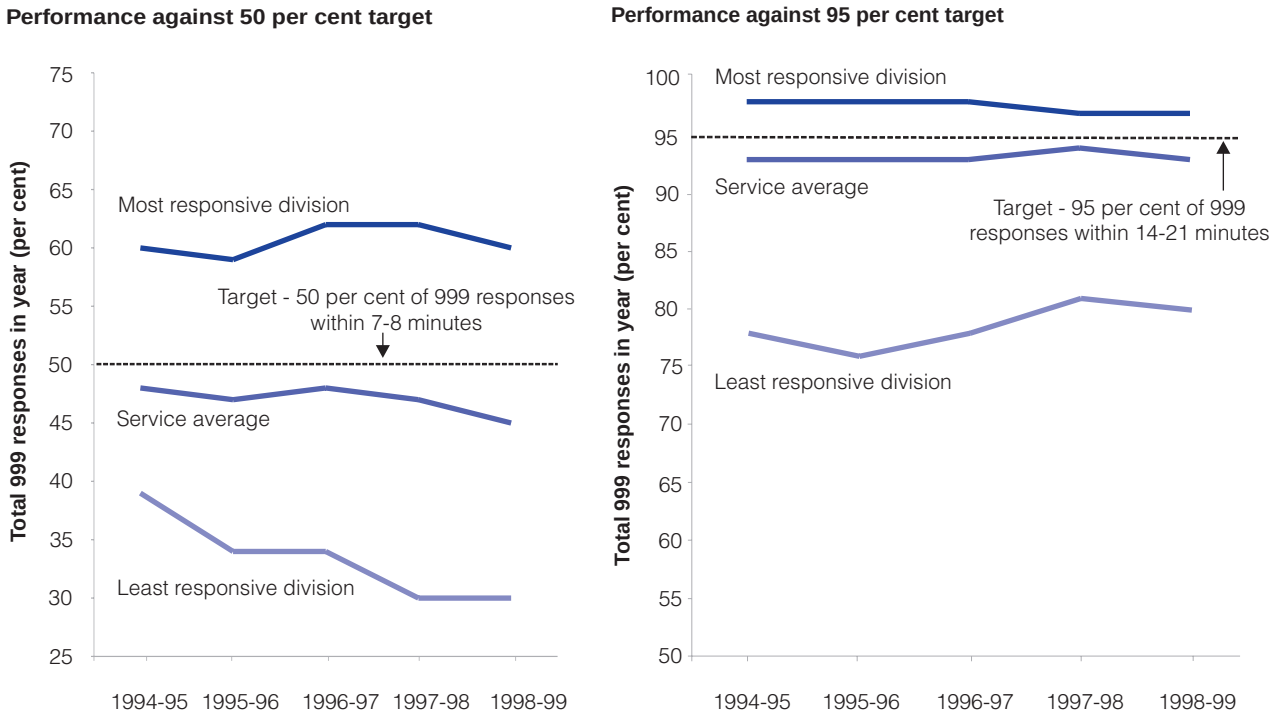
7 For the purposes of this target the response time starts when the ambulance control are confident that they have identified the location of the incident.

2.7 Since 1994-95, against increasing demand the Service's performance against response time targets has remained broadly constant overall. The Service have not greatly improved the proportion of 999 responses completed within the target times, and the targets for the Service as a whole remain unsatisfied by two to five per cent. Significant differences remain in the achievement of response time targets between individual Service divisions. Figure 7 summarises the range of achievement of 999 response time targets in recent years, while more detailed information about response time performance for 999 and doctors' urgent calls in each division and station in 1998-99 are depicted in Appendix 1.

Figure 7

999 response time targets and performance in Scotland 1994 to 1999

This Figure shows that performance against response time targets has remained broadly constant since 1994-95. The Service as a whole have not greatly improved the proportion of 999 responses completed within the target times, while there remains a wide range in performance between the most responsive and least responsive of the Service's separate divisions.



Source: Service management information statistics

There are shortfalls against target in more remote areas

2.8 In Scotland there are many sparsely populated remote areas that experience much slower ambulance responses than in other areas. Of the Service's 152 ambulance stations in total they categorise 102 as serving sparsely populated areas i.e. with less than 125 people per square kilometre[8].

2.9 In 1998-99 ambulances from 56 stations in these areas responded to 40 per cent or less of calls within eight minutes, compared to the target of 50 per cent. Ambulances in such areas may on average take 20 minutes or more to respond to each 999 call - and in individual cases substantially longer - compared to ten minutes on average for the Service as a whole. Reflecting the sparse population of the areas, though, the 56 remote stations with the slowest response times were responsible for handling only some six per cent of all 999 calls in 1998-99. Consequently the number of people receiving the slowest response times is a relatively small proportion of all responses made, as Figure 8 demonstrates.

There are also shortfalls against target in busy and populous areas of Scotland

2.10 Although those living in remote areas receive the slowest responses on average, it is not the case that those living in busy and populous areas of, say, central Scotland necessarily receive faster responses than in all other areas. For example, against the target of 50 per cent of 999 responses arriving at an incident within 7-8 minutes, 59 per cent did so during 1998-99 in Tayside (a mainly rural area though including Dundee). In contrast, in the much more densely populated conurbation of Glasgow, only 30 per cent did so. Figure 9 provides an example of how such differences are reflected in the actual response times achieved at two busy urban stations in Scotland.

2.11 Since 1994-95 the Service's busiest division, Greater Glasgow, has had least success in achieving 999 response time targets. At present in Glasgow, as has been the case for several years, only about one in three ambulances reaches the scene of a 999 incident within seven minutes against the target of one in two. In

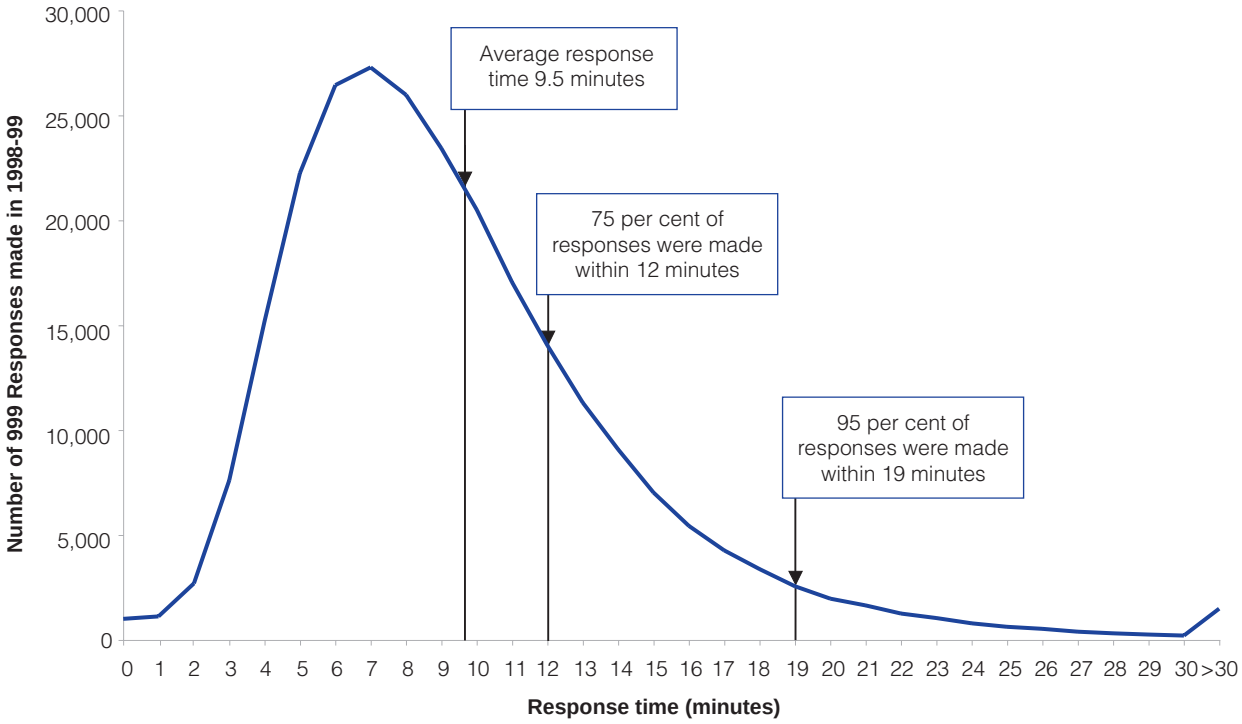
8 Ambulance stations in these remote areas may cover a catchment area as large as 1,200 square kilometres, with a population as few as two people a square kilometre. This means that it is unlikely to be practicable for the Service to achieve significantly faster responses in these areas without having more ambulances on the ground, which cannot be provided within available resources. In contrast, in densely populated urban areas such as Edinburgh stations may have a catchment area of only some 130 square kilometres, with a population of 1,700 people a square kilometre or more.

other busy and populous areas of central Scotland performance is better than in Glasgow, though two other divisions in these areas, Lothian and Lanarkshire, also do not meet all response time targets (Appendix 1).

Figure 8

Frequency distribution of response times in Scotland 1998-99

This Figure shows that most people in Scotland calling 999 have a response in less than 10 minutes and 95 per cent of responses are made within 19 minutes



Source: Analysis of emergency responses in Scotland, 1998-99

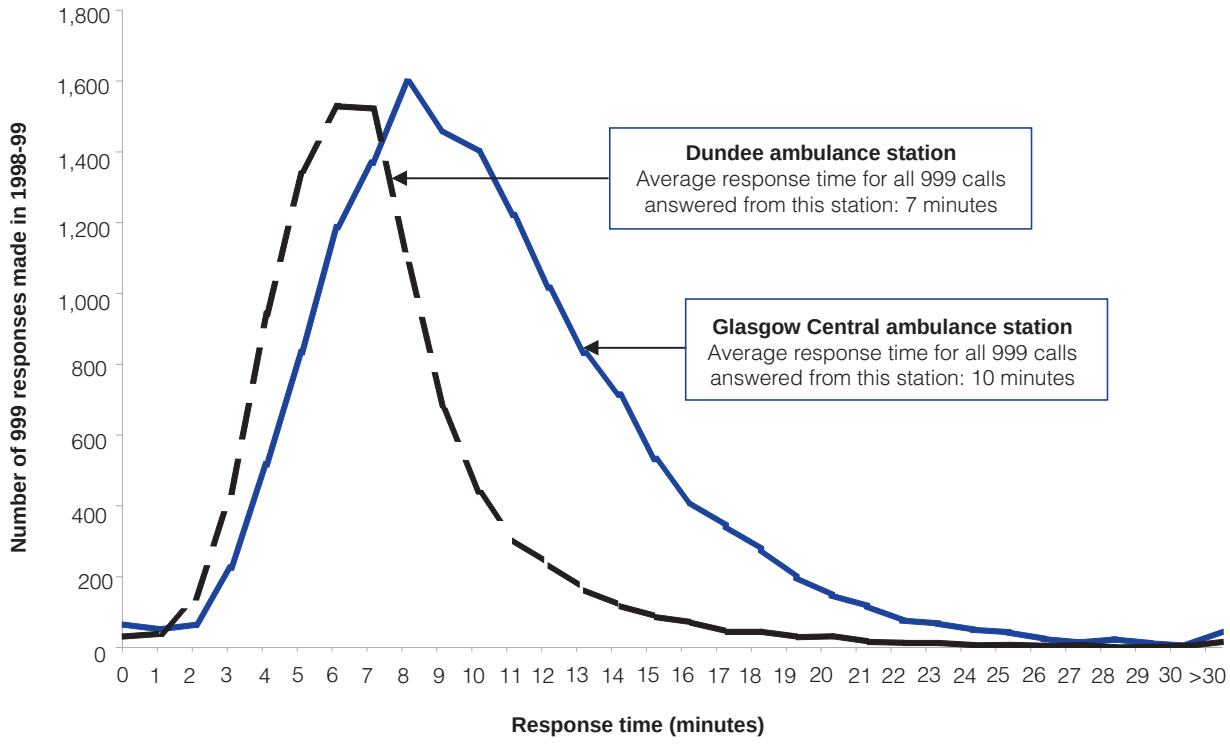
Except for Glasgow, response times compare favourably with English ambulance services

2.12 To obtain a wider perspective we compared response time statistics for Scotland and England. Specifically, we compared the performance in 1998-99 of the Service in each of the 15 Health Board areas in Scotland against the 50 per cent response time target with performance against the corresponding response time target which the 37 ambulance services in England reported in the same year. Slightly different response time targets apply in each country. In order to compare actual response times on a consistent basis, we measured the response times for the Service in Scotland against a common benchmark of eight minutes.

Figure 9

Varying 999 response times at two busy urban stations in Scotland

This Figure shows an example of how people living in different parts of Scotland receive different response times to 999 calls. Most stations we examined had response time profiles that fell between those of the two examples illustrated here



Source: Analysis of emergency responses by Dundee and Glasgow Central stations during 1998-99

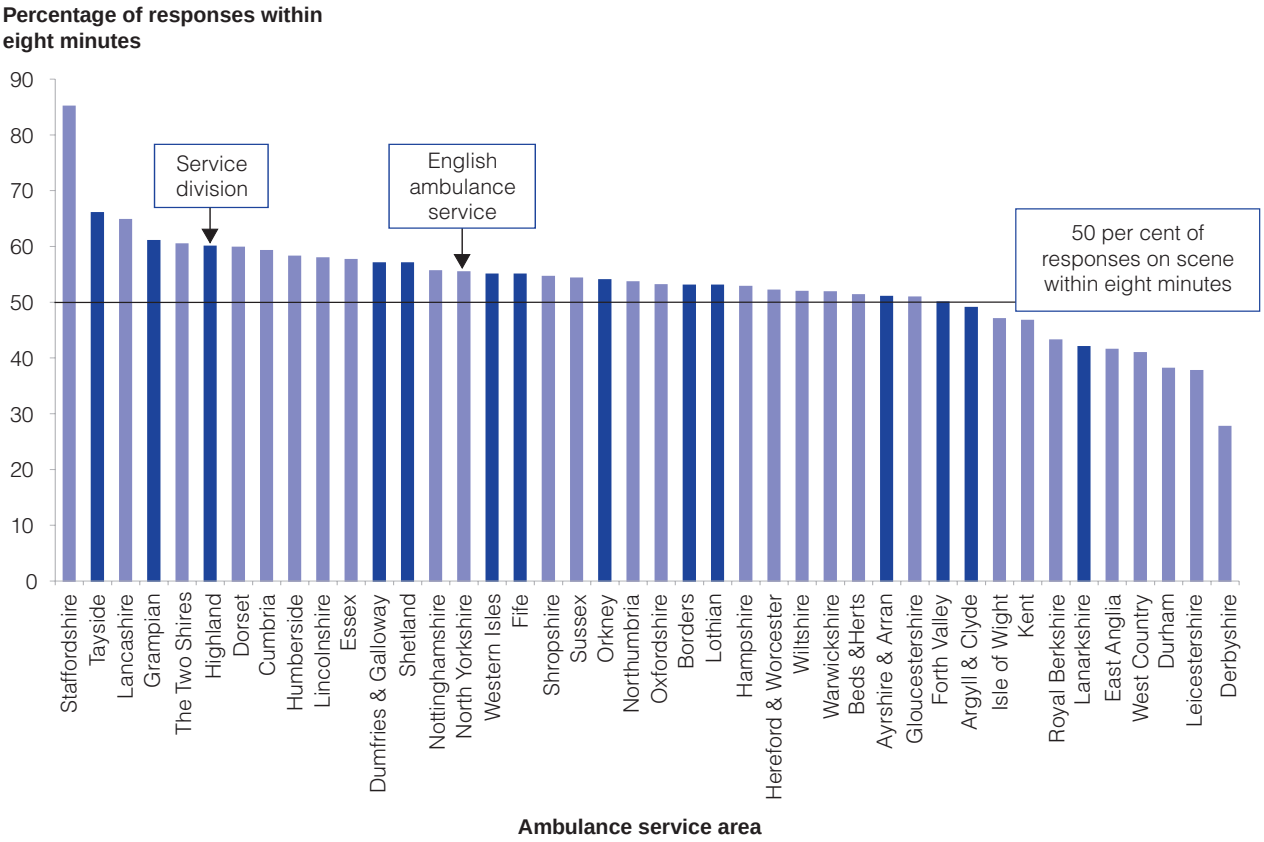
2.13 Except for Greater Glasgow, the Service's performance in each Health Board area in Scotland generally compares reasonably well to English ambulance services of similar population density. In parts of Scotland such as Tayside, Grampian and Highland the Service achieved a greater proportion of responses within the eight minutes benchmark than most other services in England, while only Lanarkshire achieved significantly less responses within this time (Figure 10).

2.14 Response time performance in Greater Glasgow is worse than in most English ambulance services of similar population density (Figure 11).

Figure 10

999 response times outside major urban areas, Scotland and England 1998-99

Excluding Glasgow (Figure 11) the performance of the Service in most Health Board areas in Scotland (the dark columns) compares favourably with the performance of services in England which the Department of Health categorise as "rural".



Note: The target of attending 50 per cent of all calls within eight minutes applies to English services not operating call prioritisation. In the 16 English ambulance services where call prioritisation operates, the targets are to respond to 75 per cent of life threatening calls within eight minutes and 50 per cent of all other calls within eight minutes. In Scotland the target is to respond to 50 per cent of all 999 calls in seven minutes in urban areas and eight minutes elsewhere. For this presentation all performance is measured against a benchmark of eight minutes to make a consistent comparison.

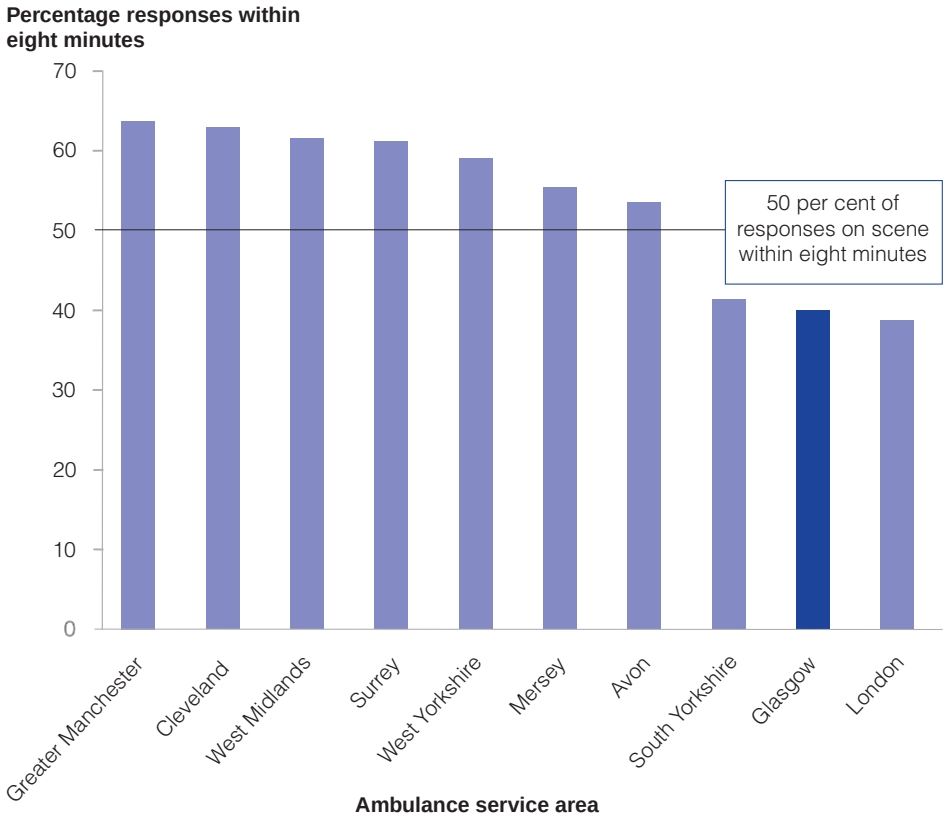
Source: National Audit Office

999 response times in major urban areas, Scotland and England 1998-99

Figure 11

This Figure shows that response performance in Glasgow (the dark column) is lower than in most English ambulance services serving similar urban areas.

Glasgow is the only urban area in Scotland similar in size and population density to the ambulance services in England which the Department of Health catagorise as "urban".



Note: The target of attending 50 per cent of all calls within eight minutes applies to English services not operating call prioritisation. In the 16 English ambulance services where call prioritisation operates, the targets are to respond to 75 per cent of life threatening calls within eight minutes and 50 per cent of all other calls within eight minutes. In Scotland the target is to respond to 50 per cent of all 999 calls in seven minutes in urban areas and eight minutes elsewhere. For this presentation all performance is measured against a benchmark of eight minutes to make a consistent comparison.

Source: National Audit Office

2.15 There are a number of reasons that the Service consider have contributed to poor response times in Glasgow. Firstly, stemming from industrial relations problems experienced before 1995, local management in Glasgow had not succeeded in motivating some staff effectively. Secondly, ambulance crews in Glasgow each make amongst the highest number of responses a year of any ambulance service in Britain (see Part 3). The high workload can result in longer response times at peak times through no ambulance being immediately available to deal with an incoming emergency call. Other operational problems include ambulance stations not being sited in the optimum places to minimise response

times, vehicle crew shift rosters which did not adequately reflect the pattern of demand placed on the emergency service and sickness absence rates which are significantly higher than the Service's average.

2.16 The Service have also faced more demand for emergency ambulances in Glasgow, though less than in some parts of Scotland. Between 1994-95 and 1998-99 999 responses in Glasgow increased by 30 per cent, while there were 25 per cent fewer doctors' urgent responses. Overall, total emergency responses in Glasgow have increased some nine per cent since 1994-95, compared to an increase of 15 per cent in the same period for the Service as a whole.

2.17 The Service are aiming to reduce response times in Glasgow through a range of measures such as the introduction of new shift rosters in October 1998 (Figure 12).

The Service has introduced a range of measures designed to improve response times in Glasgow

Figure 12

- Changes in crew shift patterns and working practices intended to make more efficient use of existing resources were introduced in October 1998. These have included an initiative to dedicate an "urgent tier" of ambulances to dealing with doctors' urgent responses. The Service expects that this will permit them to release more highly trained crews to handle 999 incidents whilst maintaining a satisfactory standard of urgent service.

- Under their corporate contract with the Service, the Scottish Executive Health Department have provided additional funding for Glasgow of £0.5 million for each of the three years commencing April 1999. They have used the extra resources to deploy an extra 10 vehicle crew staff into Glasgow from April 1999.

- The Service have enhanced control room oversight of ambulance deployment by the fitting of automatic vehicle locating systems to all emergency ambulances in Glasgow. Information technology permits the display of the position and status of each ambulance on computerised maps. As we discuss in Part 3, this should improve the efficient use of vehicles and permit productivity to increase.

- The Service have also introduced measures to reduce the time crews spend at hospital. The aim here is to free ambulances as quickly as possible and maximise the time available to respond to subsequent calls. Initiatives include negotiating with hospital emergency departments to ensure there are sufficient porters to receive each patient when an ambulance arrives and the establishment of stores in the hospital to enable prompt replenishment of items of equipment such as blankets without the ambulance having to return to base. We discuss in Part 3 scope for the Service to increase staff productivity more generally.

Source: National Audit Office

2.18 These actions appear to be contributing to improved response times which the Service have recently recorded in Glasgow. Using time series analysis we compared recent response time performance to what they may have achieved based on a seasonally adjusted projection from the previous three years' results.

On this basis during the first six months of 1999 the Service responded to an extra 750 "999" calls in Glasgow within the response time target of seven or eight minutes (depending on area). During this period the percentage of responses within the seven or eight minutes target rose by three per cent to 31 per cent compared to the equivalent period in 1998 despite a seven per cent increase in the number of emergency incidents. The Service are continuing to monitor closely the situation in Glasgow.

Demand peaks and travelling distance appear to be the most common causes for long activation and response times

2.19 The Service's control room staff are required to record reasons where ambulance activation (the time between receipt of a call and an ambulance becoming mobile) to a 999 incident takes longer than three minutes, or where a response takes longer than 18 minutes. Before our audit there was no systematic analysis of this data. We therefore analysed the data for all 999 responses by the Service during one sample week as an indicator of the main reasons for long response times.

2.20 On *activation* times, we found that 450 responses (10 per cent of all 999 responses in the sample week) took longer than Service's target of three minutes in all cases. The most common recorded reason for activation times exceeding three minutes was "lack of available resources" (recorded in 40 per cent of such cases). Usually this means that when the control room needs to deploy an ambulance at times of peak demand all such resources are already committed to other calls. The second most common reason (25 per cent of cases) was that the control room was unable to contact the necessary ambulance at the necessary time. This could be for a variety of reasons but is most likely to be because crews are busy and unable to respond at once to radio messages.

2.21 On *response* times, we found that 210 responses (five per cent) to 999 incidents took longer than 18 minutes in the week examined. The most common reason for this was "excessive distance" (36 per cent of occasions), as is to be expected in remote, sparsely populated areas. The second most common reason was, again, "lack of available resources" (22 per cent of cases).

2.22 Long response times may also be the consequence of inefficiency and poor ambulance productivity and these results confirm the need for the Service to organise and deploy available resources productively to best match demand. We examine further in Part 3 of this report how well the Service manage available resources so as to promote the best possible response times.

There is support for the Service moving towards priority based dispatch, though caution is necessary

The Service respond to patients on a first come, first served basis not according to clinical need

2.23 The main performance measure for the Service has been the achievement of response time targets measuring how quickly the emergency ambulance service respond to 999 calls and urgent requests from doctors. They embrace responses to all patients, no matter how ill they are, and consequently the Service respond to patients more or less on the basis of first come, first served. First set 25 years ago, the targets were based largely on what was felt to be achievable within available resources and were never based on clinical need nor on an assessment of costs and benefits in healthcare terms.

2.24 There is evidence from medical research that in some serious cases a more rapid ambulance response than the current target of seven or eight minutes - which the Service aim to achieve in 50 per cent of cases - is beneficial. Specifically, research suggests that the earlier an emergency ambulance can arrive at the scene of a cardiac arrest and start treatment, the greater are the chances of saving the victim's life[9].

2.25 The Service must maintain records of ambulance patient condition and treatment for legal and medical reasons. However the Service have not computerised these patient records and consequently cannot readily analyse them. Nor, with a few important exceptions such as cardiac arrest patients, do they maintain records of patient outcomes – for example survival rates following arrival and treatment in hospital[10]. For these reasons it has not previously been possible to measure objectively features such as how seriously ill ambulance patients are. This in turn makes it difficult to assess what benefits there might be from improved ambulance response times, or whether variations in performance against response time targets have specific adverse effects.

9 *Review of ambulance performance standards,* Final report of Department of Health Steering Group (in England), July 1996. Drawing on medical research the review concluded that an eight minute response time is too long for cardiac arrest cases. After allowing for likely delay between onset of cardiac arrest and alerting the ambulance service, and between the ambulance crew arriving at a scene and actually commencing treatment, this response time might at best permit treatment to commence within 12 minutes of cessation of a pulse. This is generally too late to save a victim of cardiac arrest

10 The Service do not generally collect patient health outcome information. While hospitals do so, their IT and clinical information systems are not compatible with those of the Service. This means that it is not possible to obtain outcome information for ambulance patients retrospectively, except on a case by case basis, because it is generally difficult to identify from existing IT systems which patients have arrived by ambulance.

2.26 As a first step towards addressing such aspects our work included a joint pilot clinical audit project with the Service. This provided for the first time consistent, systematic descriptive information about a large sample of patients (4,460) transported by emergency ambulance in Scotland during one week commencing 26 November 1997[11]. On this basis we and the Service were able to estimate, typically, how ill ambulance patients were and why, and what were the most important skills that ambulance crews exercised in treating them. About how seriously ill patients are, the results were:

- Generally, response times for the most seriously ill patients were not significantly better than those for other patients. The audit categorised eight per cent of 999 patients as seriously ill (defined as requiring immediate clinical treatment, where the condition otherwise would be immediately life threatening). For these seriously ill 999 call patients the average ambulance response time was nine minutes, and the average time between answering the 999 call and delivering the patient to hospital was 42 minutes (Figure 13).

- At the other end of the scale the audit categorised almost one third (31 per cent) of patients as having no or only minor illness, including 33 per cent of 999 cases. Yet these 999 patients still benefited from rapid response and pre-hospital times (average nine and 32 minutes respectively).

- By far the most ambulance patients – 64 per cent – were classed as moderately ill (defined as needing medical treatment immediately or some measure of disability may have occurred). On average, moderately ill 999 patients waited for nine minutes for an ambulance to attend them and were transported to hospital within 36 minutes of answering the 999 call. Once at the hospital accident and emergency department, though, these patients would expect to wait between another 17 and 19 minutes to see a doctor[12].

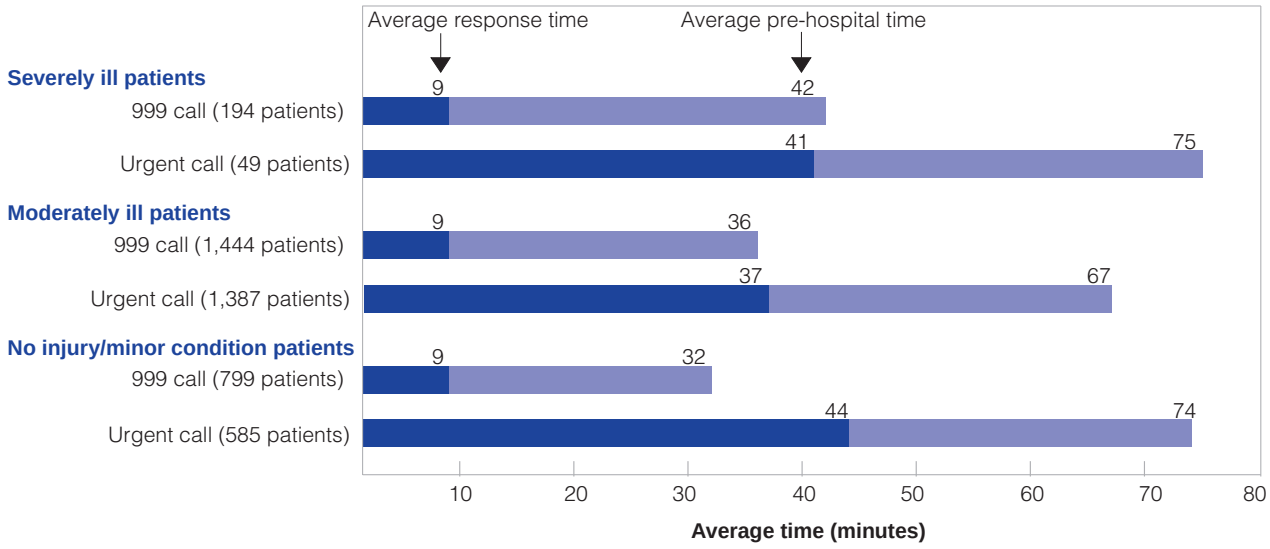
11 Our methodology involved experienced paramedic staff from the Service categorising how ill patients were based on their review of the Service's written ambulance patient and treatment records in individual cases. We were, unfortunately, unable to compare ambulance activity with patient outcome information because of the difficulty in obtaining this mentioned above.

12 Source: National Accident and Emergency Department Waiting Times Survey for one week commencing 26 November 1997, the same sample week as our joint clinical audit project. This shows that "trolley case" and "walking wounded" patients waited on average 17 and 19 minutes respectively to see a doctor. The survey does not separately record ambulance patient waiting times, and without evidence to the contrary it is reasonable to assume that moderately ill ambulance patients receive treatment no more or less quickly than patients who attend by other means.

Figure 13

Comparison of ambulance response and pre-hospital times and patient condition

The Figure shows that ambulance response and pre-hospital times vary significantly depending on whether it is a 999 or doctors' urgent call. But how severely ill patients are does not affect response and pre-hospital times.



Note: During the week commencing 26 November 1997 emergency ambulances in Scotland transported 10,030 patients of whom 8,114 were included in the clinical audit project. Ambulance crews did not complete Patient Report Forms in respect of 3,334 of these patients and a further 322 Patient Report Forms were not completed in sufficient detail to allow assessment of patient condition. This analysis is based on the remaining 4,458 patients with adequately completed Patient Report Forms.

Source: National Audit Office/Service pilot clinical audit project

Priority dispatch may permit more rapid ambulance responses for immediately life-threatening cases

2.27 Priority dispatch is a way of deploying emergency ambulances so that they may respond to calls according to the seriousness of the patient's ailment or injury. One major potential benefit of such systems is that they may permit ambulance services to reduce ambulance response times in the most immediately life threatening cases, avoiding the increased costs that they might expect if they aimed to reduce response times to all patients. Priority dispatch systems are already in operation in some countries, notably the United States. In England 16 ambulance services are operating and evaluating priority dispatch systems and the Department of Health have set a target for the remaining 21 services in England to move to the new system by a 2001. Further information about the advantages and disadvantages of priority dispatch are at Appendix 3.

2.28 For the Service to make decisions about working practices, such as whether to move towards a system of priority dispatch, they need reliable information about the impact on patients. Increasingly this is available from published research, and the results of our joint clinical audit project in Scotland provide particular pointers to potential benefits available from priority dispatch:

- Patients with no or only minor injuries account for 31 per cent of all ambulance responses. This does not imply that no such patients require an ambulance, because cases which involve no or only minor injury include those where it is necessary for a doctor in hospital to make a diagnosis, and it is better to be safe than sorry. However many calls in this category, albeit they are genuine calls for help meriting some form of response, clearly do not justify the same priority as a life-threatening emergency. Giving these less urgent calls the same priority as more serious cases means that some very ill and moderately ill patients who would benefit more from early treatment have to wait longer before an ambulance can attend.

- The Service do not target their more highly skilled paramedic resources towards the most seriously ill patients. Doing so might improve the quality of care these most vulnerable patients receive. There might also be benefit to the Service from increasing the specialisation of their most skilled front line staff, whose skills risk atrophy without being regularly exercised.

- Our clinical audit project suggested that the most seriously ill patients account for eight per cent of all 999 ambulance responses, equivalent to some 22,000 individual cases across Scotland a year. Many would consider that improving response times for at least these life-threatening emergency cases would be desirable.

2.29 Our clinical audit project also shows that, in considering any priority dispatch system, the Service should evaluate whether to include within its scope doctors' urgent as well as 999 calls. Under the Service's existing dispatch system doctors' urgent calls usually receive a much slower response, typically 39 minutes, than 999 calls, typically nine minutes. However, as noted above, our audit looking retrospectively at how ill a sample of ambulance patients were showed that, despite the different care pathways for ambulance patients, the profile of 999 and urgent patients in terms of the seriousness of injury or illness was very similar.

Users and patients support priority dispatch, provided the Service manage the risks of implementation effectively

2.30 Our research amongst healthcare professionals, Health Board staff and patient representatives included survey questions on their degree of support for the concept of priority dispatch and the potential advantages and disadvantages. We also asked about response time standards under such a system, in particular whether they agreed that faster or slower responses would be appropriate according to how ill a patient is.

2.31 Generally the results (Figure 14) showed that overall some 90 per cent of these users of the Service supported the concept of priority dispatch. Potential benefits that survey respondents identified were faster responses better matched to patients' needs, improved patient treatment and outcomes, greater efficiency and a reduction in callers misusing the ambulance service for trivial or unjustified reasons.

2.32 Respondents also described their main concerns about any system of priority dispatch. These were: how in practice the Service would make decisions on priority in individual cases; the need for additional staff training and skills (particularly on communication with callers); and the risks of wrongly prioritising callers as low priority cases. Many respondents commented that in implementing any system of priority dispatch the Service would do best through a partnership approach with other healthcare providers who would be affected. Only 18 per cent of respondents reported that the Service had previously consulted them about the issue.

2.33 On response standards, while there were slightly less clear cut responses, most healthcare professionals, Health Board staff and patient representatives favoured:

- Faster responses than at present for immediately life threatening cases;
- No change for other serious emergency cases;
- Slower response standards for non-emergency cases (Figure 14).

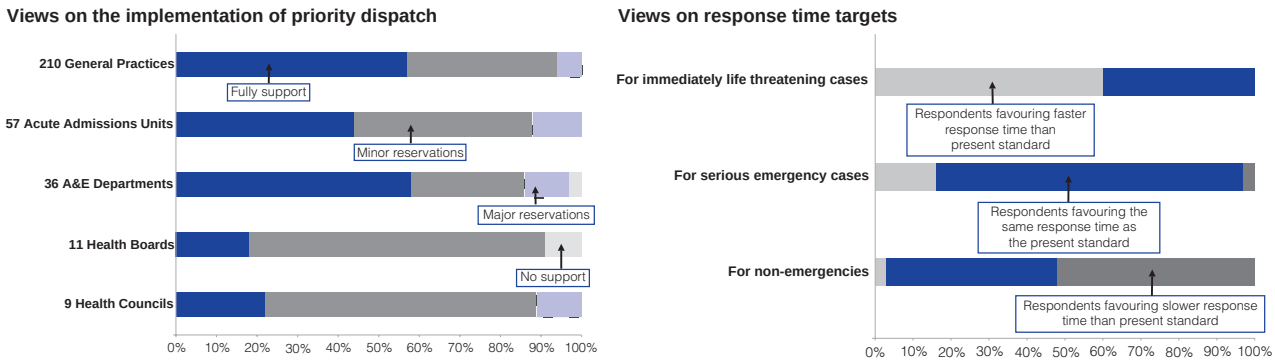
2.34 In October 1997 the Service approached the NHS in Scotland Management Executive with a view to piloting a "shadow" priority dispatch system in one ambulance control centre for Lothian and Borders. The Executive invited the Service to work up proposals and in December 1997 the Service estimated the cost of establishing priority dispatch in this area would be £515,000 including £200,000 for a public education programme and £265,000 start up costs mainly

for additional control centre staff. In February 1998 the Management Executive requested that the Service prepare a more detailed business case of the costs and benefits of adopting a priority dispatch system including expected benefits in terms of outcomes and more efficient use of resources.

Figure 14

Service users' views on priority dispatch

The Figure shows that in our survey of clinicians and others concerned with the emergency ambulance service, over 90 per cent supported the concept of priority dispatch. Most respondents also favoured varying response time targets to reflect patients' varying needs.



Note: See Figure 6 for a description of the current emergency and urgent ambulance response time targets in Scotland

Source: National Audit Office/Frontline stakeholder research

2.35 The Service have not yet prepared the business case. This is because they considered that for a priority dispatch system to work, there needed to be an alternative to sending immediately emergency ambulances to the least serious incidents, so as to free ambulance resources to deal with higher priority cases. In early 1998 the Service were negotiating with Borders Health Board to set up a call-handling/NHS Direct[13] service in the Borders, and they aimed to develop this (in conjunction with a pilot priority dispatch system) to respond to less serious

13 The Government announced details of NHS Direct Scotland in March 1999. In brief it is a two-year £2.5 million investment in primary care to pilot the expansion of existing general practitioner out-of-hours services to include 24-hour access for patients to health advice from trained nurses. The pilot arrangements aim to encourage Primary Care Trusts and general practitioner co-operatives to explore the potential for nurse provided advice/triaging including 24 hour telephone advice lines. These would help patients who have worries about their health but which may not be serious enough for a GP visit. The pilot also aims to foster better links between general practitioner out-of-hours services, out-of-hours social work services, and hospital accident and emergency services. Once developed the new services may also provide a better response to 999 callers who do not require the immediate dispatch of an ambulance.

calls. They believed that without this a priority dispatch system would not be acceptable in terms of providing a service to all members of the public who call for help.

2.36 Unfortunately however, despite enthusiasm from the Service and Borders Health Board, the Borders call-handling centre did not proceed. The Service and the Board were not able to achieve consensus with other healthcare providers involved about the call-handling service, and it became clear that a larger catchment area than the Borders was likely needed to make the service viable. Within the Service there was also wider uncertainty about whether to go forward with priority dispatch, associated with the resignation of the Service's Chief Executive in September 1998 and the appointment of a new Chief Executive in April 1999. These factors meant that the Service did not present a composite business case to the NHS in Scotland Management Executive and the pilot scheme for priority dispatch in Lothian and Borders has not progressed.

Part 3: Economic and efficient use of resources

3.1 In this part of the report we review firstly the controls over the main cost components of the emergency ambulance service, including staff and vehicles. Secondly we compare resources with those of other ambulance services in Britain. Finally we examine how well the Service manage the available resources in areas such as vehicle deployment and use of crew time.

The Service have controlled core resource costs

3.2 The direct operating costs for the Service's emergency service in 1998-99 are estimated at £67 million[14]. Of this £46 million (69 per cent) were for staff costs, £6 million (nine per cent) were for depreciation and £4 million (six per cent) were for vehicle running and maintenance costs. Capital expenditure amounted to £3 million mainly on a communication system and ambulance station buildings.

The Service have introduced employment terms which encourage flexibility and are competitive

3.3 Staff costs are the major component of the Service's operating costs. After becoming a Trust in April 1995 the Service introduced new terms and conditions of service for new employees and provided existing staff with the opportunity to transfer to the new conditions. The new terms provide for greater staff flexibility with regard to the working times of vehicle crews. For example additional pay allowances have been simplified and reduced and staff undertake to work up to eight hours overtime for every 160 rostered hours without overtime pay. In return, staff on the revised terms and conditions have basic pay some 10 per cent higher than previously. Some 95 per cent of Service staff are now on board terms and conditions of employment.

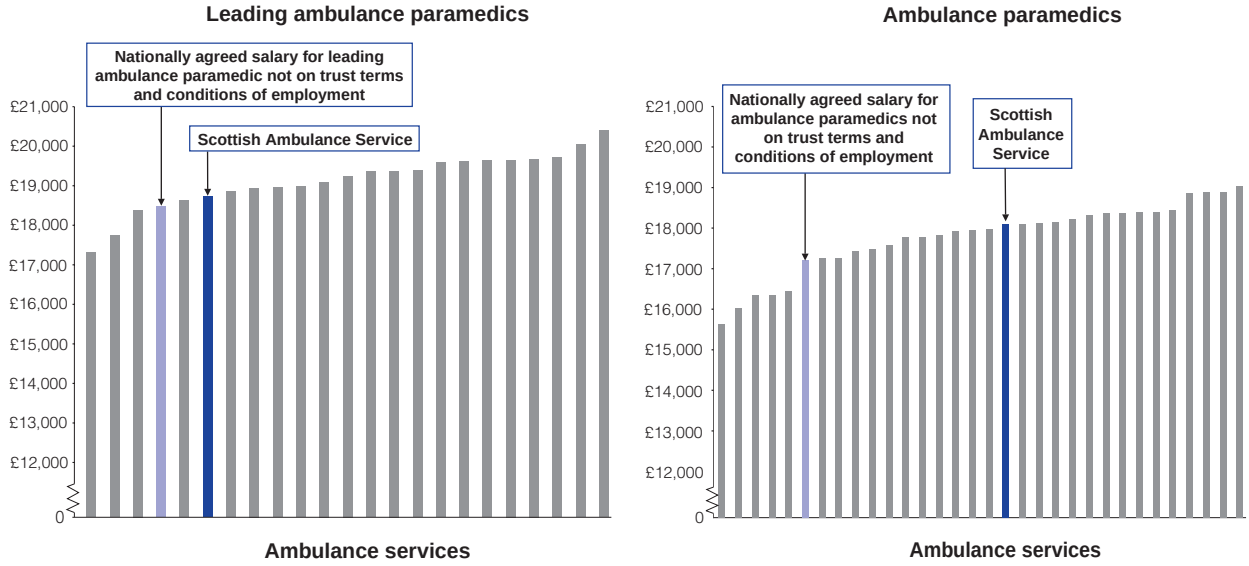
3.4 The Service seek to pay competitive pay rates to attract and retain the best quality staff. Comparing pay rates for emergency ambulance crews with those of other UK ambulance services shows that the Service pay around the average level for ambulance paramedics and towards the lower end of the range for leading ambulance paramedics (Figure 15).

14 Excluding the Air Transport Service, cost £4 million in 1998-99.

Figure 15

Pay rates for emergency ambulance crews

This Figure shows that the Service pay around the average level for ambulance paramedics and towards the lower end of the range for leading ambulance paramedics. Pay levels for ambulance staff across Britain on local trust terms and conditions are higher than nationally agreed levels in most ambulance services because under trust terms and conditions salaries have been increased to compensate for the loss of certain additional allowances.



Source: Pay and Workforce Research survey of UK ambulance service pay rates at 1 January 1998. Pay rates have been adjusted to a 42 hour working week as worked by the Service's emergency vehicle crews

3.5 Ambulance services must report each year their overall management costs. Under administrative rules of the Scottish Executive Health Department and of the Department of Health in England these are the salary costs of senior management and other staff who work in corporate management functions. Services are required to report such costs as a percentage of total income. The Department of Health in England has set ambulance services targets for containing management costs although no targets exist for the Service in Scotland. The Service's £3.2 million management costs for 1997-98 were 3.8 per cent of total income, lower than the 4.0 to 7.3 per cent that ambulance services in England achieved in that year.

The Service have market tested key business areas

3.6 For emergency ambulances the Service's strategy is to retain vehicles for a maximum of seven years. They expect to have a constant vehicle age profile by 2002. In September 1997 the Service submitted a business case to the Scottish Office for the procurement of replacement ambulances and support vehicles. The business case concluded that procuring 65 emergency ambulances, 47 patient transport service vehicles and 50 support vehicles by lease each year over the

period 1997-98 to 1999-2000 would result in savings of £3.6 million over the operating life of the vehicles compared to outright purchase. The Scottish Office approved the first year of the lease option only because at that time funding arrangements for the Service were expected to change with the abolition of the NHS internal market.

3.7 In February 1998 the Service competitively tendered the provision of replacement ambulances and support vehicles. They selected the lowest tender for a five year lease costing £6 million for the supply of 144 vehicles, including 64 emergency ambulances and 47 patient transport vehicles. The Scottish Executive have subsequently approved the second year of the lease option and are discussing the third year with the Service.

3.8 In September 1996 the Service reviewed the operation of their 20 vehicle workshops. They concluded that they should keep workshop services in-house as they were a core element of the business. The review showed that there was scope for greater efficiency through a more streamlined management structure and from more flexible staff working, and that more income could be generated from supplying repair and maintenance services to outside customers. Subsequently the Service introduced revised staff terms and conditions and they estimate that these and other changes have resulted in annual net savings of some £280,000 in the cost of workshop services (10 per cent of total workshop costs). In 1998-99 external repairs and servicing contracts for vehicles generated £500,000 for the Service.

Emergency ambulance costs are mostly in line with those of services in England and Wales

3.9 Quantitative indicators, such as unit costs, may be used to compare performance between organisations, to promote accountability and to improve performance. Unit costs may not reliably show relative efficiency, but they may help to show where questions should be asked.

3.10 Before we completed our value for money examination of the Service, the Audit Commission also examined ambulance services in England and Wales[15]. We shared the data they obtained for their study to compare the unit costs of the

15 *A Life in the Fast Lane, Value for Money in Emergency Ambulance Services*, Audit Commission, 1998

Service's divisions in Scotland with those of emergency ambulance services in England and Wales. Because of the time between our work and the Audit Commission's examination we could compare costs for only 1996-97[16].

3.11 The Service's average unit cost for each 999 and urgent response for 1996-97 was £131. This is higher than the average for ambulance services in England and Wales, £106, but this comparison must be treated with considerable caution because it hides large variations in the unit costs of divisions in Scotland and individual services in England and Wales serving populations with greatly varying characteristics.

3.12 There is a strong inverse relationship between costs and the density of the population that an ambulance service is responsible for, as the Audit Commission demonstrated regarding services in England and Wales. Unit costs tend to increase as population density decreases for two main reasons. Firstly, for a given area widely dispersed communities give rise to many fewer calls than in more populated areas, with crews having to spend much more "unproductive" time ready waiting for a call so as to provide the necessary ambulance cover. Secondly the distance involved in transporting a patient to hospital in these areas results in much longer ambulance journeys. For example, in Scotland in 1998-99 the average length of each emergency ambulance journey from remote stations was 108 kilometres compared to the average for Edinburgh South, a typical urban station, 21 kilometres.

3.13 We therefore compared the costs of the Service in each Health Board area in Scotland with those of services in England and Wales of similar population density drawing on the previous Audit Commission work (Figure 16). We excluded the three island Board areas in Scotland, for which there are no ready comparators and which account for only two per cent of the Services' total emergency ambulance costs.

16 Since then the unit cost of each emergency ambulance response in Scotland has remained constant in real terms, as has aggregate funding for emergency ambulance services in England and Wales allowing for the increase in the number of responses made. This suggests that the comparisons we had made remain valid.

Figure 16

Comparisons between emergency ambulance services in Britain

Scottish Ambulance Service Health Board area	*Population characteristics*	*Audit Commission "Family" group*	*Typical comparative services in England from each family*
Glasgow	Very densely populated, including significant conurbation	Family 5 807 – 4,415 people per km^2	Greater Manchester, West Midlands, London
Lothian	Densely populated areas including significant, very densely populated urban centres	Family 3 359 – 477 people per km^2	Sussex, Hampshire, Nottinghamshire
Lanarkshire, Fife	Quite densely populated, though with significant less densely populated rural areas	Family 2 226 – 295 people per km^2	Oxfordshire, Dorset, Northumbria
Argyll & Clyde, Ayrshire & Arran, Forth Valley, Grampian, Tayside	Mainly rural areas, overall low density population, though with some more densely populated towns	Family 1 72 – 207 people per km^2	Cumbria, Wiltshire, Pembrokeshire
Borders, Dumfries & Galloway, Highland	As above, but with population densities of only eight to 23 people per km^2	No Family equivalent	No ready comparator in England and Wales
Orkney, Shetland, Western Isles	Islands with population densities of nine to 20 people per km^2	No Family equivalent	No ready comparator in England and Wales

Source: National Audit Office and Audit Commission

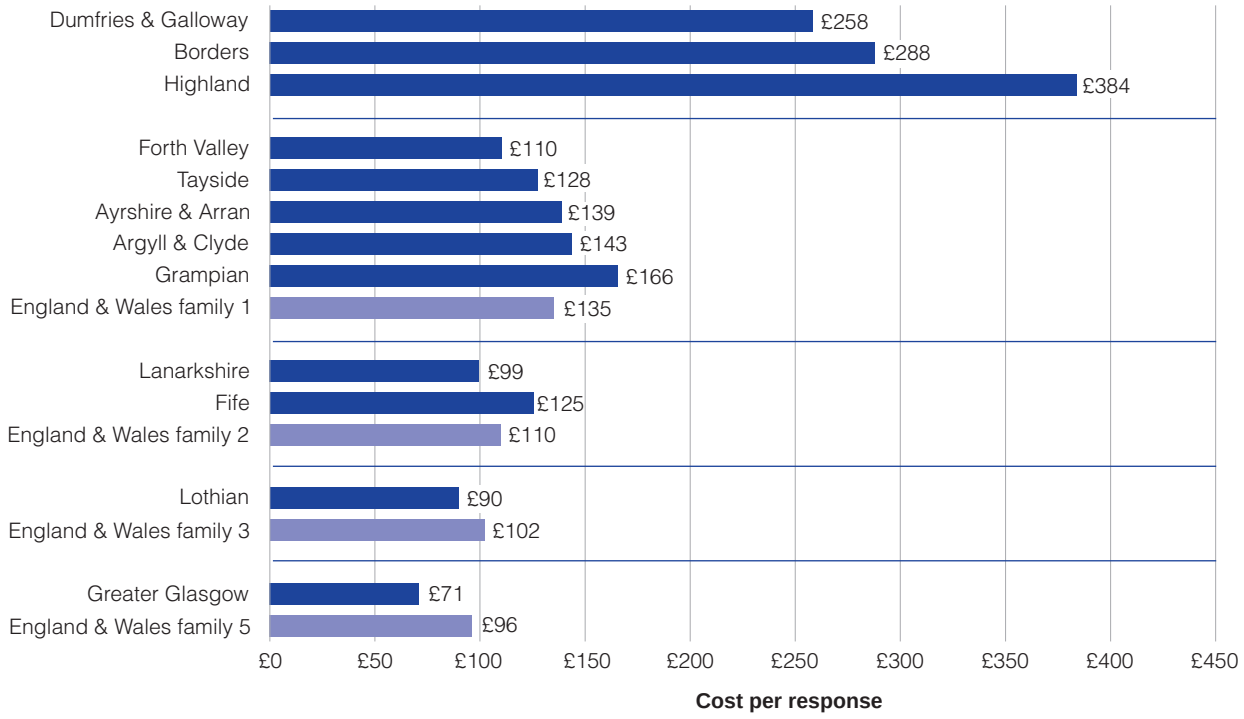
3.14 The results of the comparison showed that for most areas of Scotland the Service's unit costs for each accident and emergency response is similar to, or lower than services in England and Wales working in areas of similar population density. It also confirmed that unit costs are lowest in urban areas and highest in rural areas, reflecting differences in population density (Figure 17).

3.15 It is notable that in Greater Glasgow the Service has amongst the lowest unit cost of all ambulance services in Britain. It is also the least responsive division in terms of achieving response time targets (Part 2). In contrast the Service's unit costs in the three rural areas of Borders, Dumfries & Galloway and Highland are higher than in any other ambulance service in Britain, though none serve such low population densities as in these areas of Scotland. In 1998-99 these three areas with the highest unit costs were responsible for nine per cent of accident and emergency responses made by the Service, and achieved a greater proportion of responses within time targets than in Glasgow (though the targets permit longer response times in rural areas than in Glasgow). They consumed 22 per cent (£15 million) of the total resources for this work compared to 11 per cent (£7 million) for Glasgow.

Figure 17

Emergency ambulance unit costs in 1996-97 in Scotland, England and Wales

The Figure shows that for most areas of Scotland the Service's costs for each emergency response are similar to, or lower than services in England and Wales working in areas of similar population density. The least densely populated areas of Scotland have high unit costs, though no other services cover populations of such low densities as in these areas of Scotland.



Source: Service management information statistics and Audit Commission survey of ambulance services in England and Wales

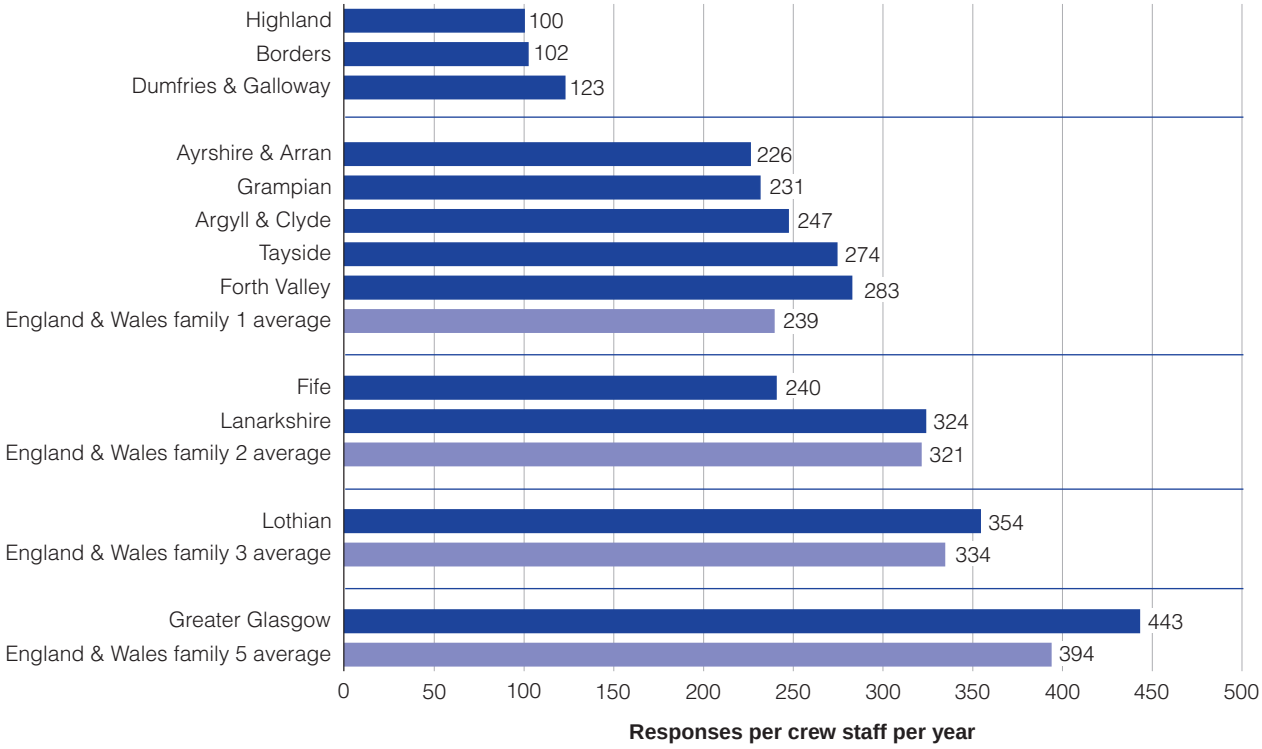
3.16 Because of the expected impact on unit costs, we also compared workloads of Service divisions in Scotland with each other and with services in England and Wales, using the number of responses a year by each crew staff as a measure of productivity. This showed that emergency ambulance crew members in the Greater Glasgow division each respond on average to 443 incidents a year, over four times as many as their colleagues in rural areas in Scotland and that Glasgow is amongst the busiest ambulance services in Britain.

3.17 In most other divisions in Scotland productivity is similar to that of services in England and Wales working in areas of similar population density (Figure 18). Again, as with unit costs, analysis of productivity shows that the three rural areas of Borders, Dumfries & Galloway and Highland are exceptions with each crew staff making on average around 100 responses a year, much less than in any other ambulance service in Britain. But because of the relationship between costs, population density and productivity, high costs and low productivity in these areas are to be expected.

Figure 18

Emergency ambulance crew workload in 1996-97 in Scotland, England and Wales

The Figure shows ambulance crew productivity, as measured by the number of responses by each crew member each year. In Greater Glasgow the Service is amongst the busiest ambulance services in Britain, while in most other areas in Scotland productivity is similar to that of services in England and Wales working in areas of similar population density. Crews in three rural areas in Scotland, though, make many fewer responses than other ambulance services in Britain.



Source: Service management information statistics and Audit Commission survey of ambulance services in England and Wales

There is potential to improve the management of available resources

3.18 The demand for emergency ambulances to respond to 999 and doctors' urgent calls is not constant. It varies by the hour, the day of the week and the time of year. Ambulance services can detect patterns and trends and predict when peaks in demand are most likely but there is a considerable random element to demand for emergency ambulances, which makes very accurate prediction difficult. The challenge for the Service is to ensure nevertheless that they provide ambulance cover efficiently when and where it is needed.

3.19 In the rest of this part of the report we concentrate on how the Service make the best use of available resources in managing ambulance crews and vehicles so as to provide a responsive service. We consider three main aspects:

- How the Service profile the available ambulance resources, both by time of day and by location, to match patterns of demand.

- How the Service manage crews' time so as to get the most from them.

- The role of control centres in deploying ambulance resources.

Mostly the Service provide sufficient ambulances to meet average but not peak demand

3.20 Having sufficient ambulances to meet the very highest demand likely to be encountered at any given time of the day should help provide a good level of service but would cost more. As a consequence the Service aim to strike a balance between responding to demand within time targets whilst keeping within available resources.

3.21 In practice balancing demand and resources means careful planning of ambulance shift rosters, which determine how many ambulances are available at any given time and which is the responsibility of local Service managers. A broad policy or rule of thumb that the Service have applied is to provide for each station sufficient emergency ambulances each hour to meet at least average demand.

3.22 The Service have also used operational research to help this process for local ambulance station areas. This involves demand trend analysis over a year or longer and modelling resource options, demand patterns and expected response time outcomes to find the optimum number and location of ambulances. But only the Service headquarters staff have the necessary expertise and they have most often used the techniques only when local managers suggest a particular case for doing so, which is relatively rare. As a result the Service have used these techniques to review resources for only four out of ten divisions since 1995.

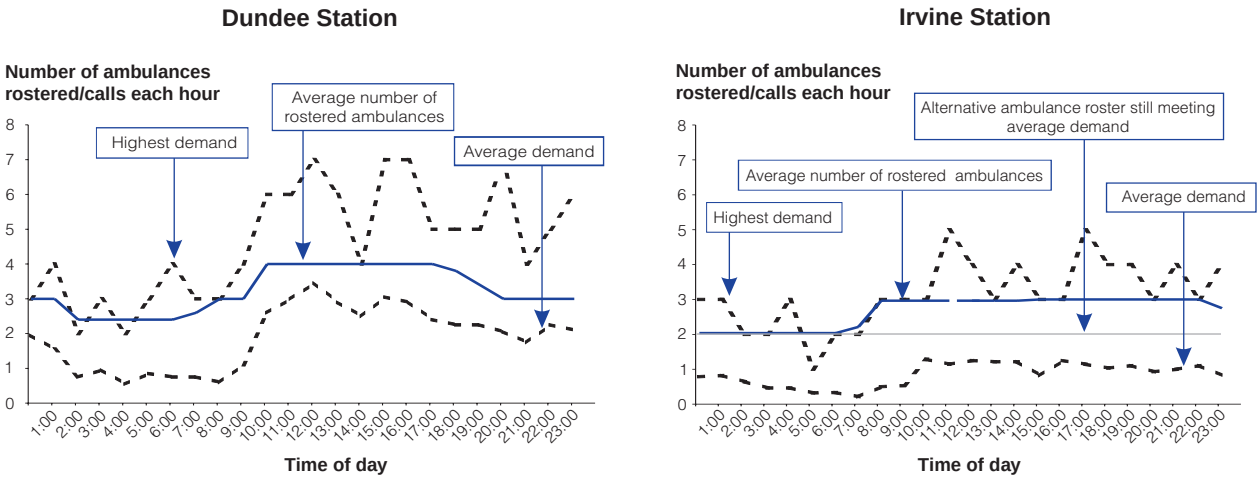
3.23 In the absence of such full analysis we analysed how closely the Service match available resources to demand patterns, and other aspects of operational efficiency, at a sample of 22 of the Service's busiest stations. The 22 stations were responsible for 57 per cent of emergency ambulance responses in 1998-99. We reviewed the Service's shift rosters in these stations for five sample weeks between June 1997 and September 1998.

3.24 We found that in 16 of the 22 sample stations examined, consistent with their broad policy, the Service structured shifts so as to meet at least the average but not necessarily the peak demand arising. For example, Figure 19 shows how at Dundee station there were sufficient vehicles and crews on shift to meet average weekday demand per hour but not the highest peaks of demand. We found also that, like Dundee, most of the sample stations sensibly rostered more ambulances to be on duty during the hours of 10.00 to 18.00 when there is more demand arising from doctors' urgent calls. Similarly, we found that there were generally fewer shifts rostered at the weekend reflecting the lower demand placed on the Service during this time.

Figure 19

Balancing resources and demand at two sample stations

*The Figure shows an example of how the Service provide different levels of resources to meet demand at two locations. **Dundee station** (below left) complies with the Service's broad resourcing policy to provide sufficient emergency ambulances each hour to meet at least average but not necessarily the peak demand placed on them. In contrast, **Irvine station** (below right) provides more resources, to meet average demand comfortably and a large part of peak demand, and could roster fewer ambulances and still meet average demand. This raises a question about how the Service achieve the best balance between resources and responsiveness*



Source: Analysis of shift rosters and demand over five separate weeks during 1997 and 1998. To simplify this presentation we have excluded weekend results and results for the week ending 4 January 1998 because of the very high levels of demand in that week.

3.25 In the remaining six of the 22 stations examined we found that for much of the time the Service rostered more crews and vehicles than the minimum their broad policy suggested. For example, Figure 19 also shows the results for Irvine station. At these stations there were sufficient emergency ambulances to meet average demand comfortably and a large part of peak demand. However, although it would be possible to reduce resources at stations like Irvine and still meet average demand, it is not necessarily the case that they are "over-resourced" because it is possible that reducing resources would diminish overall

responsiveness unacceptably. The findings therefore raise an important question about how the Service achieve the best balance between resources and responsiveness, which we consider further below (paragraphs 3.30 to 3.32).

Better positioning of vehicles may help to improve efficiency and responsiveness

3.26 No matter how many ambulances the Service have available, if they position them too far away from where calls for help originate they will not be able to achieve satisfactory response times. In short, ambulances must be available where the demand is.

3.27 The Service is organised so that each ambulance station covers a given geographic area of operation. This can and should provide efficiency benefits such as more effective management supervision of ambulance crews, development of crew knowledge of local geography and the road network, scope to share work between crews and reduced travel distances resulting in faster response times. At the same time, the Service may require an ambulance to leave its normal operational area to help meet demand elsewhere if circumstances require. This expedient may involve a loss of efficiency, particularly if a vehicle consistently has to operate a long distance from its normal area.

3.28 In our analysis of 999 and urgent responses during one week commencing 30 March 1998 at a sample of stations we found:

- In only about half of cases (48 per cent) did ambulances respond from within their normal operational area to incidents within the same area.

- In over a third of cases (38 per cent) ambulances responded to incidents outside their station's normal area of operations. Mostly these were ambulances that left their normal area to respond to an incident, though 13 per cent were already outside their normal area (in response to earlier work) when they responded to a further incident outside it.

- In the remaining cases (14 per cent) ambulances on their way home from work outside their normal area responded to calls within their area.

3.29 These figures varied greatly between individual stations. In particular, ambulances from stations such as Haddington, Kirkintilloch and Clydebank, which are located some 30 kilometres from the centres of Edinburgh and Glasgow, are drawn into the cities to drop off patients at hospital. On becoming free for the

next job, the ambulances are being immediately deployed to other calls within Edinburgh and Glasgow. We recommended that the Service should investigate further the reasons why out of area work is occurring and whether any changes in working practice are required.

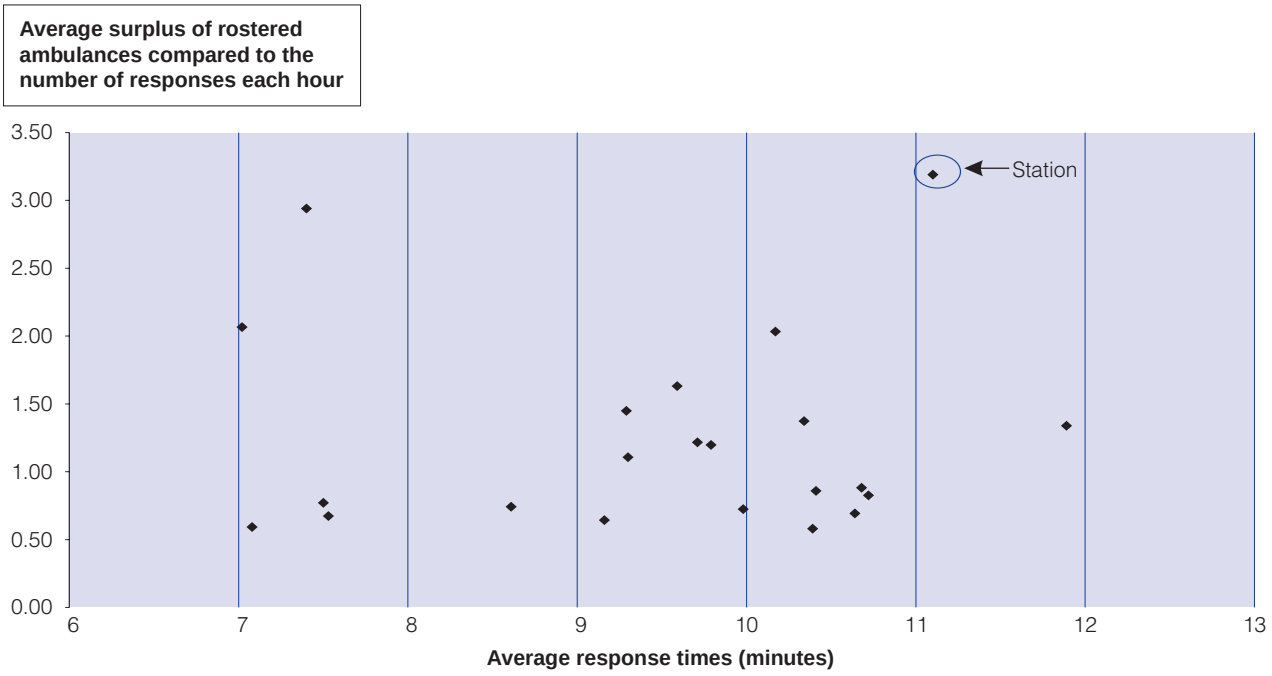
The Service should use more systematically existing tools to review ambulance deployment

3.30 In the light of these results we conducted some analysis to help understand the relationship between available resources, demand and response times. In particular, for our sample of 22 stations we calculated the average difference between (i) the number of rostered ambulances and (ii) demand per hour over our sample period; we then compared this with (iii) the average response time at each station. The results indicate that there is only low correlation between ambulance availability and average response times (Figure 20).

Figure 20

The relationship between available resources, demand and response times

The Figure shows that stations with the largest surplus of rostered ambulances compared to demand do not necessarily have the shortest average response times



Source: Analysis of shift rosters and demand over five separate weeks during 1997 and 1998.

3.31 Drawing together the results illustrated in Figures 19 and 20, it is evident that the existence of sufficient ambulances to meet average demand, which is the basis of the Service's resourcing policy, does not guarantee that response time targets will be met. It is inevitable that at any given time peaks in demand may arise which stretch the Service's ability to respond to calls based on average demand.

3.32 The Service could consider using the scientific methods they already deploy on occasions (paragraph 3.22) on a more frequent, systematic and deliberate basis. For example, reflecting a strong proven relationship between costs and population density (Part 2), the Service could review all stations where:

- the unit cost of each emergency response compared to other stations appears high, taking into account relative density of population served (suggesting there may be scope for more efficient deployment of resources without compromising response times);

- response time targets are not met and unit costs are low (suggesting that additional resources could promote improvements in responsiveness);

- responses to calls outside the station's normal operational area are a high proportion of workload.

There would need to be resources for the small increase in headquarters costs for the additional analysis, and for some associated costs. For example, the Service would need to implement systems to permit them to calculate accurately costs at station level. However there would also be the prospect of offsetting improvement in efficiency through better matching of resource and demand. There would also be greater confidence that the Service were addressing resource decisions objectively and with consistency between areas.

The Service need better targets for incident service time

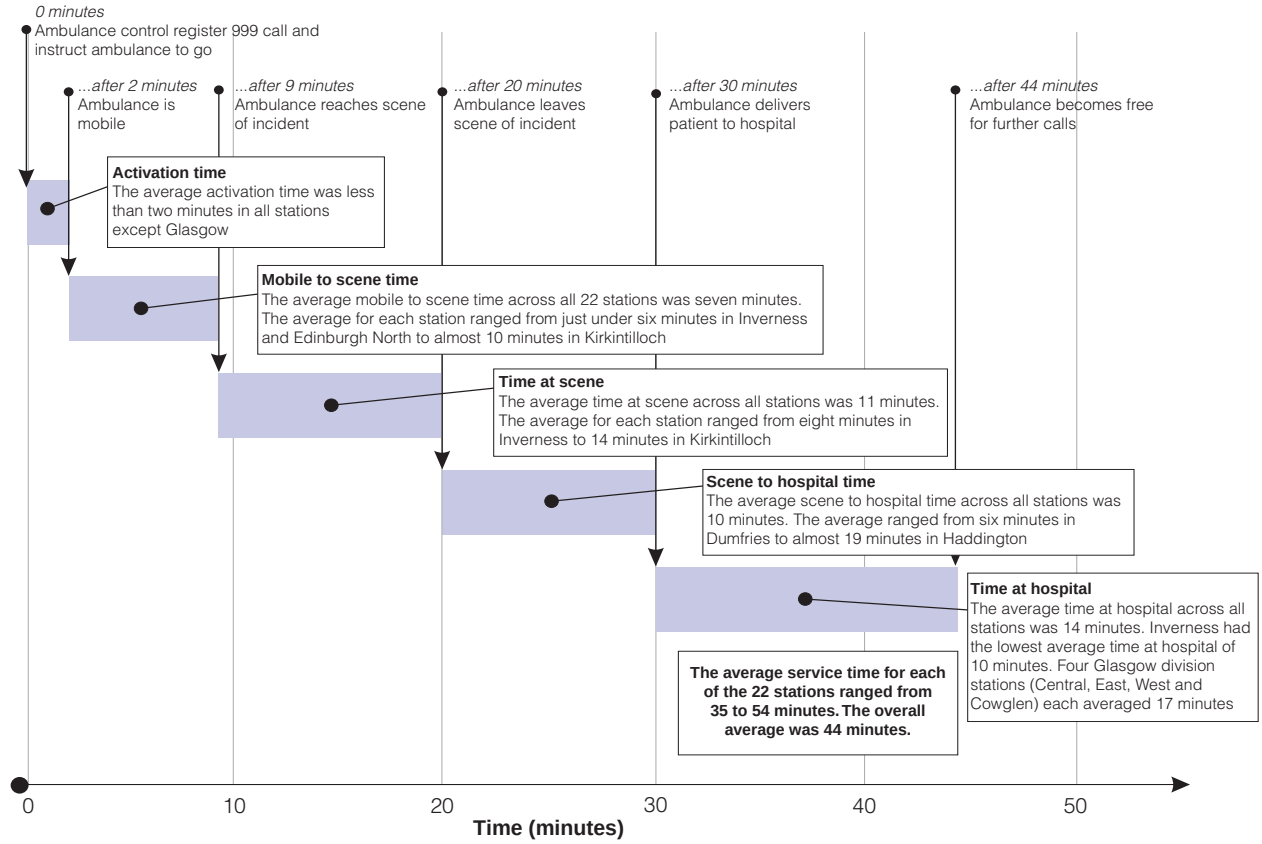
3.33 The more quickly ambulances can reach patients and, as usually happens, transfer them to hospital, the sooner each crew is available for further work. So a large determinant of vehicle and crew productivity is the whole time taken to deal with each 999 and doctors' urgent incident - the incident service time. (This is different from the response time, which measures only the time taken from the 999 call to an ambulance arriving at an incident.)

3.34 We looked carefully at the different components of the service time to deal with each 999 incident. Figure 21 shows that for each component of the service time there were significant variations at individual stations compared to the results for the Service as a whole.

Figure 21

999 incident timeframes - the components of incident service time

The more quickly ambulances can reach patients and, as usually happens, transfer them to hospital, the sooner each crew is available for further work. The Figure shows that for each component of the service time there were significant variations at individual stations compared to the results for the Service as a whole. Time at hospital accounts for the single largest component of incident service time.



Source: Analysis of emergency responses for the Service's busiest 22 stations over five weekly periods

3.35 Traffic congestion, distance to travel, nature of incident and patient condition can all affect how long an ambulance needs to deal with each call. So it is not realistic or sensible to expect that all stations achieve the same results. At the same time, emergency ambulances and crews are the Service's single most valuable (and most costly) resource and it is reasonable to seek to minimise service time wherever possible, in the interests both of economy and improving performance. In the busiest stations, where managers often task crews with the next job as soon as they complete the previous one, reducing the time taken to deal

with each call means each crew can deal with more cases in each shift. For these stations reducing the total time for each call may also enable responses to other calls faster than would otherwise be possible.

3.36 At the same time there is a need to balance a concern for efficiency with the well being of patients and crews. For example the work of ambulance crews can be stressful to those attending serious incidents and may sometimes even be physically dangerous. So, at the end of responding to a particular incident, it can be good practice for crews to have a short break before being tasked with the next job.

3.37 In addition to the response time targets set by the Secretary of State, the Service have set a target that they should activate an ambulance within three minutes of every 999 call being received. However, no other targets exist for the other stages of the time taken to deal with each call. The consequence is that for most of the time that the Service take to answer a call - i.e. on average for 34 minutes within the total for each call of 44 minutes - there are no targets to encourage the crews to minimise the service time. Nor have the Service collected data to explore reasons for the significant variances which occur.

3.38 The Service recognise the benefits of actively managing how long crews take to respond to each call, and there are several initiatives to improve this aspect of their work. For example, in Greater Glasgow division the Service have an initiative to reduce response and service times (Part 2). Another example is that several ambulance control centres have also improved monitoring by using control facilities to "flag up" and query vehicles that have spent longer than ten minutes at hospital.

3.39 Improved information about where components of service time appear to be high should enable the Service to secure greater efficiency in how they respond to emergency and urgent calls. We recommended to the Service that they should set new targets to allow them to measure and monitor systematically all aspects of the time taken to deal with each call. For example, it is noteworthy that on average the largest single component of the incident service time is time spent at hospital. The Service need to consider carefully what steps they can take to minimise the time the crews spend handing over patients to hospital medical staff - such as the steps taken in Glasgow (Figure 12 above) - so as to maximise the other time available to crews to respond to calls.

Control centres have a key role to ensure overall responsiveness

3.40 Control centre staff play an important role in ensuring an appropriate ambulance response to an emergency incident. The choice of ambulance tasked with attending an incident can influence the response time, the overall service time and the ability of the ambulance crew to provide effective clinical care to the patient. Whilst the workload of control room staff is largely demand led, they must be able to deal with incoming telephone calls quickly, calmly and efficiently.

3.41 Deploying resources well and minimising the time taken to respond to each call is likely to help maximise ambulance availability and productivity. To complement this it is important to review what factors in practice result in longer response times. This can help control room managers to identify trends in performance, and problem areas where further management attention is necessary. But although Service control room staff are required to note the reasons for excessive response times, they have not previously undertaken any systematic analysis of the results (Part 2). We therefore recommended to the Service that they should investigate the potential for a computerised ambulance control system to provide regular reports about excessive response times that reflect the particular response standards that apply for each station.

3.42 The Service have recently acquired new technology to help enhance the operational control of crew vehicle resources and improve response times. In February 1999 the Service equipped all Glasgow emergency ambulances with automatic vehicle locating systems. These permit control staff to see at a glance - without having to rely on speaking to individual ambulance crews, which may not be possible immediately - the geographic location and status of each emergency ambulance, enabling them to deploy the best-placed ambulance in each case. Also in February 1999, the Service began trials of a geographic information system intended to enhance the ability of the Service to interrogate the incident data from their computerised ambulance control system.

3.43 Both systems may help the Service deploy ambulances better and improve response times. They will make it much easier for the Service to analyse hour by hour where exactly emergency incidents happen and therefore may be likely to occur in future. This could permit the Service to position ambulances better i.e. in response locations selected to be closest to where demand is most likely to arise so that response times can be minimised, though any such change would require careful preparation and management. For example, using temporary response locations may require greater flexibility from crews (who otherwise may be based

in permanent ambulance stations) and other factors to consider would include how to maintain fuel and medicines on board ambulances when they are not required to return to a permanent station between calls.

The Service should review the provision and resourcing of the existing eight separate control centres

3.44 The Service have set standards for how quickly control centre staff respond to emergency telephone calls (Part 2), though they do not measure or have other targets for staff productivity. We examined the productivity in each of the Service's eight control centres during 1997-98, measured as the ratio of emergency ambulance responses to each staff member. We also looked at the relationship between productivity and how far each control room achieved telephone-answering standards.

3.45 For emergency ambulance control room staff, we found that the productivity varied by a factor of more than 100 per cent between control centres, and was generally lower in the smaller centres dealing with fewest responses (Figure 22). This is most likely to be because it is not possible for the four smallest control centres to have less than the minimum essential cover of one officer and one control room assistant 24 hours per day, seven days per week.

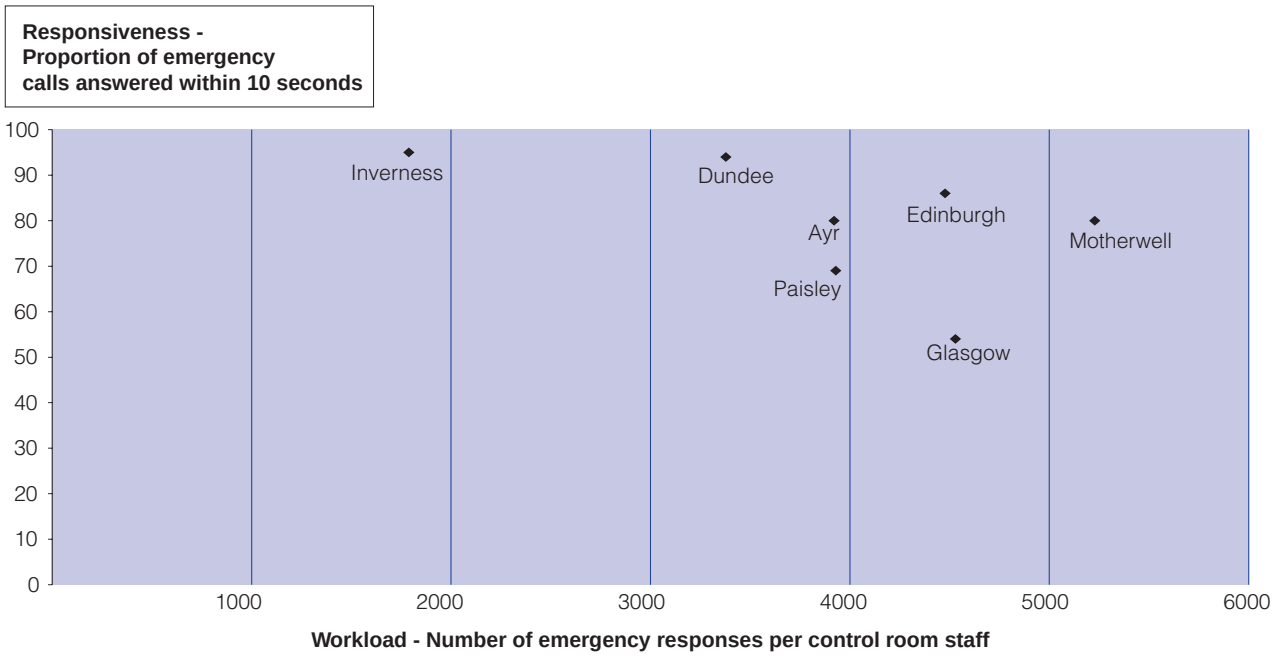
3.46 As regards performance against telephone answering standards we found there was no definite relationship between performance and productivity. So relatively less busy control centres such as Dundee and Inverness performed better against the standard to answer all 999 calls within 10 seconds. But in other equally busy stations with similar workloads, such as Edinburgh and Glasgow, there were wide differences in reported performance.

3.47 We found also that there were wider issues within the Service about the level of staffing and training and development needs for staff in control centres. For these reasons we recommended that the Service establish clear benchmarks for assessing control room staff productivity and consider improvements in how they measure performance against telephone answering standards. We suggested also that there may be scope for the Service to make a wider strategic review of the provision and resourcing of the existing eight separate control centres, to establish whether economies in provision could be achieved. The Service accepted our recommendation and they are committed to review the number, role and purpose of their control centres by March 2000.

Figure 22

Emergency ambulance control room workloads and responsiveness 1997-98

The Figure shows that the workload for each operator varies widely between ambulance control centres. There is no definite relationship between workload and performance against telephone answering standards



Note: There was no available data for emergency service telephone answering standards for Aberdeen

Part 4: Providing effective pre-hospital emergency care

4.1 This part of our report concerns how the emergency ambulance service meet the clinical needs of patients for whom they care. The Service aim to save lives in emergencies and more generally support the health and well being of all patients they care for. We examine what evidence there is to provide assurance that the Service provide effective pre-hospital emergency care.

4.2 Figure 23 illustrates the main aspects of emergency ambulance clinical care.

Targeting, quality and effectiveness are essential components of ambulance clinical care

4.3 Within available resources, the Government expects the whole NHS in Scotland to achieve the highest possible standards of healthcare and to assure the public that these are being achieved. This includes all aspects of healthcare including the effectiveness of clinical practice, the environment in which it is delivered and responsiveness to the needs and preferences of patients[17].

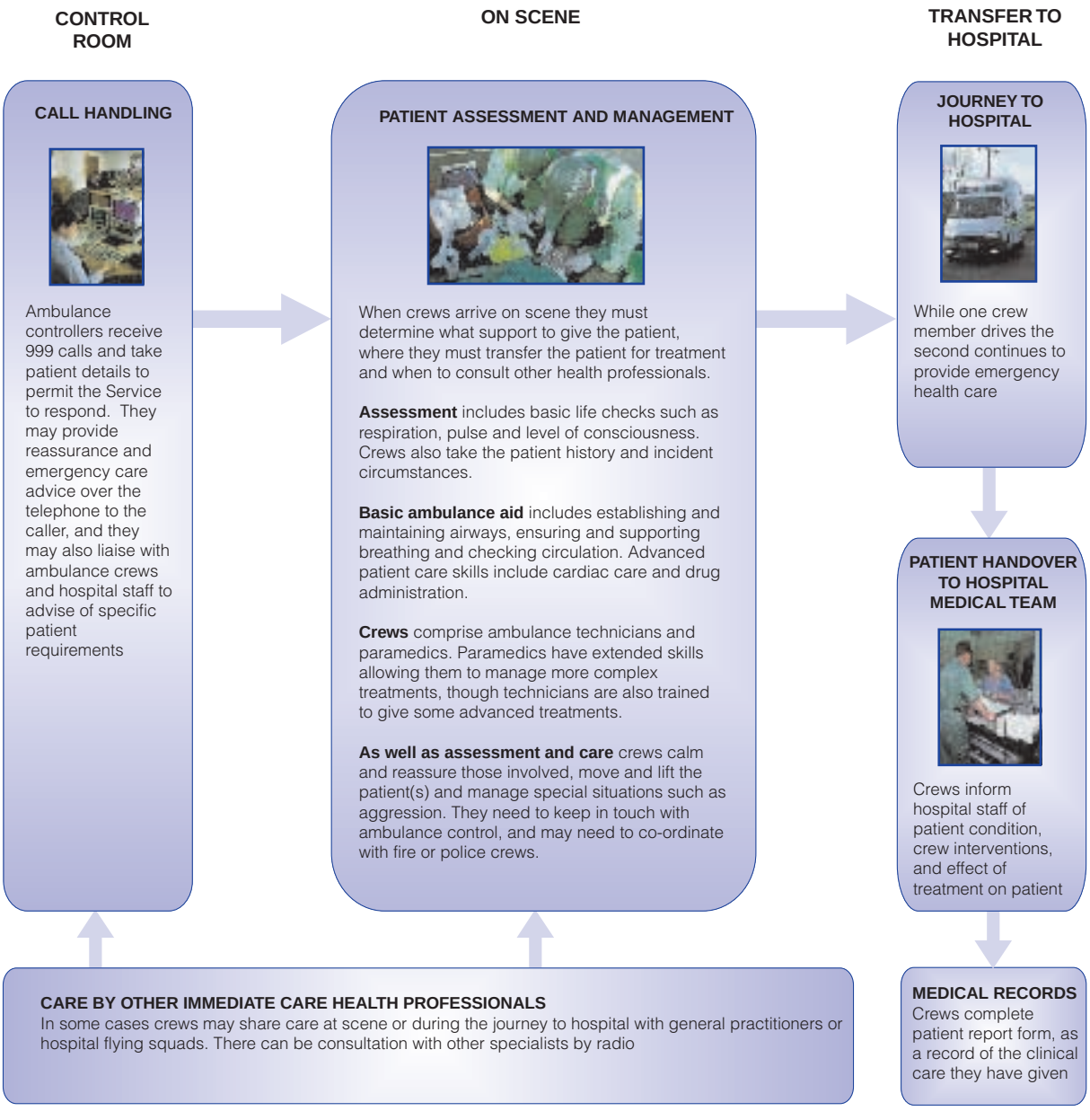
4.4 This goal for high quality clinical care applies to the Service and the Service's recently revised Mission, Core Purpose and Key Corporate Objectives statement (Appendix 1) includes commitments consistent with it. These include commitments to keep patient care to the fore, to respond promptly and effectively to need, and to drive the consolidation and improvement of services through the support of research and development and decisions based upon appropriate evidence and clinical effectiveness.

17 *Designed to Care, Renewing the National Health Service,* The Scottish Office Department of Health, December 1997. *Priorities and Planning Guidance for the NHS in Scotland 1999-2000*, NHS Management Executive Letter number 63, September 1998, section 3.

Figure 23

The main aspects of emergency ambulance clinical care

Saving lives and improving patient health and well being



Source: National Audit Office

4.5 Assessing good practice in pre-hospital emergency ambulance care means considering questions such as:

- **Targeting the clinical care that ambulance crews provide.** It is important that the Service target clinical care towards areas that provide the greatest benefit to patients. The Service need to consider how they will contribute to specific health needs and priorities set for the NHS as a whole, and opportunities for collaboration with other providers such as general practitioners and hospital emergency departments to improve effectiveness[18].

- **Clinical effectiveness and evidence based care.** Clinical effectiveness means providing healthcare which results in measurable benefits for patients, especially in terms of survival or reduced morbidity. Good practice is that the Service base healthcare procedures on specific research showing positive evidence of improvement to patient health and well-being[19].

- **Clinical quality.** This means providing healthcare in line with professionally recognised standards. For example, ambulance crews need to observe a range of precautions when administering drugs to patients or giving assistance such as defibrillation in cardiac arrest cases[20].

4.6 One way of determining the clinical quality and effectiveness of the Service would be to measure the Service's compliance with recognised clinical quality standards and seek to identify the specific health benefits for individual patients. However, it was not practicable for us to complete such in-depth clinical effectiveness research as part of our study. Instead we undertook the following research to capture evidence concerning the clinical quality and effectiveness of the Service's pre-hospital care:

- We examined the Service's strategic framework and processes relevant to the clinical care that they provide, so we could understand what processes existed to support quality.

18 *Designed to Care, Renewing the National Health Service,* The Scottish Office Department of Health, December 1997, paragraphs 4, 5 and 8.

19 *Designed to Care, Renewing the National Health Service,* The Scottish Office Department of Health, December 1997, paragraphs 20 to 22. *Priorities and Planning Guidance for the NHS in Scotland 1999-2000*, NHS Management Executive Letter number 63, September 1998.

20 *Clinical Governance*, NHS Management Executive Letter number 75, November 1998. *Standard Operating Procedures, Quality in Pre-hospital Patient Care*, Scottish Ambulance Service

- We consulted the Service's healthcare partners, also concerned with the emergency care of individual patients, who could provide an informed view about the effectiveness and quality of the Service's pre-hospital emergency care. This included liaison across Scotland with clinical staff from hospital accident and emergency departments, acute admission units and general practice, and with commissioning staff in Health Boards. To put our findings into context, our research also involved individual patients and patient representatives, to identify from the patient perspective, the quality of care that emergency ambulance crews provide.

- We reviewed the current research and literature, and networked with other key players in emergency ambulance clinical quality, audit and effectiveness work. Our review included the work of Heartstart Scotland and of the Scottish Trauma Audit Group (Figure 24).

Heartstart Scotland and the Scottish Trauma Audit Group

Figure 24

Heartstart Scotland is one of the world's largest out-of-hospital cardiac arrest audits. It is a collaborative initiative between the Department of Medical Cardiology of the University of Glasgow and the Scottish Ambulance Service and followed the installation of automated external defibrillators in all emergency ambulances in Scotland during 1988-89. Since then the aim of the audit has been to document the overall results of out-of-hospital resuscitation by ambulance technicians and paramedics in Scotland and to identify factors predicting the outcome of resuscitation.

Results show that between May 1991 and March 1998 the Service had defibrillated 11,407 out-of-hospital cardiac arrest patients, with 22 per cent of patients being alive on hospital admission and 11 per cent being discharged alive from hospital. Patient outcomes varied with the type of treatment and confirm the life saving benefits of early cardio pulmonary resuscitation (CPR) and defibrillation. Thus for cardiac arrest patients who received CPR and defibrillation the proportion of patients discharged alive from hospital varied between 43 per cent (in cases where the ambulance crew witnessed and immediately treated the cardiac arrest), 12 per cent (where a bystander witnessed the cardiac arrest and gave early CPR but defibrillation took place later) and three per cent (where no-one witnessed the arrest and CPR and defibrillation took place later).

Source: Heartstart Scotland data from the University of Glasgow 1999; Scottish Trauma Audit Group: "An evaluation of paramedic activities in pre-hospital trauma care" (Injury Vol 28, 623-627 1997); Scottish Ambulance Service: Annual Clinical Audit Report 1998 -99

The Scottish Trauma Audit Group was set up in 1991 to audit the management of seriously injured patients. The audit involves Scottish hospital accident and emergency department staff and the Service, co-ordinated by an independent central research office in Edinburgh.

Amongst a wide range of audits, one study by the group evaluated the impact of paramedic activities in pre-hospital trauma care in Scotland. This concluded that for serious injury cases paramedics deliver a better process of care at scene than less highly trained technicians, though their activities do not appear to improve significantly patient outcomes measured by mortality or length of stay in intensive care.

- With the Service, we undertook a pilot clinical audit project, which included auditing some aspects of the Service's emergency clinical processes. We looked at other aspects of how the Service could best use clinical information, for example how crews and hospital staff shared such information to improve effectiveness.

The Service need to strengthen their clinical direction and development

The Service have established processes which support clinical quality

4.7 The Service's senior management and board are ultimately responsible for determining clinical issues that affect the Service and the Service's medical director takes the lead responsibility for the development and maintenance of clinical policy and procedures. This includes a specific responsibility to ensure that the Service maintain awareness of clinical issues which may affect the Service. The medical director also liaises on clinical matters as they arise with external parties including all NHS Trusts and Health Boards in Scotland. An example is the Service's recent work consulting other healthcare providers about the opportunity for ambulance crews to do more in the early management of patients with heart attacks.

4.8 National and local committees with representatives from other healthcare providers and health professions advise the Service on clinical matters. National professional bodies such as the Royal College of Surgeons of Edinburgh nominate representatives on the Service's professional advisory group, which advises on clinical issues affecting the Service as a whole. There are nine local paramedic steering committees, which are responsible at local level across Scotland for advice on training and other clinical matters affecting the Service.

4.9 Specific procedures that the Service operate which contribute to effective pre-hospital emergency care are:

- **Mandatory training and qualification of frontline crews in professional pre-hospital emergency care.** All frontline crews must, as a minimum, have passed basic technician or paramedics skills training courses which the Institute of Healthcare Development recognise. Crews must periodically demonstrate their continued professional competence by completing mandatory refresher training and independent re-assessment.

- **Clinical protocols for patient care.** Consistent with guidance from the Scottish Executive to the whole of the NHS in Scotland, the Service have introduced clinical protocols to enhance the quality of clinical care[21]. Since 1994 the Service have approved 35 written clinical protocols for their emergency ambulance crews[22]. Figure 25 gives examples of the protocols and procedures that crews follow in treating patients.

Figure 25

Examples of the Service's clinical protocols for patient care

Protocols for the guidance of paramedics and technicians:

- **Adult basic life support** (includes patient assessment, airway management, breathing,circulation management, on-going resuscitation)
- **Oxygen therapy** (via a mask, for airway problems and for conditions including suspected heart attack)
- **Presumption of death** (when and when not to attempt resuscitation)
- **Cardiac arrest** (use of coronary pulmonary resuscitation and defibrillators)

Protocols for the guidance of paramedics only:

- **Naloxone** (a drug used to reverse coma and respiratory depression)
- **Diazepam** (a drug used to eliminate convulsions in epileptic or febrile fits)
- **Tension pneumothorax** (for example, what to do where there is blunt chest trauma)
- **Acute bradycardia** (includes treatment where there is slow pulse and symptoms such as shock, chest pain and heart failure)

Source: National Audit Office

The Service need clearer objectives and priorities about their contribution to wider health improvement goals

An example of a clinical intervention covered by clinical protocols.

4.10 Taken together, the Service's clinical procedures provide reassurance that they are able to provide satisfactory standards of patient care. However, there remains scope for clearer direction on clinical matters, to increase confidence that crews are making the most effective contribution to pre-hospital patient care. In particular a strategy statement or analysis dealing with clinical direction and development across the Service is now an essential requirement for preparing a Health Improvement Programme, which is required as a consequence of the designation of the Service as a Special Health Board from April 1999 (Part 1). As we discuss below, areas where fuller analysis of issues may be helpful include targets for achieving health gains, responsiveness and staff skills mix.

21 *Clinical Guidelines*. The Scottish Office, A report by a Working Group set up by the Clinical Resource and Audit Group, May 1993.

22 *Standard Operating Procedures, Quality in Pre-hospital Patient Care*, Scottish Ambulance Service

Targets for achieving health gains

4.11 Targets for achieving health gains such as reduced mortality for a given disease or improving the results of patient treatment in priority areas can facilitate service development in key areas of clinical care. However the Service have no specific goals in these areas.

4.12 An example of where the Service could consider a specific target is how they are responding to the Scottish Executive's year 2010 target for the NHS as a whole to reduce by half compared to 1995 the number of people under age 75 dying from coronary heart disease[23]. The Service have aimed to improve rates of survival from cardiac arrest amongst ambulance patients. In April 1999, the Service's clinical audit manager completed analysis of crew management of the previous twelve months cardiac arrest patients, concluding that the Service overall were reasonably successful in resuscitating cardiac arrest victims (Figure 26).

Figure 26

Cardiac arrest amongst ambulance patients in Scotland 1998-99

	Number of patients	Per cent
Number of ambulance responses involving patients suffering cardiac arrest:		
■ Treated by ambulance technician crews	904	35
■ Treated by ambulance paramedic crews	1,707	65
■ Total in year	2,611	100
Number of patients with general practitioner also in attendance	700	27
Number of patients receiving by-stander or general practitioner cardiopulmonary resuscitation	931	36
Number of patients receiving defibrillation	1,566	60
Average number of defibrillation shocks per patient	4	-
Initial success rate (number of patients with signs of life on admittance to hospital)	310	12

Source: The Service

Responsiveness

4.13 Providing services that are responsive to patients' varying clinical needs is important to delivering high quality patient care in the NHS [24]. Ambulance response times, though, are slower than target in some parts of Scotland, and

23 *Towards a Healthier Scotland , a White Paper on Health,* The Scottish Office Department of Health February 1999. The 2010 target replaces a previous year 2000 target to reduce by 40 per cent compared to 1990 premature mortality from coronary heart disease

Example of a defibrillator in action.

there are potential benefits from responding first to patients with the most urgent medical need (Part 2). The Service could therefore usefully consider what and where specific improvements in response times may be most needed and why, what benefits might be obtained at what cost and the options for improving performance.

Staff skills mix

4.14 Matching emergency crew skill level to patient need is part of a quality emergency ambulance response[25]. One reason for the Service's higher expenditure in recent years has been the recruitment of more highly trained ambulance paramedic staff. The expected benefit to patients is that paramedics are able to deploy a higher standard and range of emergency healthcare than ambulance technicians[26]. However, there is limited definitive research confirming this practice[27].

4.15 Despite the expected benefits to patients from paramedic care there remain more technicians than paramedics in the Service. Moreover our pilot clinical audit showed that less skilled ambulance technicians can attend a greater number of moderately to severely ill patients than paramedic crew (Figure 27). In our research some clinicians such as general practitioners working alongside the Service expressed concern about the difficulty in not knowing whether a technician or a paramedic crew would attend any given incident.

24 *Designed to Care, Renewing the National Health Service,* The Scottish Office Department of Health, December 1997

25 *Standards for Ambulance Emergency Medical Services*. Health Services Accreditation, January 1999

26 *Training Manuals for Paramedics and Technicians* Institute of Healthcare Development.

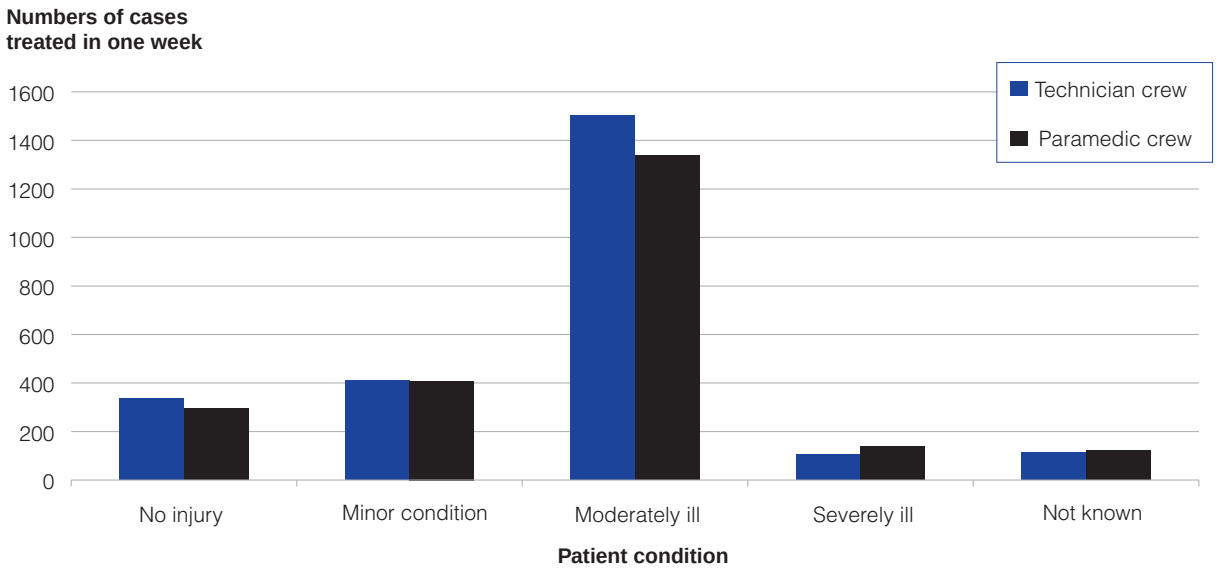
27 As detailed in Figure 24, one study in Scotland in 1997 showed that for serious injury cases paramedics deliver a better process of care at scene than less highly trained technicians, though their activities do not appear to improve significantly patient outcomes measured by mortality or length of stay in intensive care. Some researchers suggest that in contrast in some specific circumstances paramedic intervention is associated with worse patient outcomes compared to care by ambulance technicians (*The Costs and Benefits of Paramedic Skills in Pre-hospital Trauma Care*, University of Sheffield, 1998). The authors concluded that the protocols used by paramedics increase the mortality from serious trauma involving bleeding injuries, though they may also lead to better outcomes for those who survive. Delays on scene and inappropriate pre-hospital fluid infusion may be contributing factors to the observed increase in mortality.

Figure 27

Deployment of emergency ambulance paramedic and technician crews

Severity of patient condition and ambulance crew type

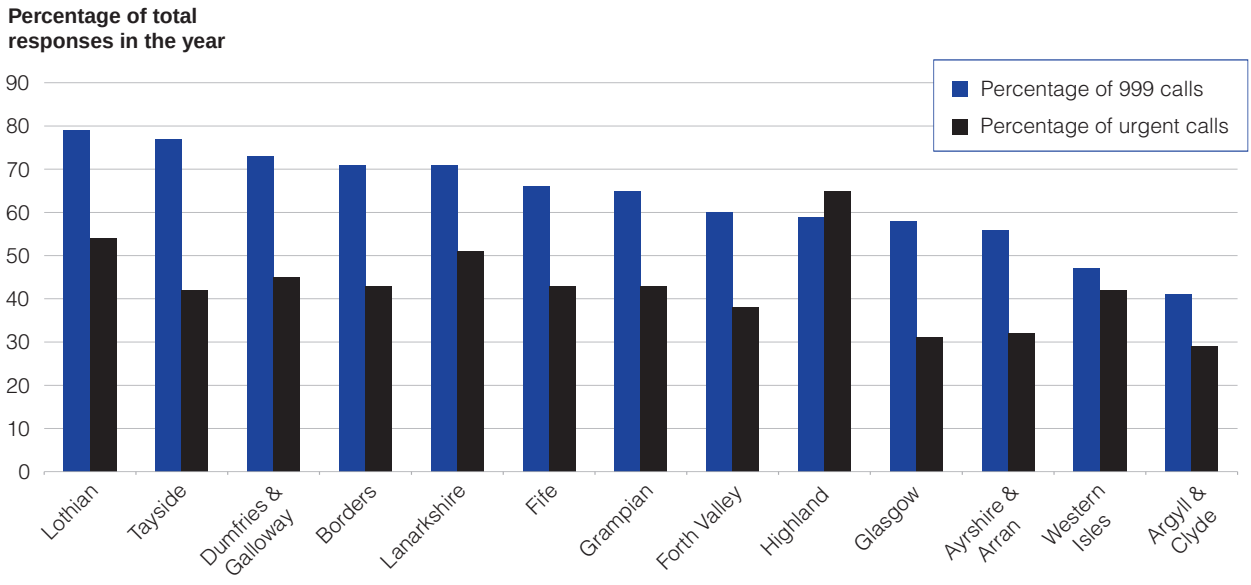
There is no strong relationship between how ill a patient is and the skill level of the ambulance crew who attend. This reflects the Service's deployment system, which is not based on priority dispatch.



Source: National Audit Office/Service collaborative clinical audit project. Data relates to a sample of 4,458 patients transported in the week commencing 26 November 1997

Percentage of paramedic responses by Health Board area 1998-99

There is considerable variation across Scotland in the proportion of responses which paramedic crews make, both between areas and call type (999 or doctors urgent call)



Note: There are no paramedics in Orkney and Shetland

Source: Service management statistics for 1998-99

The Service are now preparing their first Health Improvement Programme

4.16 Health gain is a key aspect of performance on which the NHS in Scotland is monitored. As a newly established Health Board, the Service are now preparing their first Health Improvement Programme covering the period 1999-2004. This is an NHS planning procedure established in 1997 through which Health Boards are required to work with their health partners in an open and collaborative manner to secure health gain. Accordingly, this is an opportunity for the Service, in consultation with patients and the rest of the NHS, to improve their direction of clinical matters and to set clearer objectives and priorities concerning health gain, based on assessment of clinical need.

Patients and NHS staff are satisfied with crew quality of service

4.17 Ninety-seven per cent of the patients whom we surveyed described accident and emergency crews as "professional", "reassuring", "calm", "efficient", "caring" and "good communicators". There was also very positive feedback from a number of clinicians working alongside the Service, including hospital and general practice staff (Figure 28).

Figure 28

Healthcare provider views on emergency ambulance crews quality of service

"They are excellent at doing their job"

"Pleasant and confident - inspiring to patients

"I only know about Grampian - first rate"

"Caring paramedics, calming of irate individuals, good use of skills"

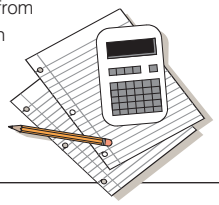
"Excellent hand over techniques" (concerning the transfer of patients into the care of hospital staff

"They have all round abilities required in a remote area"

We received questionnaire responses from 300 healthcare providers across Scotland, also involved in emergency care pathways.

Other providers included general practices, coronary care, maternity and head injury units, and hospital A&E departments.

Responses were from a mixture of health professionals.



Source: National Audit Office/Frontline stakeholder research

NHS staff see scope to develop aspects of the emergency service

4.18 The Service's healthcare partners confirmed to us that emergency attendance, patient assessment, patient life support/immediate care and rapid transport to hospital remain at the heart of the Service's work. While praising crew

emergency care they saw opportunities to further improve Service quality in the areas of minimising pre-hospital time, closer working between the Service and other healthcare providers and increasing knowledge about clinical impact.

Minimising pre-hospital time

4.19 Our research showed that NHS staff had a wider concept of ambulance responsiveness than is implicit in the Service's key performance targets, which are concerned mainly with the time taken to arrive at a call. Hospital clinicians stressed that the Service should concentrate on this, and of course on patient care, but also on transporting the patient as quickly as possible *from* an emergency incident *to hospital*. This is because the evidence is that any intervention on scene reduces the window for definitive care for the patient, which in more serious cases can only be provided in hospital[28]. So the Service need to manage carefully the extent of intervention on scene to provide the best chance of patient survival and recovery by early hospital treatment.

4.20 While the predominant message in this area was to minimise pre-hospital time as well as response time, clinicians recognised that in rural areas emergency ambulance services may benefit more from greater ambulance crew intervention. This is because of the relative remoteness of hospitals in these areas and inevitably longer journey times in some cases. Again, though, care needs to be provided in partnership with doctors, for example through systems which operate in many areas that permit ambulance crews to co-ordinate closely with general practitioners with enhanced immediate care skills[29].

Partnership working and a customer oriented approach

4.21 Hospital and general practice clinical staff whom we consulted recognised and valued the co-operation and collaboration that the Service often provide. However, they still saw scope for the Service to improve communication and consultation with them as healthcare providers. They believe that this would help the Service to tailor aspects of care in a way that would benefit patients. For example, direct ambulance radio communication with hospital coronary care units and immediate care general practitioners could help ambulance crews better manage individual cardiac care patients.

28 *The Costs and Benefits of Paramedic Skills in Pre-hospital Trauma Care*, University of Sheffield, 1998, Health Technology Assessment NHS R&D HTA Programme.

29 *Acute Services Review Report*. The Scottish Office Department of Health, May 1998

Improving knowledge about the Service's clinical impact

4.22 In our focus group research, hospital and general practice clinicians and others expressed concern over the lack of clinical quality and other information to help measure the Service's contribution to pre-hospital care. In particular, commissioning staff in Health Boards emphasised that "developing a more clinically focussed audit tool was now a high priority for the Service, and that there was a need to develop leadership and expertise in this area within the Service."

Clinical information and monitoring should be strengthened

Improved clinical information would support better emergency pre-hospital care

4.23 Clinical information includes patient diagnoses, severity of illness measures, patient treatment details and information about outcomes and quality of care. For an ambulance service, ready access to such clinical information facilitates patient management and provides the basis for ambulance crews to learn how to develop and improve the care they provide. Specific evidence of where emergency ambulance services make a difference in clinical care, also facilitates the targeting of service development and investment. In order to achieve this, the Service needs to collaborate with their healthcare partners to track these emergency patients through their subsequent hospital and community care pathways and to collect relevant clinical data.

4.24 Some of the results of our collaborative clinical audit work with the Service illustrate how better clinical information may help to foster better emergency pre-hospital care. Figure 29 details some selected patient care findings from this work. It also illustrates some important questions arising where it may be beneficial for the Service to consider changes in care procedures or practices.

Figure 29

Collaborative clinical audit project - selected patient care findings and issues relevant to emergency ambulance care procedures and practices

Patient care findings	Issues arising
Management of on scene and pre-hospital times Average on scene times for 999 calls ranged from 11 minutes in Argyll and Clyde to 16 minutes in Fife. Some rural areas had faster pre-hospital times than did several urban environments. Moreover, for certain more serious marker conditions examined (arrest, chest pain, asthma, diabetes and overdoses/suicides) average pre-hospital times for doctors' urgent calls were sometimes less than for 999 calls in other areas.	*To maximise benefit to patient care the Service should investigate such time variations and anomalies, with a view to positive management of on scene and pre-hospital time to improve patient care and patient outcomes.*
Patient diagnosis information Our audit showed that the most common incidents were: medical unspecified (850 patients); chest pain (464 cases); limb injuries (428); abdominal pain (290); difficulty in breathing (289); unknown problem (222); overdose / suicide (210); trauma-collapse (191); trauma- road traffic accident (190). 152 patients refused treatment/transport.	*Understanding what are the most common conditions is important in devising effective training and care procedures. The Service should investigate opportunities for improving information about patient condition.*
Chest pain incidents 39% of these cases were managed as "doctor's urgent" incidents, resulting in significantly longer pre-hospital times for the patients concerned (55 minutes compared to 38 minutes for 999 calls).	*The Service may need to agree a policy with their health partners for managing chest pain incidents, i.e., to manage all such cases as emergency 999 calls to reduce pre-hospital times.*
Patient mix information Although crews had not recorded patient age in 13 per cent of cases, the available data showed some interesting variations. For example Dumfries and Galloway and Borders Health Board areas had relatively high percentages of patients in the 75+ age group (34 per cent each).	*This type of information could help the Service to target both staff training and the emergency care supplies that emergency teams carry, to the benefit of patients.*
Use of crew skills Overall, the most common specific treatments crews applied were: oxygen therapy (recorded in 29 per cent of patients); management of respiratory emergencies (13 per cent); management of cardiac emergencies (11 per cent); immobilising and supporting fractures (9 per cent). Crews used most other specific interventions relatively infrequently. Technician and paramedic crews applied similar skill sets. Paramedic crew used their extensive paramedic skills in less than 1 per cent of patient management cases, except for the administration of intravenous fluids (7 per cent of paramedic responses).	*All of these findings have implications for Service training, clinical audit and the targeting of crew skills. In particular, the audit suggested that where paramedic skills were deemed to have been relevant, these skills were recorded in only 44% of cases.*
Variations in clinical practice The use of oxygen in the management of chest pain in general is a Service policy. There was notable variation in this practice across Scotland, 46 per cent to 95 percent of Health Board area case loads. There also appeared to be some variation in clinical practice in the management of diabetics, asthmatics and limb injuries.	*The Service need to review whether these variations in clinical practice are justified, and what additional training or guidance to crews may be required.*

Source: National Audit Office/Service pilot clinical audit project

4.25 Because of the importance of the data they contain, the Service have encouraged ambulance crews to complete patient report forms in all cases[30]. However the results of our collaborative clinical audit project showed that, in November 1997, forms were missing for 44 percent of 999 responses and 38 percent of urgent responses, with considerable variation in completion between Service divisions. The audit work also suggested that crews needed to improve the quality of information they recorded. The Service accept the need to investigate why crews are not completing patient report forms in many cases.

4.26 We also worked with Service emergency staff to explore views more generally about the availability and use of clinical information in the Service (Appendix 2). The results showed that:

- 88 per cent of the staff in our survey considered some measure of improvement was needed with the patient care information available to them.

- The main difficulties in accessing patient care information included poor feedback arrangements, insufficient time, lack of encouragement, limited knowledge of information sources and of computing skills, and lack of user friendly information.

- However, staff frequently obtained feedback about their work from other sources particularly hospital staff. Many Service staff considered that it would be helpful to receive still more feedback on the quality of their patient care from the clinicians with whom they work, including from general practitioners.

Better monitoring is needed to ensure that the Service achieve satisfactory clinical quality

4.27 Clinical quality monitoring is also an integral part of healthcare provision, to ensure that patients receive sufficient, effective healthcare in line with professional standards when they need it[31]. Regular monitoring may include:

30 Ambulance services use patient report forms to capture information about individual responses such as patient age, condition, treatment, mobility, response times, and crew attending. Sometimes these records also hold specific clinical audit data and other such evidence of monitoring the quality of care that frontline crews provide. They may also be important evidence if there are any claims of clinical negligence or poor care against the Service.

31 *Clinical Governance*, NHS Management Executive Letter number 75, November 1998

colleagues / supervisors monitoring compliance with evidence based clinical protocols; more formalised clinical audit, involving the constructive criticism of the quality of clinical care; patient case review with other healthcare professionals; exception and critical incident reporting.

4.28 Our work with Service staff suggested that the Service do not achieve such good practice in this area. We confirmed that training paramedics and leading ambulance crew undertake some monitoring of clinical protocol compliance. However we found also that compliance monitoring appears to be ad-hoc, with only 40 per cent of respondents in our staff survey reporting they had participated regularly in such activity. Staff suggested that priorities for such compliance activity in future should include: adult and paediatric basic life support; the patient management plan; cardiac arrest; chest pain; and presumption of death.

4.29 How far protocols benefit patient care depends on founding them on good, evidence-based research. While most staff responding in our survey consider that existing protocols benefit patient care, many also reported their view that there is scope to improve the empirical foundation of some of them. Their suggested priorities for development of new evidence-based protocols included: paediatrics; specific drug administration; obstetrics; spinal injuries; alcohol and drugs; diabetics; intubation; other psychiatric; head injuries; other trauma; and some aspects of respiratory and cardiac care.

Achieving Service wide clinical audit is now a priority

4.30 The 1995 Scottish Office Framework for Clinical Audit aimed to encourage groups of healthcare professionals who work together in the delivery of clinical care also to conduct audit jointly as part of clinical practice[32]. Collaborative clinical audit was seen as a key measure to assessing the quality of clinical care, especially in terms of patient outcome. Figure 30 is an example of one audit by the Service. There are, though, few such examples of clinical audit work in the Service and our survey of Service staff indicated that 73 percent of respondents had not been involved in such work. Similarly, our survey of clinicians and others working with the Service in Scotland showed that 94 percent of respondents were not involved in collaborative audit with them.

32 *A Strategic Framework for Clinical Audit in Scotland*, NHS Management Executive Letter number 52, August 1995

An example of clinical audit involving the Service

Figure 30

An audit of paramedic performance, Ayrshire and Arran Service division and Ayr Hospital A&E department

Clinical staff of the accident and emergency department, Ayr Hospital regularly review ambulance paramedic performance on the basis of information contained in patient report forms, which the Service routinely copy to them.

Audit findings highlight the appropriateness of Service treatment, and the hospital department feeds back audit findings to the Service. This review work showed that the paramedics provided appropriate care in the periods audited.

Source: The Service/ Ayr Hospital data 1998

4.31 The Service appointed a national clinical audit manager for the first time in April 1998. Prior to this appointment there was no formal programme nor priorities set for audits, and activity was limited to ad-hoc and largely undocumented audits by line managers mainly concerned with compliance issues. This is in contrast to some other ambulance services for example in England, which have published the results of their programmed clinical audit work[33].

4.32 In September 1998 the Service Board approved a draft strategy for Service clinical audit activity. Prior to this, our pilot clinical audit project involving the review of Service patient report forms for one week's activity has been the main clinical audit investment for the Service. Other audit initiatives include pilot work in Fife on the effectiveness of pain relief and in Highland where emergency crews are reviewing spinal immobilisation practice. The Service have also reviewed their feedback processes from the 'Heartstart Scotland' audit (Figure 24).

4.33 Our joint work with the Service management identified some further possible options to improve clinical audit within the Service:

- Senior management need to demonstrate to staff their commitment to implement clinical audit. This could involve setting targets for the completion of specific priority audits, and assigning necessary resources.

33 *A Survey of UK Ambulance Services. Evidence For Change.* Index of Projects Resulting in Change. A collaborative initiative between the Ambulance Services Association / JCALC Clinical Effectiveness Committee, and the Department of Health, England, March 1998

- Service managers could improve the "clinical audit culture" by communicating audit information and findings better, and by involving more staff.

- There needs to be more clinical audit with external partners, and better sharing of clinical audit evidence between the Service and other health providers and commissioners.

Appendix 1
Scottish Ambulance Service organisation, management and responsibilities

Board and management

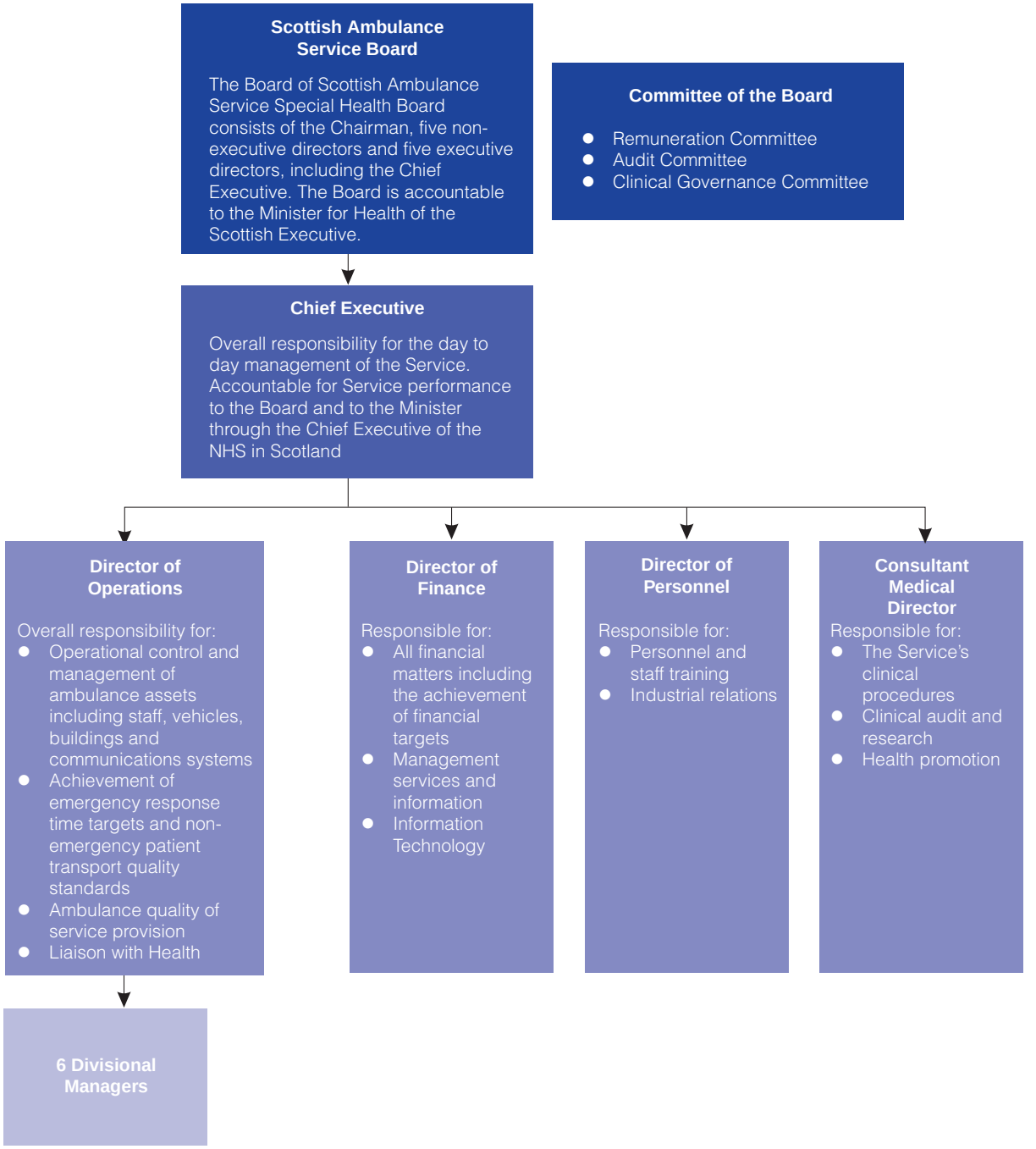
1 The Scottish Ambulance Service became a Special Health Board from 1 April 1999. At this date the Service's Board consisted of the Chairman, five non-executive directors and five executive directors, including the Chief Executive.

2 The Chief Executive and other executive directors are responsible for the day-to-day running of the Service. The Chief Executive is accountable for the performance of the Service to the Board which in turn is accountable to the Minister for Health of the Scottish Executive (the Secretary of State for Scotland before July 1999) through the Chief Executive of the NHS in Scotland.

3 The roles and responsibilities of the Board and top management are shown in Figure A.

Figure A

Scottish Ambulance Service - Board and top management



Source: The Service

4 The Service supports and seeks to follow all aspects of corporate governance. A Remuneration Committee, an Audit Committee and a Clinical Governance Committee are in place to help ensure the essential safeguards of corporate governance.

5 Since first becoming an NHS Trust in April 1995 the Service has sought to encourage effective, meaningful delegation and empowerment so that decisions are made at the most appropriate level. To this end the Service has developed a series of statements outlining their mission and core purpose. These statements have been reviewed and amended since the Service became a Special Health Board in April 1999 (Figure B).

Figure B

Scottish Ambulance Service - Mission, Core Purpose and Key Corporate Objectives

MISSION

To aim to become a fully integrated healthcare provider by:

- Building on existing competencies to complement other healthcare professionals;
- Providing care appropriate to local needs;
- Providing co-ordination of health services via the network of our communication centres;
- Providing, free at the point of delivery, equal access to community, pre and inter hospital care/transport; and
- Being recognised as a good employer, utilising people-centred management philosophies.

In providing the above, the Service are committed to doing so in a caring, economical, efficient manner with the patient always at the forefront .

CORE PURPOSE

To provide Scotland with a national ambulance service by delivering and supporting comprehensive:

- Accident and emergency services;
- Non-emergency patient transport services; and
- Other associated services to the ultimate benefit of patients.

KEY CORPORATE OBJECTIVES

Patient Services:

- To establish the Service as a principal pathway for appropriate access to all healthcare services within Scotland;
- To respond promptly and effectively to emergency need through the expansion of the "hospital to patient" concept;
- To capitalise upon technological advances in order to provide flexible modes of service delivery and investigate, then address, inequities in health access and demand across Scotland;
- To drive the consolidation and improvement of services through the support of research and development and decisions based upon appropriate evidence and clinical effectiveness;
- To focus on improving the public's health and reducing inappropriate admissions; and
- To continually provide equal access for all our patients.

People:

- To empower the workforce through recognition, reward, promotion and opportunity for career and job development in line with the needs of the patient and the organisation;
- To develop a flexible workforce capable of responding swiftly to changes in economic and technical healthcare environments;
- To develop the human resource competencies and employment policy to encourage multi-professional team working, evidence based and user focused training and practice and reduce costs by maximising application of employee skills; and
- Through the competencies of Service staff, to become a leader throughout the UK and Europe in the provision of pre-hospital and ambulance care.

Alliance Development:

- To consolidate existing partnerships and instigate new alliances with local organisations as a means of attaining better integration of healthcare services for Scotland;
- To expand the range of service provision to incorporate both primary and community care services to meet the local population's health needs;
- To be pro-active in meeting patient and local service needs in promoting partnerships and co-operation in the delivery of healthcare services;
- To exploit technological advances to inform, shape and promote appropriate and equitable healthcare services;
- To bring added value to patients the Service will develop the competencies required for healthcare multi-disciplinary teams; and
- To develop partnerships with commercial organisations in the provision of support services to improve quality and augment exchequer funds to the benefit of patients.

Finance:

- To achieve and maintain financial balance through sound policies and practice supported by robust financial controls and regular review.
- To promote value for money and best use of public money at all times;
- To develop and introduce external finance to supplement exchequer funds and further improve patient services e.g. estate and vehicles;
- To ensure all staff exercise the highest level of probity, accountability and openness; and
- To ensure sound management arrangements are in place to minimise personal, professional and financial risks.

Source: The Scottish Ambulance Service Draft Health Improvement Programme 1999-2004 (September 1999)

Organisation

6 The Service is organised on a divisional basis. At the beginning of our audit the Service comprised 10 divisions organised into two regions which were geographically aligned with Health Board boundaries. From April 1999 there have been six divisions (North and West, North East, West Central, East Central, South West and South East) each headed by a divisional manager. The Service's headquarters is in Edinburgh. There are also eight control centres throughout Scotland. Some key statistics for the Service corresponding to the 15 Health Board areas in Scotland are shown in Figure C.

Figure C

Scottish Ambulance Service - Health Board area statistics

Health Board Area	Number of emergency ambulance responses (1998-99)	Population	Area (square kilometres)	Number of emergency vehicle crews (full time equivalents)	Number of emergency ambulances	Number of ambulance stations/ locations
Greather Glasgow	100,367	917,000	548	199	56	7
Lothian	73,336	759,000	1,755	195	43	7
Lanarkshire	52,438	561,000	2,177	146	30	9
Argyll & Clyde	46,246	433,000	7,434	155	53	17
Grampian	40,616	533,000	8,707	162	41	17
Tayside	39,765	395,000	7,502	137	34	12
Ayrshire & Arran	34,538	377,000	3,368	138	32	11
Fife	29,767	352,000	1,308	110	25	7
Highland	20,732	208,000	25,304	181	50	27
Forth Valley	20,416	273,000	2,627	66	15	6
Dumfries & Galloway	14,016	148,000	6,370	97	26	12
Borders	9,813	106,000	4,670	90	19	6
Western Isles	2,428	29,000	2,898	28	11	7
Shetland	1,060	23,000	1,433	7	6	4
Orkney	995	20,000	976	9	5	3
ALL SCOTLAND	486,539	5,134,000	77,077	1,720	446*	152

* A further five ambulances are used for training purposes at the Scottish Ambulance College near Peebles.

Source: The Service

Response time targets

7 Emergency response targets measure the percentage of ambulances arriving at an incident within specified time periods from receipt of a 999 call:

- High population density areas - 50% within 7 minutes, 95% within 14 minutes

- Medium population density areas - 50% within 8 minutes, 95% within 18 minutes

- Low population density areas - 50% within 8 minutes, 95% within 21 minutes

8 Doctor's urgent calls - 95% of patients delivered to hospital within 15 minutes of the time specified by a commissioning doctor.

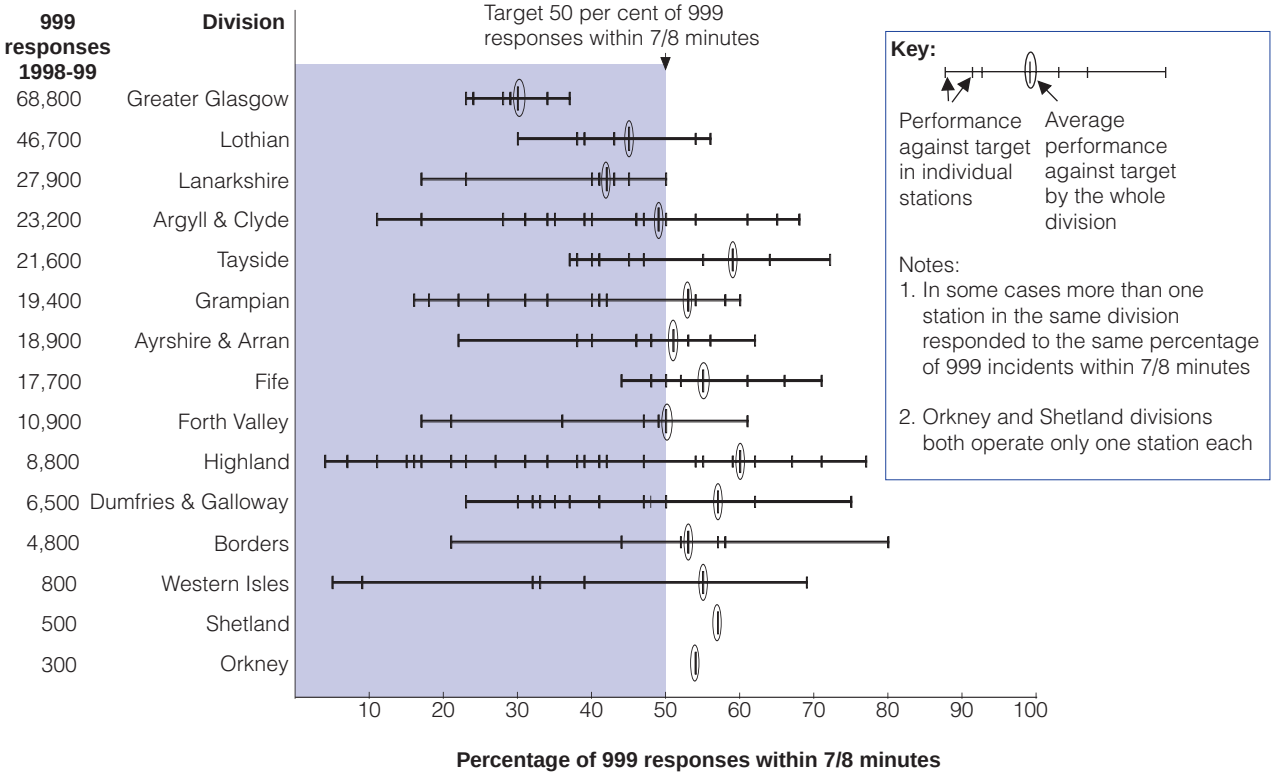
9 The performance of each of the Service's divisions against these targets is shown in Figures D to F.

Figure D

Divisional performance against 999 ambulance response time targets in Scotland 1998-99 - Performance against 50 per cent target

This Figure shows that 11 of the Service's 15 divisions achieved their target to respond to 50 per cent of 999 calls within seven or eight minutes, and many did better. However the three divisions which did worse against the target are the Service's busiest. They responded to 143,400 "999" calls in 1998-99, 52 per cent of all calls.

This Figure shows that there is significant variation around the average, with individual stations within each division achieving comparatively low and high results



Source: Service management information statistics

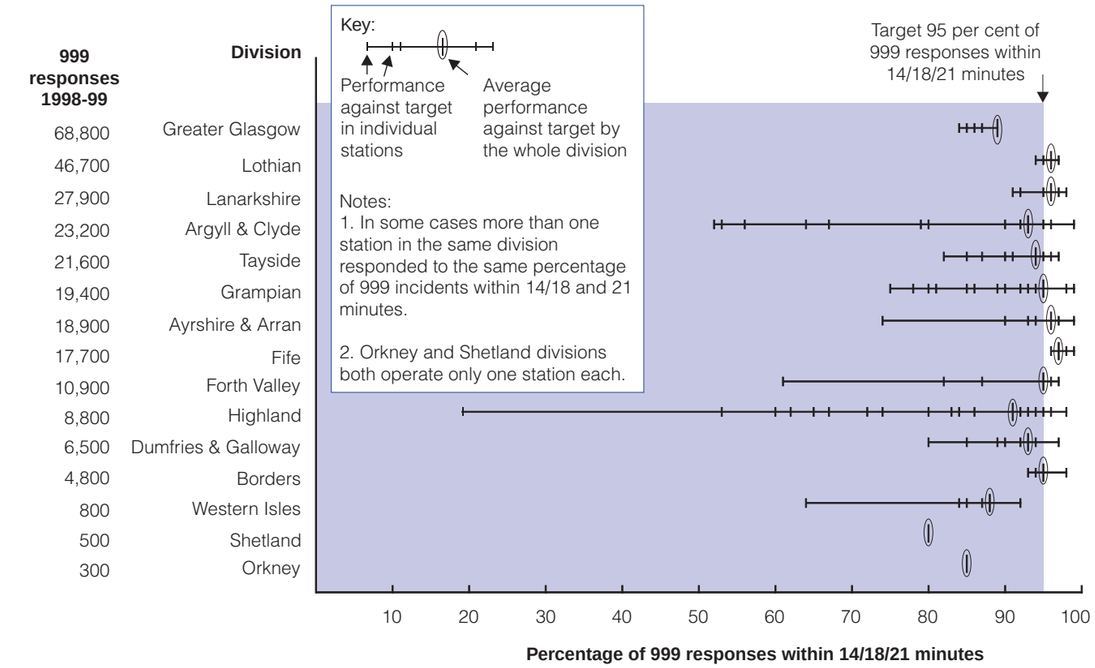
Figures E and F

Figure E

Divisional performance against 999 ambulance response time targets in Scotland 1998-99 - Performance against 95 per cent target

This Figure shows that less than half of the divisions achieved the target to respond to 95 per cent of 999 calls within 14/18/21 minutes. However, with the exception of Glasgow division and the island divisions of Western Isles, Shetland and Orkney, all Service divisions achieved the time target on 90% of occasions.

This Figure shows that there is significant variation around the average, with individual stations within each division achieving comparatively low and high results.

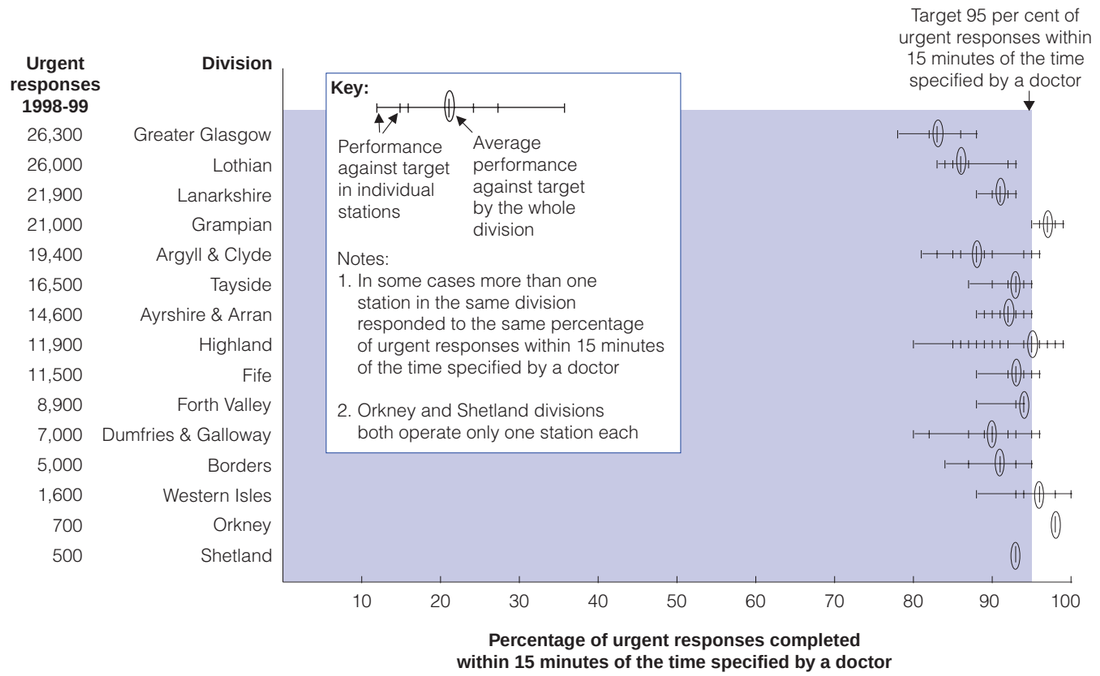


Source: Service management information statistics

Figure F

Divisional performance against urgent ambulance response time targets in Scotland 1998-99

This Figure shows that most divisions failed to achieve the target to deliver urgent patients to hospital within 15 minutes of the time set by doctors on least 95 per cent of occasions. Often, though, divisions missed the target by a only small amount. Again, as with 999 responses, there are for individual stations significant variations around the average.



Source: Service management information statistics

Appendix 2
The National Audit Office methodology

A. Introduction

1. Detailed review of the Service's accountability arrangements and their role within the framework of the NHS in Scotland.

2. Interviewing key staff at the Scottish Executive and the Service and reviewing key documents relating to, for example, organisational and managerial change, and the Service's stated purpose, values, vision and mission.

3. Review of trends in the Service's resources and demand for ambulances.

4. A review of the Service's performance measurement framework to establish the scope for better performance measures. The review included a survey of 80 Service managers and separate workshops involving, in the first instance operational managers, and in the second instance senior managers and Board members. We presented detailed findings as a separate management report to the Service.

B. Providing a rapid and responsive emergency service

1. Review of the Service's performance against emergency telephone answering standards 1997-98.

2. Detailed review of the Service's performance against response time targets for 999 and doctor's urgent incidents since 1993-94 and analysis of response time performance compared with other UK ambulance services.

3. Analysis of the Service's stated reasons for long activation and response times to determine whether any trends exist.

4. Review of Service initiatives in Glasgow division to establish how the Service plans to improve response time performance there.

5. Review of medical and other research about the need for more rapid response to some incidents and to establish the potential advantages and disadvantages of priority based dispatch systems.

6. Joint clinical audit project with the Service using some 4,500 patient report forms completed during one week in November 1997 to establish the severity of patient condition compared with response and pre-hospital times.

7. Survey of general practices, hospital A&E departments and acute admission units, Health Boards and Health Councils to determine their views of priority dispatch and response time targets (see D.3 for information about our survey, of which this was part).

C. Economic and efficient use of emergency resources

1. Review of principal areas of expenditure to determine the Service's success in controlling costs. The review included comparison of pay rates and management costs with other UK ambulance services, the provision of workshop services and vehicle procurement costs.

2. Analysis of the Service's costs per emergency response and crew productivity compared with other ambulance services in Britain. For this exercise we obtained cost and activity data on other ambulance services from the Audit Commission. Because unit costs are greatly influenced by population density, we adopted the Audit Commission's approach to group ambulance services in England and Wales into one of five "families" based on population density. We compared the cost and productivity of each Service division with the average for the appropriate "family" of ambulance services in England and Wales.

3. Visits to Service divisions to examine various aspects of efficiency and resource utilisation:

- Analysis of shift rosters at 22 stations over five week long sample periods between June 1997 and September 1998 to determine whether shift rosters were properly structured to take account of hourly peaks and troughs in the number of emergency incidents;
- Analysis of the total 999 incident time at 22 stations over the same sample period to determine inter-station variations and scope for the setting of targets;
- Locational analysis of ambulance dispatch point with incident location at a sample of 15 stations over a one week period.

4. Review of the role of control rooms in ensuring best use of operational resources including analysis of control room productivity compared to performance against telephone response standards, and use of IT.

D. Providing effective pre-hospital emergency care

1. Review of research papers and other published documents to establish good practice in pre-hospital emergency ambulance care and in clinical quality monitoring.

2. Review of the Service's strategic framework for clinical care. The review included the Service's Board and senior management team minutes and papers, and the minutes and papers from the Service's Local Paramedic Steering Committees and Professional Advisory Group. We also examined arrangements for the training and maintenance of professional ambulance skills and systems for establishing clinical protocols.

3. Frontline Management Consultants were appointed to work with us to survey 415 patients and 700 other healthcare providers and service commissioners (including representatives from general practices, hospital A&E departments and acute admission units, Health Boards and Health Councils) to obtain information on the effectiveness and quality of the Service's pre-hospital emergency care. A total of 706 questionnaire responses were received indicating a response rate of 84 per cent from patients and 51 per cent from healthcare providers and service commissioners. Four focus groups also comprising patients and other healthcare partners complemented the survey findings.

4. Analysis of the findings of a joint clinical audit project with the Service to establish the incidence of types of patient care administered and to illustrate how better clinical information may help to foster better emergency pre-hospital care. The clinical audit project was complemented by a survey of 1,963 Service managers and emergency crews (23 per cent response rate) and workshops to determine the scope for improved clinical information use and monitoring together with priorities for attention.

5. Review of the Scottish Office Framework for Clinical Audit and the Service's clinical audit strategy to determine clinical audit objectives and priorities.

Appendix 3
The costs and benefits of priority based dispatch systems

Priority dispatch

1 Priority dispatch is a system of prioritising the deployment of emergency ambulances according to a patient's clinical need, with the objective of improving response times to the most seriously ill patients. This can include the use of "fast responders" (such as motorcycle paramedics, or suitably trained general practitioners or fire, police and coastguard staff) if they can reach the scene quicker than the ambulance crew.

2 Priority dispatch aims to match ambulance response to the seriousness of the patient's ailment or injury. This should enhance ambulance efficiency and speed of response for the most serious cases, by sending vehicles to them first. But equally the ambulance service may not necessarily send an ambulance immediately to a patient suffering minor or non-threatening injury. In the most trivial cases an option for the ambulance service may be to advise callers to consult their GP and/or attend a hospital casualty department by their own means.

3 Priority dispatch is already in operation in some countries, notably the United States. In the UK a Department of Health Steering Group[34] was established in 1996 to review ambulance performance standards in England. This group conducted research into priority dispatch in the UK and recommended that the Department permit ambulance services in England to introduce such systems, subject to further pilot evaluations.

4 The Department accepted this and four ambulance services in England introduced call prioritisation on a pilot basis on 1 April 1997. Currently 16 ambulance services in England are operating and evaluating priority dispatch systems and the Department of Health have set a target for the remaining 21 services in England to move to the new system by 2001. The systems require the most serious incidents to receive a faster response, but do not allow the response to minor incidents to be downgraded (unless exceptionally where pilot projects have been specifically authorised).

34 *Review of ambulance performance standards,* Final report of Department of Health Steering Group (in England), July 1996

Call priorities

5 The Department of Health's Steering Group identified three possible categories for 999 calls under priority dispatch:

- Category A – immediately life threatening calls (concerning victims of illness or trauma who may benefit from life-saving help on scene within minutes).

- Category B – serious calls (concerning patients with conditions benefiting from emergency care that requires a more conventional degree of urgency).

- Category C – not life threatening or serious calls (concerning patients requiring an urgent rather than emergency response, by ambulance or other means).

6 Consequently, in England the Department of Health have set targets for services operating call prioritisation that require faster responses for immediately life threatening calls. The new targets in England are that:

- Services using call prioritisation should respond to 75 per cent of immediately life threatening calls within eight minutes. For measuring performance responses by motorcycle paramedics or suitably trained GPs, fire or police services count towards the target, as well as those by ambulances.

- In the event that the ambulance control room calls out a "first responder" for immediately life threatening calls there is still an expectation that a fully equipped ambulance will also respond to transport the patient to hospital. This should be within the previous response time target of 14 or 19 minutes (depending on area) for 95 per cent of calls.

- For other 999 calls, and for services without call prioritisation the previous standards continue to apply. These require 50 per cent of responses within eight minutes and 95 per cent of responses within 14 or 19 minutes (depending on area).

Potential benefits of priority based dispatch

7 In serious cases, how soon an ambulance responds can make the difference between life and death. The Department of Health's Steering Group illustrated how priority dispatch could improve response times in such cases. They estimated that an additional 3,200 cardiac arrest victims could be saved each year if all ambulance services in England responded to 90 per cent of the most serious incidents within eight minutes.

8 Other potential benefits of priority dispatch arise from increased use of telephone medical advice to callers prior to ambulance arrival, the maintenance of key skills through more paramedics being dispatched to the most serious incidents, and a decline in emergency vehicle accidents through fewer lights and siren responses.

Potential costs of priority based dispatch

9 Additional ambulances may be required, particularly in rural areas, to accelerate response times to the most serious (highest priority) incidents. The level of the extra costs will depend on a mixture of operational and service level decisions, such as how much more quickly ambulances should respond in the most serious cases. The Department of Health's Steering Group estimated that extra costs in England might be between £15 million £50 million a year across all services.

Other issues to be considered

10 Under priority dispatch, ambulance control room staff establish the seriousness of the incident by asking the caller a series of questions. A stressed or confused caller may result in a prioritisation that does not fully reflect the seriousness of the patient's condition. However evidence so far suggests that providing proper telephone procedures are adhered to, the risk of underprioritisation is far outweighed by the reduction in risk for those patients with high priority conditions who are not responded to within eight minutes.

11 A sensitive issue is how far the wider public will be prepared to accept a system which may involve a reduction in response times for less serious incidents. So there may need to be publicity about the new system and associated issues. For example one alternative being piloted in England is nurse led emergency help-lines whereby trained staff can provide a caller with a number of options ranging from simple advice to calling out a full emergency ambulance response.